filed 4/19/85; Order 76-6, § 296-24-47505, filed 3/1/76; Order 73-5, § 296-24-47505, filed 5/9/73 and Order 73-4, § 296-24-47505, filed 5/7/73.]

WAC 296-24-47507 Cylinder systems. (1) Application. This section applies specifically to systems utilizing containers constructed in accordance with DOT specifications. All requirements of WAC 296-24-47505 apply to this section unless otherwise noted in WAC 296-24-47505.

(2) Marking of containers.

(a) Containers shall be marked in accordance with DOT regulations. Additional markings not in conflict with DOT regulations may be used.

(b) Except as provided in (c) of this subsection each container shall be marked with its water capacity in pounds or other identified unit of weight.

(c) If a container is filled and maintained only by the owner or his representative and if the water capacity of each container is identified by a code, compliance with (b) of this subsection is not required.

(d) Each container shall be marked with its tare weight in pounds or other identified unit of weight including all permanently attached fittings but not the cap.

(3) Description of a system. A system shall include the container base or bracket, containers, container valves, connectors, manifold valve assembly, regulators, and relief valves.

(4) Containers and regulating equipment installed outside of buildings or structures.

(a) Containers shall not be buried below ground. However, this shall not prohibit the installation in a compartment or recess below grade level, such as a niche in a slope or terrace wall which is used for no other purpose, providing that the container and regulating equipment are not in contact with the ground and the compartment or recess is drained and ventilated horizontally to the outside air from its lowest level, with the outlet at least three feet away from any building opening which is below the level of such outlet.

Except as provided in WAC 296-24-47505 (10)(n), the discharge from safety relief devices shall be located not less than three feet horizontally away from any building opening which is below the level of such discharge and shall not terminate beneath any building unless such space is well ventilated to the outside and is not enclosed on more than two sides.

(b) Containers shall be set upon firm foundation or otherwise firmly secured; the possible effect on the outlet piping of settling shall be guarded against by a flexible connection or special fitting.

(5) Containers and equipment used inside of buildings or structures.

(a) When operational requirements make portable use of containers necessary and their location outside of buildings or structures is impracticable, containers and equipment are permitted to be used inside of buildings or structures in accordance with (a)(i) through (xii) of this subsection, and, in addition, such other provisions of this section as are applicable to the particular use or occupancy.

(i) Containers in use shall mean connected for use.

(ii) Systems utilizing containers having a water capacity greater than two and one-half pounds (nominal one pound LP-gas capacity) shall be equipped with excess flow valves. Such excess flow valves shall be either integral with the container valves or in the connections to the container valve outlets. In either case, an excess flow valve shall be installed in such a manner that any undue strain beyond the excess flow valve will not cause breakage between the container and the excess flow valve. The installation of excess flow valves shall take into account the type of valve protection provided.

(iii) Regulators, if used, shall be either directly connected to the container valves or to manifolds connected to the container valves. The regulator shall be suitable for use with LP-gas. Manifolds and fittings connecting containers to pressure regulator inlets shall be designed for at least 250 p.s.i.g. service pressure.

(iv) Valves on containers having a water capacity greater than fifty pounds (nominal twenty pounds LP-gas capacity) shall be protected while in use.

(v) Containers shall be marked in accordance with WAC 296-24-47505 (5)(c) and subsection (2) of this section.

(vi) Pipe or tubing shall conform to WAC 296-24-47505(8) except that aluminum pipe or tubing shall not be used.

(vii) Hose shall be designed for a working pressure of at least 250 p.s.i.g. Hose and hose connections shall have their correctness as to design, construction and performance determined by listing by a nationally recognized testing laboratory.

(A) The hose length may exceed the length specified in WAC 296-24-47505 (9)(g)(ii), but shall be as short as practicable. Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.

(B) Hose shall be long enough to permit compliance with spacing provisions of this section without kinking or straining or causing hose to be so close to a burner as to be damaged by heat.

(viii) Portable heaters, including salamanders, shall be equipped with an approved automatic device to shut off the flow of gas to the main burner, and pilot if used, in the event of flame extinguishment. Such heaters having inputs above 50,000 B.t.u. manufactured on or after May 17, 1967, and such heaters having inputs above 100,000 B.t.u. manufactured before May 17, 1967, shall be equipped with either:

(A) A pilot which must be lighted and proved before the main burner can be turned on; or

(B) An electric ignition system. The provisions of (a)(viii) of this subsection do not apply to tar kettle burners, torches, melting pots, nor do they apply to portable heaters under 7,500 B.t.u.h. input when used with containers having a maximum water capacity of two and one-half pounds. Container valves, connectors, regulators, manifolds, piping, and tubing shall not be used as structural supports for heaters.

(ix) Containers, regulating equipment, manifolds, pipe, tubing, and hose shall be located so as to minimize

exposure to abnormally high temperatures (such as may result from exposure to convection or radiation from heating equipment or installation in confined spaces), physical damage, or tampering by unauthorized persons.

(x) Heat producing equipment shall be located and used so as to minimize the possibility of ignition of combustibles.

(xi) Containers having water capacity greater than two and one–half pounds (nominal one pound LP–gas capacity) connected for use, shall stand on a firm and substantially level surface and, when necessary, shall be secured in an upright position.

(xii) Containers, including the valve protective devices, shall be installed so as to minimize the probability of impingement of discharge of safety relief devices upon containers.

(b) Containers having a maximum water capacity of two and one–half pounds (nominal one pound LP–gas capacity) are permitted to be used inside of buildings as part of approved self–contained hand torch assemblies or similar appliances.

(c) Containers having a maximum water capacity of twelve pounds (nominal five pounds LP–gas capacity) are permitted to be used temporarily inside of buildings for public exhibition or demonstration purposes, including use for classroom demonstrations.

(d) When buildings frequented by the public are open to the public, containers are permitted to be used for repair or minor renovation as follows:

(i) The maximum water capacity of individual containers shall be fifty pounds (nominal twenty pounds LP–gas capacity).

(ii) The number of LP–gas containers shall not exceed the number of workmen assigned to using the LP–gas.

(iii) Containers having a water capacity of greater than two and one–half pounds (nominal one pound LP–gas capacity[)] shall not be left unattended in such buildings.

(e) When buildings frequented by the public are not open to the public, containers are permitted to be used for repair or minor renovations, as follows:

The provisions of (f) of this subsection shall apply except that containers having a water capacity greater than two and one–half pounds (nominal one pound LP–gas capacity) shall not be left unattended in such buildings.

(f) Containers are permitted to be used in buildings or structures under construction or undergoing major renovation when such buildings or structures are not occupied by the public, as follows:

(i) The maximum water capacity of individual containers shall be two hundred forty–five pounds (nominal one hundred pounds LP–gas capacity).

(ii) For temporary heating such as curing concrete, drying plaster and similar applications, heaters (other than integral heater–container units) shall be located at least six feet from any LP–gas container. This shall not prohibit the use of heaters specifically designed for attachment to the container or to a supporting standard, provided they are designed and installed so as to prevent direct or radiant heat application from the heater onto the container. Blower and radiant type heater shall not be directed toward any LP–gas container within twenty feet.

(iii) If two or more heater–container units, of either the integral or nonintegral type, are located in an unpartitioned area on the same floor, the container or containers of each unit shall be separated from the container or containers of any other unit by at least twenty feet.

(iv) When heaters are connected to containers for use in an unpartitioned area on the same floor, the total water capacity of containers manifolded together for connection to a heater or heaters shall not be greater than seven hundred thirty–five pounds (nominal three hundred pounds LP–gas capacity). Such manifolds shall be separated by at least twenty feet.

(v) On floors on which heaters are not connected for use, containers are permitted to be manifolded together for connection to a heater or heaters on another floor, provided:

(A) The total water capacity of containers connected to any one manifold is not greater than two thousand four hundred fifty pounds (nominal one thousand pounds LP–gas capacity) and;

(B) Where more than one manifold having a total water capacity greater than seven hundred thirty–five pounds (nominal three hundred pounds LP–gas capacity) are located in the same unpartitioned area, they shall be separated by at least fifty feet.

(vi) Storage of containers awaiting use shall be in accordance with WAC 296–24–47513.

(g) Containers are permitted to be used in industrial occupancies for processing, research, or experimental purposes as follows:

(i) The maximum water capacity of individual containers shall be two hundred forty–five pounds (nominal one hundred pounds LP–gas capacity).

(ii) Containers connected to a manifold shall have a total water capacity not greater than seven hundred thirty–five pounds (nominal three hundred pounds LP–gas capacity) and not more than one such manifold may be located in the same room unless separated at least twenty feet from a similar unit.

(iii) The amount of LP–gas in containers for research and experimental use shall be limited to the smallest practical quantity.

(h) Containers are permitted to be used in industrial occupancies with essentially noncombustible contents where portable equipment for space heating is essential and where a permanent heating installation is not practical, as follows: Containers and heaters shall comply with and be used in accordance with (f) of this subsection.

(i) Containers are permitted to be used in buildings for temporary emergency heating purposes, if necessary to prevent damage to the buildings or contents, when the permanent heating system is temporarily out of service, as follows:

(i) Containers and heaters shall comply with and be used in accordance with (f) of this subsection.

(ii) The temporary heating equipment shall not be left unattended.

(j) Containers are permitted to be used temporarily in buildings for training purposes related in installation and use of LP-gas systems, as follows:

(i) The maximum water capacity of individual containers shall be two hundred forty-five pounds (nominal one hundred pounds LP-gas capacity), but the maximum quantity of LP-gas that may be placed in each container shall be twenty pounds.

(ii) If more than one such container is located in the same room, the containers shall be separated by at least twenty feet.

(iii) Containers shall be removed from the building when the training class has terminated.

(6) Container valves and accessories.

(a) Valves in the assembly of multiple container systems shall be arranged so that replacement of containers can be made without shutting off the flow of gas in the system.

Note: This provision is not to be construed as requiring an automatic changeover device.

(b) Regulators and low-pressure relief devices shall be rigidly attached to the cylinder valves, cylinders, supporting standards, the building walls or otherwise rigidly secured and shall be so installed or protected that the elements (sleet, snow, or ice) will not affect their operation.

(c) Valves and connections to the containers shall be protected while in transit, in storage, and while being moved into final utilization, as follows:

(i) By setting into the recess of the container to prevent the possibility of their being struck if the container is dropped upon a flat surface, or

(ii) By ventilated cap or collar, fastened to the container capable of withstanding a blow from any direction equivalent to that of a thirty-pound weight dropped four feet. Construction must be such that a blow will not be transmitted to the valve or other connection.

(d) When containers are not connected to the system, the outlet valves shall be kept tightly closed or plugged, even though containers are considered empty.

(e) Containers having a water capacity in excess of fifty pounds (approximately twenty-one pounds LP-gas capacity), recharged at the installation, shall be provided with excess flow or backflow check valves to prevent the discharge of container contents in case of failure of the filling or equalizing connection.

(7) Safety devices.

(a) Containers shall be provided with safety devices as required by DOT regulations.

(b) A final stage regulator of an LP-gas system (excluding any appliance regulator) shall be equipped on the low-pressure side with a relief valve which is set to start to discharge within the limits specified in Table H-30.

TABLE H-30

Regulator delivery pressure	Relief valve start to discharge pressure setting (percent of regulator deliver pressure)	
	Minimum	Maximum
1 p.s.i.g. or less	200	300
Above 1 p.s.i.g. but not over 3 p.s.i.g.	140	200
Above 3 p.s.i.g.	125	200

(c) When a regulator or pressure relief valve is used inside a building for other than purposes specified in WAC 296-24-47505 (6)(a)(i) through (vi), the relief valve and the space above the regulator and relief valve diaphragms shall be vented to the outside air with the discharge outlet located not less than three feet horizontally away from any building opening which is below such discharge. These provisions do not apply to individual appliance regulators when protection is otherwise provided nor to subsection (5) of this section and WAC 296-24-47505 (10)(n). In buildings devoted exclusively to gas distribution purposes, the space above the diaphragm need not be vented to the outside.

(8) Reinstallation of containers. Containers shall not be reinstalled unless they are requalified in accordance with DOT regulations.

Permissible product. A product shall not be placed in a container marked with a service pressure less than four-fifths of the maximum vapor pressure of product at 130°F.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-47507, filed 11/14/88; Order 73-5, § 296-24-47507, filed 5/9/73 and Order 73-4, § 296-24-47507, filed 5/7/73.]

WAC 296-24-47509 Systems utilizing containers other than DOT containers. (1) Application. This section applies specifically to systems utilizing storage containers other than those constructed in accordance with DOT specifications. Wac 296-24-47505 of this section applies to this section unless otherwise noted in WAC 296-24-47505.

(2) Design pressure and classification of storage containers. Storage containers shall be designed and classified in accordance with Table H-31.

(3) Container valves and accessories, filler pipes, and discharge pipes.

(a) The filling pipe inlet terminal shall not be located inside a building. For containers with a water capacity of 125 gallons or more, such terminals shall be located not less than 10 feet from any building (see WAC 296-24-47505 (6)(b)), and preferably not less than 5 feet from any driveway, and shall be located in a protective housing built for the purpose.

TABLE H-31

Container type	For gases with vapor press. Not to exceed lb. per sq. in. gage at 100°F (37.8°C.)	Minimum design pressures of container lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U-68 U-69)	1949 edition of Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of ASME Code; All editions of API-ASME Code[3]
80[1]	80[1]	80[1]	100[1]
100	100	100	125
125	125	125	156
150	150	150	187
175	175	175	219
200[2]	215	200	250

[1]New storage containers of the 80 type have not been authorized since Dec. 31, 1947.

[2]Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designations when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: (1) The 1949 ASME Code (Par. U-200 and U-201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of the ASME Code, and (3) all editions of the API-ASME Code.

[3]Construction of containers under the API-ASME Code is not authorized after July 1, 1961.

(b) The filling connection shall be fitted with one of the following:

(i) Combination back-pressure check valve and excess flow valve.

(ii) One double or two single back-pressure check valves.

(iii) A positive shutoff valve in conjunction with either:

(A) An internal back pressure valve, or

(B) An internal excess flow valve.

(c) All openings in a container shall be equipped with approved automatic excess flow valves except in the following: Filling connections as provided in (3)(b) of this section; safety relief connections, liquid-level gaging devices as provided in WAC 296-24-47505 (7)(d), (19)(c) and (19)(h); pressure gage connections as provided in WAC 296-24-47505 (7)(e), as provided in (3)(d), (f) and (g) of this section.

(d) An excess flow valve is not required in the withdrawal service line providing the following are complied with:

(i) Such systems' total water capacity does not exceed 2,000 U.S. gallons.

(ii) The discharge from the service outlet is controlled by a suitable manually operated shutoff valve which is:

(A) Threaded directly into the service outlet of the container; or

(B) Is an integral part of a substantial fitting threaded into or on the service outlet of the container; or

(C) Threaded directly into a substantial fitting threaded into or on the service outlet of the container.

(iii) The shutoff valve is equipped with an attached handwheel or the equivalent.

(iv) The controlling orifice between the contents of the container and the outlet of the shutoff valve does not exceed five-sixteenths inch in diameter for vapor withdrawal systems and one-eighth inch in diameter for liquid withdrawal systems.

(v) An approved pressure-reducing regulator is directly attached to the outlet of the shutoff valve and is rigidly supported, or that an approved pressure-reducing regulator is attached to the outlet of the shutoff valve by means of a suitable flexible connection, provided the regulator is adequately supported and properly protected on or at the tank.

(e) All inlet and outlet connections except safety relief valves, liquid level gaging devices and pressure gages on containers of 2,000 gallons water capacity, or more, and on any container used to supply fuel directly to an internal combustion engine, shall be labeled to designate whether they communicate with vapor or liquid space. Labels may be on valves.

(f) In lieu of an excess flow valve openings may be fitted with a quick-closing internal valve which, except during operating periods shall remain closed. The internal mechanism for such valves may be provided with a secondary control which shall be equipped with a fusible plug (not over 220°F melting point) which will cause the internal valve to close automatically in case of fire.

(g) Not more than two plugged openings shall be permitted on a container of 2,000 gallons or less water capacity.

(h) Containers of 125 gallons water capacity or more manufactured after July 1, 1961, shall be provided with an approved device for liquid evacuation, the size of which shall be three-fourths inch national pipe thread minimum. A plugged opening will not satisfy this requirements.

(4) Safety devices.

(a) All safety devices shall comply with the following:

(i) All container safety relief devices shall be located on the containers and shall have direct communication with the vapor space of the container.

(ii) In industrial and gas manufacturing plants, discharge pipe from safety relief valves on pipe lines within a building shall discharge vertically upward and shall be piped to a point outside a building.

(iii) Safety relief device discharge terminals shall be so located as to provide protection against physical damage and such discharge pipes shall be fitted with loose raincaps. Return bends and restrictive pipefittings shall not be permitted.

(iv) If desired, discharge lines from two or more safety relief devices located on the same unit, or similar lines from two or more different units, may be run into a common discharge header, provided that the cross-sectional area of such header be at least equal to the sum of the cross-sectional area of the individual discharge lines, and that the setting of safety relief valves are the same.

(v) Each storage container of over 2,000 gallons water capacity shall be provided with a suitable pressure gage.

(vi) A final stage regulator of an LP–gas system (excluding any appliance regulator) shall be equipped on the low–pressure side with a relief valve which is set to start to discharge within the limits specified in Table H–30.

(vii) When a regulator or pressure relief valve is installed inside a building, the relief valve and the space above the regulator and relief valve diaphragms shall be vented to the outside air with the discharge outlet located not less than 3 feet horizontally away from any opening into the building which is below such discharge. (These provisions do not apply to individual appliance regulators when protection is otherwise provided. In buildings devoted exclusively to gas distribution purposes, the space above the diaphragm need not be vented to the outside.)

(b) Safety devices for aboveground containers shall be provided as follows:

(i) Containers of 1,200 gallons water capacity or less which may contain liquid fuel when installed above ground shall have the rate of discharge required by WAC 296–24–47505 (10)(b) provided by a spring–loaded relief valve or valves. In addition to the required spring–loaded relief valve(s) suitable fuse plug(s) may be used provided the total discharge area of the fuse plug(s) for each container does not exceed 0.25 square inch.

(ii) The fusible metal of the fuse plugs shall have a yield temperature of 208°F minimum and 220°F maximum. Relief valves and fuse plugs shall have direct communication with the vapor space of the container.

(iii) On a container having a water capacity greater than 125 gallons, but not over 2,000 gallons, the discharge from the safety relief valves shall be vented away from the container vertically upwards and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container; loose–fitting rain caps shall be used. Suitable provision shall be made for draining condensate which may accumulate in the relief valve or its discharge pipe.

(iv) On containers of 125 gallons water capacity or less, the discharge from safety relief devices shall be located not less than 5 feet horizontally away from any opening into the building below the level of such discharge.

(v) On a container having a water capacity greater than 2,000 gallons, the discharge from the safety relief valves shall be vented away from the container vertically upwards to a point at least 7 feet above the container, and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container; loose–fitting rain caps shall be used. Suitable provision shall be made so that any liquid or condensate that may accumulate inside of the safety relief valve or its discharge pipe will not render the valve inoperative. If a drain is used, a means shall be provided to protect the container, adjacent containers, piping, or equipment against impingement of flame resulting from ignition of product escaping from the drain.

(c) On all containers which are installed underground and which contain no liquid fuel until buried and covered, the rate of discharge of the spring–loaded relief valve installed thereon may be reduced to a minimum of 30 percent of the rate of discharge specified in WAC 296–24–47505 (10)(b). Containers so protected shall not be uncovered after installation until the liquid fuel has been removed therefrom. Containers which may contain liquid fuel before being installed under ground and before being completely covered with earth are to be considered aboveground containers when determining the rate of discharge requirement of the relief valves.

(d) On underground containers of more than 2,000 gallons water capacity, the discharge from safety relief devices shall be piped vertically and directly upward to a point at least 7 feet above the ground.

Where there is a probability of the manhole or housing becoming flooded, the discharge from regulator vent lines shall be above the highest probable water level. All manholes or housings shall be provided with ventilated louvers or their equivalent, the area of such openings equaling or exceeding the combined discharge areas of the safety relief valves and other vent lines which discharge their content into the manhole housing.

(e) Safety devices for vaporizers shall be provided as follows:

(i) Vaporizers of less than 1 quart total capacity, heated by the ground or the surrounding air, need not be equipped with safety relief valves provided that adequate tests certified by any of the authorities referred to in WAC 296–24–47505(2), demonstrate that the assembly is safe without safety relief valves.

(ii) No vaporizer shall be equipped with fusible plugs.

(iii) In industrial and gas manufacturing plants, safety relief valves on vaporizers within a building shall be piped to a point outside the building and be discharged upward.

(5) Reinstallation of containers. Containers may be reinstalled if they do not show any evidence of harmful external corrosion or other damage. Where containers are reinstalled underground, the corrosion resistant coating shall be put in good condition (see (7)(f) of this section). Where containers are reinstalled above ground, the safety devices and gaging devices shall comply with (4) of this section and WAC 296–24–47505(19) respectively for aboveground containers.

(6) Capacity of containers. A storage container shall not exceed 90,000 gallons water capacity.

(7) Installation of storage containers.

(a) Containers installed above ground, except as provided in (7)(g) of this section, shall be provided with substantial masonry or noncombustible structural supports on firm masonry foundation.

(b) Aboveground containers shall be supported as follows:

(i) Horizontal containers shall be mounted on saddles in such a manner as to permit expansion and contraction. Structural metal supports may be employed when they are protected against fire in an approved manner. Suitable means of preventing corrosion shall be provided

on that portion of the container in contact with the foundations or saddles.

(ii) Containers of 2,000 gallons water capacity or less may be installed with nonfireproofed ferrous metal supports if mounted on concrete pads or footings, and if the distance from the outside bottom of the container shell to the concrete pad, footing, or the ground does not exceed 24 inches.

(c) Any container may be installed with nonfireproofed ferrous metal supports if mounted on concrete pads or footings, and if the distance from the outside bottom of the container to the ground does not exceed 5 feet, provided the container is in an isolated location.

(d) Containers may be partially buried providing the following requirements are met:

(i) The portion of the container below the surface and for a vertical distance not less than 3 inches above the surface of the ground is protected to resist corrosion, and the container is protected against settling and corrosion as required for fully buried containers.

(ii) Spacing requirements shall be as specified for underground tanks in WAC 296-24-47505 (6)(b).

(iii) Relief valve capacity shall be as required for aboveground containers.

(iv) Container is located so as not to be subject to vehicular damage, or is adequately protected against such damage.

(v) Filling densities shall be as required for aboveground containers as specified in Table H-27. See WAC 296-24-47505.

(e) Containers buried underground shall be placed so that the top of the container is not less than 6 inches below grade. Where an underground container might be subject to abrasive action or physical damage due to vehicular traffic or other causes, then it shall be:

(i) Placed not less than 2 feet below grade, or

(ii) Otherwise protected against such physical damage.

It will not be necessary to cover the portion of the container to which manhole and other connections are affixed; however, where necessary, protection shall be provided against vehicular damage. When necessary to prevent floating, containers shall be securely anchored or weighted.

(f) Containers shall be given a protective coating before being placed underground. This coating shall be equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt. In lowering the container into place, care shall be exercised to prevent damage to the coating. Any damage to the coating shall be repaired before backfilling.

(i) Containers shall be set on a firm foundation (firm earth may be used) and surrounded with earth or sand firmly tamped in place. Backfill should be free of rocks or other abrasive materials.

(g) Containers with foundations attached (portable or semiportable containers with suitable steel "runners" or "skids" and popularly known in the industry as "skid tanks") shall be designed, installed, and used in accordance with these rules subject to the following provisions:

(i) If they are to be used at a given general location for a temporary period not to exceed 6 months they need not have fire-resisting foundations or saddles but shall have adequate ferrous metal supports.

(ii) They shall not be located with the outside bottom of the container shell more than 5 feet above the surface of the ground unless fire-resisting supports are provided.

(iii) The bottom of the skids shall not be less than 2 inches or more than 12 inches below the outside bottom of the container shell.

(iv) Flanges, nozzles, valves, fittings, and the like, having communication with the interior of the container, shall be protected against physical damage.

(v) When not permanently located on fire-resisting foundations, piping connections shall be sufficiently flexible to minimize the possibility of breakage or leakage of connections if the container settles, moves, or is otherwise displaced.

(vi) Skids, or lugs for attachment of skids, shall be secured to the container in accordance with the code or rules under which the container is designed and built (with a minimum factor of safety of four) to withstand loading in any direction equal to four times the weight of the container and attachments when filled to the maximum permissible loaded weight.

(h) Field welding where necessary shall be made only on saddle plates or brackets which were applied by the manufacturer of the tank.

(i) For aboveground containers, secure anchorage or adequate pier height shall be provided against possible container flotation wherever sufficiently high floodwater might occur.

(j) When permanently installed containers are interconnected, provision shall be made to compensate for expansion, contraction, vibration, and settling of containers, and interconnecting piping. Where flexible connections are used, they shall be of an approved type and shall be designed for a bursting pressure of not less than five times the vapor pressure of the product at 100°F. The use of nonmetallic hose is prohibited for permanently interconnecting such containers.

(k) Container assemblies listed for interchangeable installation above ground or under ground shall conform to the requirements for aboveground installations with respect to safety relief capacity and filling density. For installation above ground all other requirements for aboveground installations shall apply. For installation under ground all other requirements for underground installations shall apply.

(8) Protection of container accessories.

(a) Valves, regulating, gaging, and other container accessory equipment shall be protected against tampering and physical damage. Such accessories shall also be so protected during the transit of containers intended for installation underground.

(b) On underground or combination aboveground-underground containers, the service valve handwheel, the terminal for connecting the hose, and the opening through which there can be a flow from safety relief valves shall be at least 4 inches above the container and this opening shall be located in the dome or housing.

Underground systems shall be so installed that all the above openings, including the regulator vent, are located above the normal maximum water table.

(c) All connections to the underground containers shall be located within a substantial dome, housing, or manhole and with access thereto protected by a substantial cover.

(9) Drips for condensed gas. Where vaporized gas on the low-pressure side of the system may condense to a liquid at normal operating temperatures and pressures, suitable means shall be provided for revaporization of the condensate.

(10) Damage from vehicles. When damage to LP-gas systems from vehicular traffic is a possibility, precautions against such damage shall be taken.

(11) Pits and drains. Every effort should be made to avoid the use of pits, except pits fitted with automatic flammable vapor detecting devices. No drains or blowoff lines shall be directed into or in proximity to sewer systems used for other purposes.

(12) General provisions applicable to systems in industrial plants (of 2,000 gallons water capacity and more) and to bulk filling plants.

(a) When standard watch service is provided, it shall be extended to the LP-gas installation and personnel properly trained.

(b) If loading and unloading are normally done during other than daylight hours, adequate lights shall be provided to illuminate storage containers, control valves, and other equipment.

(c) Suitable roadways or means of access for extinguishing equipment such as wheeled extinguishers or fire department apparatus shall be provided.

(d) To minimize trespassing or tampering, the area which includes container appurtenances, pumping equipment, loading and unloading facilities, and cylinder-filling facilities shall be enclosed with at least a 6-foot-high industrial type fence unless otherwise adequately protected. There shall be at least two means of emergency access.

(13) Container-charging plants.

(a) The container-charging room shall be located not less than:

(i) Ten feet from bulk storage containers.

(ii) Twenty-five feet from line of adjoining property which may be built upon.

(b) Tank truck filling station outlets shall be located not less than:

(i) Twenty-five feet from line of adjoining property which may be built upon.

(ii) Ten feet from pumps and compressors if housed in one or more separate buildings.

(c) The pumps or compressors may be located in the container-charging room or building, in a separate building, or outside of buildings. When housed in separate building, such building (a small noncombustible weather cover is not to be construed as a building) shall be located not less than:

(i) Ten feet from bulk storage tanks.

(ii) Twenty-five feet from line of adjoining property which may be built upon.

(iii) Twenty-five feet from sources of ignition.

(d) When a part of the container-charging building is to be used for a boiler room or where open flames or similar sources of ignition exist or are employed, the space to be so occupied shall be separated from container charging room by a partition wall or walls of fire-resistant construction continuous from floor to roof or ceiling. Such separation walls shall be without openings and shall be joined to the floor, other walls, and ceiling or roof in a manner to effect a permanent gas-tight joint.

(e) Electrical equipment and installations shall conform with WAC 296-24-47505 (17) and (18).

(14) Fire protection.

(a) Each bulk plant shall be provided with at least one approved portable fire extinguisher having a minimum rating of 12-B, C.

(b) In industrial installations involving containers of 150,000 gallons aggregate water capacity or more, provision shall be made for an adequate supply of water at the container site for fire protection in the container area, unless other adequate means for fire control are provided. Water hydrants shall be readily accessible and so spaced as to provide water protection for all containers. Sufficient lengths of firehose shall be provided at each hydrant location on a hose cart, or other means provided to facilitate easy movement of the hose in the container area. It is desirable to equip the outlet of each hose line with a combination fog nozzle. A shelter shall be provided to protect the hose and its conveyor from the weather.

(15) Painting. Aboveground containers shall be kept properly painted.

(16) Lighting. Electrical equipment and installations shall conform to WAC 296-24-47505 (17) and (18).

(17) Vaporizers for internal combustion engines. The provisions of WAC 296-24-47511(8) shall apply.

(18) Gas regulating and mixing equipment for internal combustion engines. The provisions of WAC 296-24-47511(9) shall apply.

[Order 73-5, § 296-24-47509, filed 5/9/73 and Order 73-4, § 296-24-47509, filed 5/7/73.]

WAC 296-24-47511 Liquefied petroleum gas as a motor fuel. (1) Application.

(a) This section applies to internal combustion engines, fuel containers, and pertinent equipment for the use of liquefied petroleum gases as a motor fuel on easily movable, readily portable units including self-propelled vehicles.

(b) Fuel containers and pertinent equipment for internal combustion engines using liquefied petroleum gas where installation is of the stationary type are covered by WAC 296-24-47509. This section does not apply to containers for transportation of liquefied petroleum gases nor to marine fuel use. All requirements of WAC 296-24-47505 apply to this section, unless otherwise noted in WAC 296-24-47505.

(2) General.

(a) Fuel may be used from the cargo tank of a truck while in transit, but not from cargo tanks on trailers or

semitrailers. The use of fuel from the cargo tanks to operate stationary engines is permitted providing wheels are securely blocked.

(b) Passenger–carrying vehicles shall not be fueled while passengers are on board.

(c) Industrial trucks (including lift trucks) equipped with permanently mounted fuel containers shall be charged outdoors. Charging equipment shall comply with the provisions of WAC 296–24–47517.

(d) LP–gas fueled industrial trucks shall comply with the Standard for Type Designations, Areas of Use, Maintenance and Operation of Powered Industrial Trucks, NFPA 505–1969.

(e) Engines on vehicles shall be shut down while fueling if the fueling operation involves venting to the atmosphere.

(3) Design pressure and classification of fuel containers.

(a) Except as covered in (3)(b) and (c) of this section, containers shall be in accordance with Table H–32.

(b) Fuel containers for use in industrial trucks (including lift trucks) shall be either DOT containers authorized for LP–gas service having a minimum service pressure of 240 p.s.i.g or minimum Container Type 250. Under 1950 and later ASME Codes, this means a 312.5–p.s.i.g design pressure container.

TABLE H–32

Container type	For gases with vapor press. Not to exceed lb. per sq. in. gage at 100°F. (37.8°C.)	Minimum design pressure of container lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U–68, U–69)	1949 edition of ASME Code (Par. U–200, U–201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of ASME Code; All editions of API–ASME Code[2]
200[1]	215	200	250

[1]Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designation when constructed under 1949 or earlier editions of the ASME Code (Par. U–68 and U–69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: (1) The 1949 ASME Code (Par. U–200 and U–201) (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of the ASME Code, and (3) all editions of the API–ASME Code.

[2]Construction of containers under the API–ASME Code is not authorized after July 1, 1961.

(c) Containers manufactured and maintained under DOT specifications and regulations may be used as fuel containers. When so used they shall conform to all requirements of this section.

(d) All container inlets and outlets except safety relief valves and gaging devices shall be labeled to designate whether they communicate with vapor or liquid space. (Labels may be on valves.)

(4) Installation of fuel containers.

(a) Containers shall be located in a place and in a manner to minimize the possibility of damage to the container. Containers located in the rear of trucks and buses, when protected by substantial bumpers, will be considered in conformance with this requirement. Fuel containers on passenger–carrying vehicles shall be installed as far from the engine as is practicable, and the passenger space and any space containing radio equipment shall be sealed from the container space to prevent direct seepage of gas to these spaces. The container compartment shall be vented to the outside. In case the fuel container is mounted near the engine or the exhaust system, the container shall be shielded against direct heat radiation.

(b) Containers shall be installed with as much clearance as practicable but never less than the minimum road clearance of the vehicle under maximum spring deflection. This minimum clearance shall be to the bottom of the container or to the lowest fitting on the container or housing, whichever is lower.

(c) Permanent and removable fuel containers shall be securely mounted to prevent jarring loose, slipping, or rotating, and the fastenings shall be designed and constructed to withstand static loading in any direction equal to twice the weight of the tank and attachments when filled with fuel using a safety factor of not less than four based on the ultimate strength of the material to be used. Field welding, when necessary, shall be made only on saddle plates, lugs or brackets, originally attached to the container by the tank manufacturer.

(d) Fuel containers on buses shall be permanently installed.

(e) Containers from which vapor only is to be withdrawn shall be installed and equipped with suitable connections to minimize the accidental withdrawal of liquid.

(5) Valves and accessories.

(a) Container valves and accessories shall have a rated working pressure of at least 250 p.s.i.g., and shall be of a type suitable for liquefied petroleum gas service.

(b) The filling connection shall be fitted with an approved double back–pressure check valve, or a positive shutoff in conjunction with an internal back–pressure check valve. On a removable container the filler valve may be a hand operated shutoff valve with an internal excess flow valve. Main shutoff valves on the container on liquid and vapor must be readily accessible.

(c) With the exceptions of (5)(d)(iii) of this section, filling connections equipped with approved automatic back–pressure check valves, and safety relief valves, all connections to the containers having openings for the flow of gas in excess of a No. 54 drill size shall be equipped with approved automatic excess flow valves to prevent discharge of content in case connections are broken.

(d) Liquid–level gaging devices:

(i) Variable liquid–level gages which require the venting of fuel to the atmosphere shall not be used on fuel containers of industrial trucks (including lift trucks).

(ii) On portable containers that may be filled in the vertical and/or horizontal position, the fixed liquid–level gage shall indicate maximum permitted filling level for

both vertical and horizontal filling with the container oriented to place the safety relief valve in communication with the vapor space.

(iii) In the case of containers used solely in farm tractor service and charged at a point at least 50 feet from any important building, the fixed liquid-level gaging device may be so constructed that the outward flow of container content exceeds that passed by a No. 54 drill size opening, but in no case shall the flow exceed that passed by a No. 31 drill-size opening. An excess flow valve is not required. Fittings equipped with such restricted drill size opening and container on which they are used shall be marked to indicate the size of the opening.

(iv) All valves and connections on containers shall be adequately protected to prevent damage due to accidental contact with stationary objects or from loose objects thrown up from the road, and all valves shall be safeguarded against damage due to collision, overturning or other accident. For farm tractors where parts of the vehicle provide such protection to valves and fittings, the foregoing requirements shall be considered fulfilled. However, on removable type containers the protection for the fittings shall be permanently attached to the container.

(v) (Exchange of removable fuel containers preferable should be done outdoors but may be done indoors.) When removable fuel containers are used, means shall be provided in the fuel system to minimize the escape of fuel when the containers are exchanged. This shall be accomplished by one of the following methods:

(A) Using an approved automatic quick-closing coupling (a type closing in both directions when uncoupled) in the fuel line, or

(B) Closing the valve at the fuel container and allowing the engine to run until the fuel in the line is consumed.

(6) Piping—Including pipe, tubing, and fittings.

(a) Pipe from fuel container to first-stage regulator shall be not less than schedule 80 wrought iron or steel (black or galvanized), brass or copper; or seamless copper, brass, or steel tubing. Steel tubing shall have a minimum wall thickness of 0.049 inch. Steel pipe or tubing shall be adequately protected against exterior corrosion. Copper tubing shall be types K or L or equivalent having a minimum wall thickness of 0.032 inch. Approved flexible connections may be used between container and regulator or between regulator and gas-air mixer within the limits of approval. The use of aluminum pipe or tubing is prohibited. In the case of removable containers an approved flexible connection shall be used between the container and the fuel line.

(b) All piping shall be installed, braced, and supported so as to reduce to a minimum the possibility of vibration strains or wear.

(7) Safety devices.

(a) Spring-loaded internal type safety relief valves shall be used on all motor fuel containers.

(b) The discharge outlet from safety relief valves shall be located on the outside of enclosed spaces and as far as practicable from possible sources of ignition, and vented upward within 45 degrees of the vertical in such a manner as to prevent impingement of escaping gas upon containers, or parts of vehicles, or on vehicles in adjacent lines of traffic. A rain cap or other protector shall be used to keep water and dirt from collecting in the valve.

(c) When a discharge line from the container safety relief valve is used, the line shall be metallic, other than aluminum, and shall be sized, located, and maintained so as not to restrict the required flow of gas from the safety relief valve. Such discharge line shall be able to withstand the pressure resulting from the discharge of vapor when the safety relief valve is in the full open position. When flexibility is necessary, flexible metal hose or tubing shall be used.

(d) Portable containers equipped for volumetric filling may be filled in either the vertical or horizontal position only when oriented to place the safety relief valve in communication with the vapor space.

(e) WAC 296-24-47505 (10)(1) for hydrostatic relief valves shall apply.

(8) Vaporizers.

(a) Vaporizers and any part thereof and other devices that may be subjected to container pressure shall have a design pressure of at least 250 p.s.i.g.

(b) Each vaporizer shall have a valve or suitable plug which will permit substantially complete draining of the vaporizer. It shall be located at or near the lowest portion of the section occupied by the water or other heating medium.

(c) Vaporizers shall be securely fastened so as to minimize the possibility of becoming loosened.

(d) Each vaporizer shall be permanently marked at a visible point as follows:

(i) With the design pressure of the fuel-containing portion in p.s.i.g.

(ii) With the water capacity of the fuel-containing portion of the vaporizer in pounds.

(e) Devices to supply heat directly to a fuel container shall be equipped with an automatic device to cut off the supply of heat before the pressure inside the fuel container reaches 80 percent of the start to discharge pressure setting of the safety relief device on the fuel container.

(f) Engine exhaust gases may be used as a direct source of heat supply for the vaporization of fuel if the materials of construction of those parts of the vaporizer in contact with exhaust gases are resistant to the corrosive action of exhaust gases and the vaporizer system is designed to prevent excessive pressures.

(g) Vaporizers shall not be equipped with fusible plugs.

(9) Gas regulating and mixing equipment.

(a) Approved automatic pressure reducing equipment shall be installed in a secure manner between the fuel supply container and gas-air mixer for the purpose of reducing the pressure of the fuel delivered to the gas-air mixer.

(b) An approved automatic shutoff valve shall be provided in the fuel system at some point ahead of the inlet of the gas-air mixer, designed to prevent flow of fuel to the mixer when the ignition is off and the engine is not

running. In the case of industrial trucks and engines operating in buildings other than those used exclusively to house engines, the automatic shutoff valve shall be designed to operate if the engine should stop. Atmospheric type regulators (zero governors) shall be considered adequate as an automatic shutoff valve only in cases of outdoor operation such as farm tractors, construction equipment, irrigation pump engines, and other outdoor stationary engine installations.

(c) The source of the air for combustion shall be completely isolated from the passenger compartment, ventilating system, or air-conditioning system.

(10) Capacity of containers. No single fuel container used on passenger carrying vehicles shall exceed 200 gallons water capacity. No single fuel container on other vehicles normally operating on the highway shall exceed 300 gallons water capacity except as provided in (2)(a) of this section.

(11) Stationary engines in buildings. Stationary engines and gas turbines installed in buildings, including portable engines used instead of or to supplement stationary engines, shall comply with the Standard for the Institution and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37-1970, and the appropriate provisions of WAC 296-24-47505 through 296-24-47509.

(12) Portable engines in buildings.

(a) Portable engines may be used in buildings only for emergency use, except as provided by (11) of this section.

(b) Exhaust gases shall be discharged to outside the building or to an area where they will not constitute a hazard.

(c) Provision shall be made to supply sufficient air for combustion and cooling.

(d) An approved automatic shutoff valve shall be provided in the fuel system ahead of the engine, designed to prevent flow of fuel to the engine when the ignition is off or if the engine should stop.

(e) The capacity of LP-gas containers used with such engines shall comply with the applicable occupancy provision of WAC 296-24-47507(5).

(13) Industrial trucks inside buildings.

(a) LP-gas-fueled industrial trucks are permitted to be used in buildings and structures.

(b) No more than two LP-gas containers shall be used on an industrial truck for motor fuel purposes.

(c) LP-gas-fueled industrial trucks are permitted to be used in buildings frequented by the public, when occupied by the public. The total water capacity of containers on each industrial truck shall not exceed 105 pounds (nominal 45 pounds LP-gas).

(d) Trucks shall not be left unattended in areas occupied by the public.

(e) Industrial trucks shall not be parked and left unattended in areas of possible excessive heat or sources of ignition.

(14) Garaging LP-gas-fueled vehicles.

(a) LP-gas-fueled vehicles may be stored or serviced inside garages provided there are no leaks in the fuel system and the fuel tanks are not filled beyond the maximum filling capacity specified in WAC 296-24-47505 (12)(a).

(b) LP-gas-fueled vehicles being repaired in garages shall have the container shutoff valve closed except when fuel is required for engine operation.

(c) Such vehicles shall not be parked near sources of heat, open flames, or similar sources of ignition or near open pits unless such pits are adequately ventilated.

[Order 73-5, § 296-24-47511, filed 5/9/73 and Order 73-4, § 296-24-47511, filed 5/7/73.]

WAC 296-24-47513 Storage of containers awaiting use or resale. (1) Application. This section shall apply to the storage of portable containers not in excess of one thousand pounds water capacity, filled or partially filled, at user location but not connected for use, or in storage for resale by dealers or resellers. This section shall not apply to containers stored at charging plants or at plants devoted primarily to the storage and distribution of LP-gas or other petroleum products.

(2) General.

(a) Containers in storage shall be located so as to minimize exposure to excessive temperature rise, physical damage, or tampering by unauthorized persons.

(b) Containers when stored inside shall not be located near exits, stairways, or in areas normally used or intended for the safe exit of people.

(c) Container valves shall be protected while in storage as follows:

(i) By setting into recess of container to prevent the possibility of their being struck if the container is dropped upon a flat surface, or

(ii) By ventilated cap or collar, fastened to container capable of withstanding blow from any direction equivalent to that of a thirty-pound weight dropped four feet. Construction must be such that a blow will not be transmitted to a valve or other connection.

(d) The outlet valves of containers in storage shall be closed.

(e) Empty containers which have been in LP-gas service should preferably be stored in the open. When stored inside, they shall be considered as full containers for the purpose of determining the maximum quantity of LP-gas permitted by this section.

(3) Storage within buildings frequented by the public.

(a) DOT specification containers having a maximum individual water capacity of two and one-half pounds, used with completely self-contained hand torches and similar applications, are permitted to be stored or displayed in a building frequented by the public. The display of such containers shall be limited to a total of twenty-four units of each brand and size. The total quantity on display and in storage shall not exceed two hundred pounds LP-gas.

(b) Storage as provided in subsection (5) of this section shall not be permitted within or attached to such a building.

(4) Storage within buildings not frequented by the public (such as industrial buildings).

(a) The quantity of LP-gas stored shall not exceed three hundred pounds (approximately two thousand five hundred fifty cubic feet in vapor form) except as provided in subsection (5) of this section.

(b) Containers carried as a part of service equipment on highway mobile vehicles are not to be considered in the total storage capacity in (a) of this subsection provided such vehicles are stored in private garages, and are limited to one container per vehicle with an LP-gas capacity of not more than one hundred pounds. All container valves shall be closed.

(5) Storage within special buildings or rooms.

(a) The quantity of LP-gas stored in special buildings or rooms shall not exceed ten thousand pounds.

(b) The walls, floors, and ceilings of container storage rooms that are within or adjacent to other parts of the building shall be constructed of material having at least a two-hour fire resistance rating.

(c) A portion of the exterior walls or roof having an area not less than ten percent of that of the combined area of the enclosing walls and roof shall be of explosion relieving construction.

(d) Each opening from such storage rooms to other parts of the building shall be protected by a one and one-half-hour "(B)" fire door listed by a nationally recognized testing laboratory. Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.

(e) Such rooms shall have no open flames for heating or lighting.

(f) Such rooms shall be adequately ventilated both top and bottom to the outside only. The openings from such vents shall be at least five feet away from any other opening into any building.

(g) The floors of such rooms shall not be below ground level. Any space below the floor shall be of solid fill or properly ventilated to the open air.

(h) Such storage rooms shall not be located adjoining the line of property occupied by schools, churches, hospitals, athletic fields or other points of public gathering.

(i) Fixed electrical equipment shall be installed in accordance with WAC 296-24-47505(18).

(6) Storage outside of buildings.

(a) Storage outside of buildings, for containers awaiting use or resale, shall be located in accordance with Table H-33 with respect to:

(i) The nearest important building or group of buildings;

(ii) The line of adjoining property which may be built upon;

(iii) Busy thoroughfares;

(vi) The line of adjoining property occupied by schools, churches, hospitals, athletic fields, or other points of public gathering.

TABLE H-33

Quantity of LP-Gas Stored:	Distance
500 pounds or less	0
501 to 2,500 pounds	0*
2,501 to 6,000 pounds	10 feet
6,001 to 10,000 pounds	20 feet
Over 10,000 pounds	25 feet

*Container or containers shall be at least ten feet from any building on adjoining property, any sidewalk, or any of the exposures described in (a)(iii) or (iv) of this subsection.

(b) Containers shall be in a suitable enclosure or otherwise protected against tampering.

(7) Fire protection. Storage locations other than supply depots separated and located apart from dealer, reseller, or user establishments shall be provided with at least one approved portable fire extinguisher having a minimum rating of 8-B, C.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-47513, filed 11/14/88. 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), § 296-24-47513, filed 11/13/80; Order 76-6, § 296-24-47513, filed 3/1/76; Order 73-5, § 296-24-47513, filed 5/9/73 and Order 73-4, § 296-24-47513, filed 5/7/73.]

WAC 296-24-47515 LP-gas system installations on commercial vehicles. (1) Application. This paragraph applies to LP-gas-system installations on vehicles (whether self-propelled or of the trailer or semitrailer type) used for commercial, construction, or public service purposes such as mobile libraries and clinics; to all exchangeable container systems with container capacities greater than 105 pounds water capacity (approximately 45 pounds LP-gas capacity) and to systems using containers permanently mounted on vehicles. It does not apply to LP-gas motor fuel systems covered by WAC 296-24-47511. WAC 296-24-47505 applies to this section unless otherwise noted. When such a vehicle is permanently parked, and LP-gas is supplied from a system not mounted on and secured to the unit, WAC 296-24-47507 and 296-24-47509 shall apply.

(2) Construction and marking of containers. Containers shall be constructed in accordance with WAC 296-24-47505(3), and marked in accordance with the applicable requirements of WAC 296-24-47505(5), and shall also meet the following:

(a) Containers designed for use as portable cylinders shall be constructed in accordance with DOT specifications, and in accordance with WAC 296-24-47505 (2)(e); where applicable.

(b) All other containers whether designed for permanent mounting, or for portable or semiportable use (such as skid tanks), shall be constructed as provided for by WAC 296-24-47505 (2)(d) and (3)(a). Mounting, securing, and protection of such containers shall be as in (2)(c) and (d) of this section.

(c) Permanently installed containers shall meet the requirements of (2)(c)(i) and (ii) of this section with regard to container valves and accessories, and (2)(c)(iii) through (vi) of this section as to mounting.

(i) Nonrecessed container fittings and appurtenances shall be protected against damage by either:

(A) Their location.

(B) The vehicle frame or bumper, or

(C) protective housing. The protective housing, if used, shall comply with the requirements under which the tanks are fabricated with respect to design and construction and shall be designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used. The housing shall be provided with a weather cover if necessary to insure proper operation of valves and safety devices.

(ii) Manually operated shutoff valves, except as covered in WAC 296-24-47511 (2)(a), or self-closing internal valves shall be closed except during transfer operations.

(iii) Tank motor vehicles with frames not made integral with the tank, as by welding, shall be provided with turnbuckles or similar positive devices for drawing the tank down tight on the frame. In addition, suitable stops or anchors shall be attached to the frame and/or the tank to prevent relative motion between them due to starting, stopping, and turning. The stops and anchors shall be so installed as to be readily accessible for inspection and maintenance.

(iv) Any tank motor vehicle designed and constructed so that the cargo tank constitutes in whole or in part the stress member used in lieu of a frame shall be supported by external cradles subtending at least 120 degrees of the shell circumference. The design calculations shall include beam stress, shear stress, torsion stress, bending moment, and acceleration stress for the cargo tank as a whole using a factor of safety of four, based on the ultimate tensile strength of the material. Maximum concentrated stresses which might be created at pads and cradles due to shear, bending, and torsion shall also be calculated in accordance with Appendix G of the American Society of Mechanical Engineers, Unfired Pressure Vessel Code, 1968. Fully loaded vehicles shall be assumed to be operating under highway conditions equal to two "g" loading. The effects of fatigue shall be taken into consideration. Cargo tanks mounted on frames may be supported by longitudinal members attached to pads providing the above-stated factors are taken into account.

(v) Where any tank support is attached to any part of a tank head, the stresses imposed upon the head shall be provided for as required in (2)(c)(iv) of this section.

(vi) Tank supports, stops, anchors, and bumpers shall not be welded directly to the tank but shall be attached by means of pads of the same material as the tank. The pad thickness shall be not less than one-fourth inch, or the thickness of the shell material if less, and no greater than the shell material. Each pad shall extend at least four times its thickness, in each direction, beyond the weld attaching the support, bumper, stop, or anchor. Each pad shall be preformed to an inside radius no greater than the outside radius of the tank at the place of attachment. Each pad corner shall be rounded to a radius at least one-fourth the width of the pad, and no greater than one-half the width of the pad. Weepholes and tell-tale holes, if used, shall be drilled or punched before the pads are attached to the tank. Each pad shall be attached to the tank by continuous fillet welding using filler material having properties conforming to the recommendations of the maker of the shell and head material.

(d) Portable or semiportable containers (skid tanks as covered by WAC 296-24-47509 (7)(g)) shall meet the applicable requirements of (2)(d)(i) to (vi) of this section inclusive with regard to container valves and accessories and WAC 296-24-47511 (4)(c) as to mounting. Containers designed for permanent installation as part of systems under WAC 296-24-47509 shall not be used.

(i) Nonrecessed container fittings and appurtenances shall be protected against damage by either—

(A) Their location.

(B) The vehicle frame or bumper, or

(C) A protective housing. The protective housing, if used, shall comply with the requirements under which the tanks are fabricated with respect to design and construction and shall be designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used. The housing shall be provided with a weather cover if necessary to insure proper operation of valves and safety devices.

(ii) Filling connections shall be provided with approved automatic back pressure check valves, excess flow check valves or quick closing internal valves to prevent excessive escape of gas in case the filling connection is broken, except that where the filling and discharge connect on a common opening in the container shell, and that opening is fitted with a quick-closing internal valve as specified in (2)(d)(iii) of this section, the automatic valve shall not be required. In addition every inlet and outlet connection shall be equipped with a manually or automatically operated shutoff valve. Liquid discharge openings, except those for engine fuel lines, on tanks built after September 1, 1965, shall be fitted with a remotely controlled internal shutoff valve. Such valve shall conform to the following requirements:

(A) The seat of the valve shall be inside the tank, or in the opening nozzle or flange, or in a companion flange bolted to the nozzle or flange.

(B) All parts of the valve inside the tank, nozzle, or companion flange shall be made of material not subject to corrosion or other deterioration in the presence of the lading.

(C) The arrangement of parts shall be such that damage to parts exterior to the tank will not prevent effective seating of the valve.

(D) The valve may be operated normally by mechanical means, by hydraulic means, or by air, or gas pressure.

(E) The valve shall be provided with remote means of automatic closure, both mechanical and thermal, in at least two places for tanks over 3,500 gallons water capacity. These remote control stations shall be located at

each end of the tank and diagonally opposite each other. The thermal control mechanism shall have a fusible element with a melting point not over 220°F or less then 208°F. At least one remote control station shall be provided for tanks of 3,500 gallons water capacity or less, and such actuating means may be mechanical.

(iii) All other connections to containers, except those used for gaging devices, thermometer wells, safety relief devices, and plugged openings, shall be provided with suitable automatic excess flow valves, or in lieu thereof may be fitted with quick–closing internal valves.

The control mechanism for the internal valve shall be provided with a secondary control, remote from the fill or discharge connections (for use in the event of accidents or fire during delivery operations), and such control mechanism shall have a fusible element with a melting point not over 220°F or less than 208°F.

(iv) Manually operated shutoff valves, except as covered in WAC 296–24–47511 (2)(a), or self–closing internal valves shall be closed except during transfer operations.

(v) Excess flow valves shall close automatically at the rated flow of vapor or liquid as specified by the valve manufacturers. The flow rating of the piping beyond the excess flow valve shall be greater than that of the excess flow valve and such rating shall include valves, fittings, and hose, except, when branching or necessary restrictions are incorporated in such a piping system so that flow ratings are less than that of the excess flow valve and the tank, then additional excess flow valves shall be installed in the piping where such flow rate is reduced.

(vi) Container inlets and outlets, except those used for safety relief valves, liquid–level gaging devices, and pressure gages, shall be labeled to designate whether they communicate with vapor or liquid space when the container is filled to maximum permitted filling density. (Labels may be on valves.)

(3) Capacity of a system. No single fuel container used on passenger carrying vehicles shall exceed 200 gallons water capacity.

(4) Description of a system. A system consists of an assembly of equipment installed on a commercial vehicle.

(5) Location of containers and systems.

(a) Containers shall not be installed, transported, or stored (even temporarily) inside any vehicle covered by these standards except as provided by the applicable regulations of DOT.

(b) Containers, control valves, and regulating equipment comprising a complete system shall be suitably protected against damage and weather. Systems may be installed in a recess vaportight to the inside of the vehicle and accessible from and vented to the outside.

(c) Systems installed outside of mobile units shall be so located that discharge from safety relief devices shall be not less than 3 feet horizontally away from any opening into the unit below the level of such discharge. When the system is located in a recess vaportight to the inside, vent openings in such recess shall be not less than 3 feet horizontally away from any opening into the mobile unit below the level of these vents.

(d) There shall be no fuel connection between tractor and trailer or other vehicle units.

(e) The container or container carrier shall be secured in place by fastenings designed and constructed with a minimum safety factor of four to withstand loading in any direction equal to twice the weight of the container when filled to normal capacity with LP–gas.

(6) Container valves and accessories. Container valves and accessories shall be provided, protected and mounted as follows:

(a) Systems utilizing DOT cylinders in accordance with WAC 296–24–47507(6).

(b) All other systems in accordance with WAC 296–24–47509 (3)(b) through (g).

(c) Portable, semiportable and permanently mounted containers shall be mounted and protected as provided under (2)(b) through (d) of this section.

(7) Safety–relief devices.

(a) DOT containers shall be provided with safety–relief devices as required by the regulations of DOT.

(b) ASME containers and API–ASME containers shall be provided with safety–relief devices as required by WAC 296–24–47505(10).

(c) A final stage regulator of an LP–gas system (excluding any appliance regulator) shall be equipped on the low–pressure side with a relief valve which is set to start to discharge within the limits specified in Table H–30. (See WAC 296–24–47509.)

(i) The relief valve and space above the regulator and relief valve diaphragms shall be vented to the outside air and terminate at a position to minimize the possibility of vapors accumulating at sources of ignition.

(d) Whenever equipment such as a cargo heater or cooler on commercial vehicles is a type designed to be in operation while in transit, suitable means to stop the flow such as an excess flow valve or other device, shall be installed. This device will be actuated to stop the flow in the event of the break in the fuel supply line. All excess flow valves shall comply with WAC 296–24–47505 (7)(c).

(8) System design and line pressure. Systems may be of either vapor withdrawal or liquid withdrawal type and shall comply with the applicable requirements for the type of usage involved.

(9) System enclosure and mounting.

(a) Housing or enclosures shall be designed to provide proper ventilation.

(b) Hoods, domes, or removable portions of cabinets shall be provided with means to keep them firmly in place during transit.

(c) Provision shall be incorporated in the assembly to hold the containers firmly in position and prevent their movement during transit in accordance with WAC 296–24–47511 (4)(c).

(d) Containers shall be mounted on a substantial support or base secured firmly to the vehicle chassis. Neither the container nor its support shall extend below the frame.

(10) Piping—Including pipe, tubing, and fittings.

(a) Regulators shall be connected directly to the container valve outlet or mounted securely by means of

support bracket and connected to the container valve or valves with a listed high pressure flexible connector.

(b) Provision shall be made between the regulator outlet and the gas service lines by either a flexible connector or a tubing loop to provide for expansion, contraction, jarring, and vibration.

(c) Pipe, tubing, and fittings shall conform to WAC 296-24-47505(8) except that the use of aluminum alloy piping is prohibited. Steel tubing shall have a minimum wall thickness of 0.049 inch. Steel piping or tubing shall be adequately protected against exterior corrosion.

(d) Approved gas tubing fittings shall be employed for making tubing connections.

(e) The fuel line shall be firmly fastened in a protected location and where under the vehicle and outside and below any insulation or false bottom, fastenings shall be such as to prevent abrasion or damage to the gas line due to vibration. Where the fuel line passes through structural members or floors, a rubber grommet or equivalent shall be installed to prevent chafing.

(f) The fuel line shall be installed to enter the vehicle through the floor directly beneath or adjacent to the appliance which it serves. When a branch line is required the tee connection shall be in the main fuel line and located under the floor and outside the vehicle.

(g) All parts of the system assembly shall be so designed and secured as to preclude such parts working loose during transit.

(11) Appliances.

(a) LP-gas appliances shall be approved for use on commercial vehicles.

(b) In the case of vehicles not intended for human occupancy and where the gas-fired heating appliance is used to protect the cargo, such heater may be of the unvented type but provision shall be made to dispose of the products of combustion to the outside.

(c) In the case of vehicles intended for human occupancy, all gas-fired heating appliances, including water heaters, shall be designed or installed to provide for complete separation of the combustion system from the atmosphere of the living space. Such appliances shall be installed with the combustion air inlet assembly furnished as a component of the appliance and, also, with either—

(i) The flue gas outlet assembly furnished as a component of the appliance, or

(ii) A listed roof jack if the appliance is listed for such use.

The combustion air inlet assembly, flue gas outlet assembly, and roof jack shall extend to the outside atmosphere.

(d) Provision shall be made to insure an adequate supply of outside air for combustion.

(e) All gas-fired heating appliances and water heaters shall be equipped with an approved automatic device designed to shut off the flow of gas to the main burner and to the pilot in the event the pilot flame is extinguished.

(f) Gas-fired appliances installed in the cargo space shall be located so they are readily accessible.

(g) Appliances shall be constructed or protected to reduce to a minimum possible damage or impaired operation resulting from cargo shifting or handling.

(h) Appliances inside the vehicle shall be located so that a fire at an appliance will not block egress of persons therefrom.

(12) General precautions.

(a) DOT containers shall be marked, maintained, and requalified for use in accordance with the regulations of DOT.

(b) Containers which have not been requalified as required by DOT regulations shall be removed from service. Requalified containers shall be stamped with the date of requalification. When DOT cylinders are requalified by retesting, such retest shall be made in accordance with DOT regulations.

(c) Containers shall not be charged with fuel unless they bear the proper markings of the code or specifications under which they were constructed, and in addition, with their water capacity. In the case of cylinders or portable containers filled by weight, the container shall be marked with its tareweight.

(d) DOT containers which have been involved in a fire shall not be recharged until they have been requalified for service according to DOT regulations.

(e) American Petroleum Institute-American Society of Mechanical Engineers (API-ASME) containers or ASME containers which have been involved in a fire shall not be recharged until they have been retested in accordance with the requirements for their original hydrostatic test and found to be suitable for continued service.

(f) Containers shall not be charged without the consent of the owner.

(g) A permanent caution plate shall be provided on the appliance or adjacent to the container outside of any enclosure. It shall include the word "caution" and following instructions, or instructions embodying substantially similar language.

(i) Be sure all appliance valves are closed before opening container valve.

(ii) Connections at appliances, regulators, and containers must be checked periodically for leaks with soapy water or its equivalent.

(iii) A match or flame shall not be used to check for leaks.

(iv) Container valves shall be closed when the equipment is not in use.

(13) Charging of containers. Containers shall be charged as provided in WAC 296-24-47505(12).

(14) Fire extinguisher. Mobile cook-units shall be provided with at least one approved portable fire extinguisher having a minimum rating of 8-B, C.

[Order 76-6, § 296-24-47515, filed 3/1/76; Order 73-5, § 296-24-47515, filed 5/9/73 and Order 73-4, § 296-24-47515, filed 5/7/73.]

WAC 296-24-47517 Liquefied petroleum gas service stations. (1) Application. This section applies to storage containers, and dispensing devices, and pertinent equipment in service stations where LP-gas is stored and is dispensed into fuel tanks of motor vehicles. See WAC

296-24-47511 for requirements covering use of LP-gas as a motor fuel. All requirements of WAC 296-24-47505 apply to this section unless otherwise noted.

(2) Design pressure and classification of storage containers. Storage containers shall be designed and classified in accordance with Table H-34.

(3) Container valves and accessories.

(a) A filling connection on the container shall be fitted with one of the following:

(i) A combination back-pressure check and excess flow valve.

(ii) One double or two single back-pressure valves.

(iii) A positive shutoff valve, in conjunction with either:

(A) An internal back-pressure valve, or

(B) An internal excess flow valve.

In lieu of an excess flow valve, filling connections may be fitted with a quick-closing internal valve, which shall remain closed except during operating periods. The mechanism for such valves may be provided with a secondary control which will cause it to close automatically in case of fire. When a fusible plug is used its melting point shall not exceed 220°F.

TABLE H-34

Container type	For gases with vapor press. not to exceed lb. per sq. in. gage at 100°F. (37.8°C.)	Minimum design pressure of container, lb. per sq. in gage	
		1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of ASME Code (Par. U-200, U-201); 1950, 1952 1956, 1959, 1962, 1965, and 1968 (Division I) editions of ASME Code; All editions of API-ASME Code[2]
200[1]	215	200	250

[1]Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designation when constructed under 1949 or earlier editions of ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: (1) The 1949 ASME Code (Par. U-200 and U-201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of the ASME Code, and (3) all editions of the API-ASME Code.

[2]Construction of containers under the API-ASME Code is not authorized after July 1, 1961.

(b) A filling pipe inlet terminal not on the container shall be fitted with a positive shutoff valve in conjunction with either:

(i) A back pressure check valve, or

(ii) An excess flow check valve.

(c) All openings in the container except those listed below shall be equipped with approved excess flow check valves:

(i) Filling connections as provided in (3)(a) of this section.

(ii) Safety relief connections as provided in WAC 296-24-47505 (7)(b).

(iii) Liquid-level gaging devices as provided in WAC 296-24-47505 (7)(d) and (19)(d).

(iv) Pressure gage connections as provided in WAC 296-24-47505 (7)(e).

(d) All container inlets and outlets except those listed below shall be labeled to designate whether they connect with vapor or liquid (labels may be on valves):

(i) Safety relief valves.

(ii) Liquid-level gaging devices.

(iii) Pressure gages.

(e) Each storage container shall be provided with a suitable pressure gage.

(4) Safety-relief valves.

(a) All safety-relief devices shall be installed as follows:

(i) On the container and directly connected with the vapor space.

(ii) Safety-relief valves and discharge piping shall be protected against physical damage. The outlet shall be provided with loose-fitting rain caps. There shall be no return bends or restrictions in the discharge piping.

(iii) The discharge from two or more safety relief valves having the same pressure settings may be run into a common discharge header. The cross-sectional area of such header shall be at least equal to the sum of the individual discharges.

(iv) Discharge from any safety relief device shall not terminate in any building nor beneath any building.

(b) Aboveground containers shall be provided with safety relief valves as follows:

(i) The rate of discharge, which may be provided by one or more valves, shall be not less than that specified in WAC 296-24-47505 (10)(b).

(ii) The discharge from safety relief valves shall be vented to the open air unobstructed and vertically upwards in such a manner as to prevent any impingement of escaping gas upon the container; loose-fitting rain caps shall be used. On a container having a water capacity greater than 2,000 gallons, the discharge from the safety relief valves shall be vented away from the container vertically upwards to a point at least 7 feet above the container. Suitable provisions shall be made so that any liquid or condensate that may accumulate inside of the relief valve or its discharge pipe will not render the valve inoperative. If a drain is used, a means shall be provided to protect the container, adjacent containers, piping, or equipment against impingement of flame resulting from ignition of the product escaping from the drain.

(c) Underground containers shall be provided with safety relief valves as follows:

(i) The discharge from safety-relief valves shall be piped vertically upward to a point at least 10 feet above the ground. The discharge lines or pipes shall be adequately supported and protected against physical damage.

(ii) Where there is a probability of the manhole or housing becoming flooded, the discharge from regulator vent lines should be above the highest probable water level.

(iii) If no liquid is put into a container until after it is buried and covered, the rate of discharge of the relief valves may be reduced to not less than 30 percent of the rate shown in WAC 296-24-47505 (10)(b). If liquid fuel is present during installation of containers, the rate of discharge shall be the same as for aboveground containers. Such containers shall not be uncovered until emptied of liquid fuel.

(5) Capacity of liquid containers. Individual storage containers shall not exceed 30,000 gallons water capacity.

(6) Installation of storage containers.

(a) Each storage container used exclusively in service station operation shall comply with the following table which specifies minimum distances to a building, groups of buildings, and adjoining property lines which may be built upon.

Water capacity per container (gallons)	Minimum distances	
	Aboveground and underground (feet)	Between aboveground containers (feet)
Up to 2,000	25	3
Over 2,000	50	5

Note: The above distances may be reduced to not less than 10 feet for service station buildings of other than wood frame construction.

(i) Readily ignitible material including weeds and long dry grass, shall be removed within 10 feet of containers.

(ii) The minimum separation between LP-gas containers and flammable liquid tanks shall be 20 feet and the minimum separation between a container and the centerline of the dike shall be 10 feet.

(iii) LP-gas containers located near flammable liquid containers shall be protected against the flow or accumulation of flammable liquids by diking, diversion curbs, or grading.

(iv) LP-gas containers shall not be located within diked areas for flammable liquid containers.

(v) Field welding is permitted only on saddle plates or brackets which were applied by the container manufacturer.

(vi) When permanently installed containers are interconnected, provision shall be made to compensate for expansion, contraction, vibration, and settling of containers and interconnecting piping. Where flexible connections are used, they shall be of an approved type and shall be designed for a bursting pressure of not less than five times the vapor pressure of the product at 100°F. The use of nonmetallic hose is prohibited for interconnecting such containers.

(vii) Where high water table or flood conditions may be encountered protection against container flotation shall be provided.

(b) Aboveground containers shall be installed in accordance with this section.

(i) Containers may be installed horizontally or vertically.

(ii) Containers shall be protected by crash rails or guards to prevent physical damage unless they are so protected by virtue of their location. Vehicles shall not be serviced within 10 feet of containers.

(iii) Container foundations shall be of substantial masonry or other noncombustible material. Containers shall be mounted on saddles which shall permit expansion and contraction, and shall provide against the excessive concentration of stresses. Corrosion protection shall be provided for tank-mounting areas. Structural metal container supports shall be protected against fire. This protection is not required on prefabricated storage and pump assemblies, mounted on a common base, with container bottom not more than 24 inches above ground and whose water capacity is 2,000 gallons or less if the piping connected to the storage and pump assembly is sufficiently flexible to minimize the possibility of breakage or leakage in the event of failure of the container supports.

(c) Underground containers shall be installed in accordance with this section.

(i) Containers shall be given a protective coating before being placed under ground. This coating shall be equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt. In lowering the container into place, care shall be exercised to minimize abrasion or other damage to the coating. Damage to the coating shall be repaired before back-filling.

(ii) Containers shall be set on a firm foundation (firm earth may be used) and surrounded with earth or sand firmly tamped in place. Backfill should be free of rocks or other abrasive materials.

(iii) A minimum of 2 feet of earth cover shall be provided. Where ground conditions make compliance with this requirement impractical, equivalent protection against physical damage shall be provided. The portion of the container to which manhole and other connections are attached need not be covered. If the location is subjected to vehicular traffic, containers shall be protected by a concrete slab or other cover adequate to prevent the weight of a loaded vehicle imposing concentrated direct loads on the container shell.

(7) Protection of container fittings. Valves, regulators, gages, and other container fittings shall be protected against tampering and physical damage.

(8) Transport truck unloading point.

(a) During unloading, the transport truck shall not be parked on public thoroughfares and shall be at least 5 feet from storage containers and shall be positioned so that shutoff valves are readily accessible.

(b) The filling pipe inlet terminal shall not be located within a building nor within 10 feet of any building or driveway. It shall be protected against physical damage.

(9) Piping, valves, and fittings.

(a) Piping may be underground, above ground, or a combination of both. It shall be well supported and protected against physical damage and corrosion.

(b) Piping laid beneath driveways shall be installed to prevent physical damage by vehicles.

(c) Piping shall be wrought iron or steel (black or galvanized), brass or copper pipe; or seamless copper, brass, or steel tubing and shall be suitable for a minimum pressure of 250 p.s.i.g. Pipe joints may be screwed, flanged, brazed, or welded. The use of aluminum alloy piping or tubing is prohibited.

(d) All shutoff valves (liquid or gas) shall be suitable for liquefied petroleum gas service and designed for not less than the maximum pressure to which they may be subjected. Valves which may be subjected to container pressure shall have a rated working pressure of at least 250 p.s.i.g.

(e) All materials used for valve seats, packing, gaskets, diaphragms, etc., shall be resistant to the action of LP–gas.

(f) Fittings shall be steel, malleable iron, or brass having a minimum working pressure of 250 p.s.i.g. Cast iron pipe fittings, such as ells, tees and unions shall not be used.

(g) All piping shall be tested after assembly and proved free from leaks at not less than normal operating pressures.

(h) Provision shall be made for expansion, contraction, jarring, and vibration, and for settling. This may be accomplished by flexible connections.

(10) Pumps and accessories. All pumps and accessory equipment shall be suitable for LP–gas service, and designed for not less than the maximum pressure to which they may be subjected. Accessories shall have a minimum rated working pressure of 250 p.s.i.g. Positive displacement pumps shall be equipped with suitable pressure actuated bypass valves permitting flow from pump discharge to storage container or pump suction.

(11) Dispensing devices.

(a) Meters, vapor separators, valves, and fittings in the dispenser shall be suitable for LP–gas service and shall be designed for a minimum working pressure of 250 p.s.i.g.

(b) Provisions shall be made for venting LP–gas contained in a dispensing device to a safe location.

(c) Pumps used to transfer LP–gas shall be equipped to allow control of the flow and to prevent leakage or accidental discharge. Means shall be provided outside the dispensing device to readily shut off the power in the event of fire or accident.

(d) A manual shutoff valve and an excess flow check valve shall be installed downstream of the pump and ahead of the dispenser inlet.

(i) Dispensing hose shall be resistant to the action of LP–gas in the liquid phase and designed for a minimum bursting pressure of 1,250 p.s.i.g.

(ii) An excess flow check valve or automatic shutoff valve shall be installed at the terminus of the liquid line at the point of attachment of the dispensing hose.

(e) LP–gas dispensing devices shall be located not less than 10 feet from aboveground storage containers greater than 2,000 gallons water capacity. The dispensing devices shall not be less then 20 feet from any building (not including canopies), basement, cellar, pit, or line of adjoining property which may be built upon and not less than 10 feet from sidewalks, streets, or thoroughfares. No drains or blowoff lines shall be directed into or in proximity to the sewer systems used for other purposes.

(i) LP–gas dispensing devices shall be installed on a concrete foundation or as part of a complete storage and dispensing assembly mounted on a common base, and shall be adequately protected from physical damage.

(ii) LP–gas dispensing devices shall not be installed within a building except that they may be located under a weather shelter or canopy provided this area is not enclosed on more than two sides. If the enclosing sides are adjacent to each other, the area shall be properly ventilated.

(f) The dispensing of LP–gas into the fuel container of a vehicle shall be performed by a competent attendant who shall remain at the LP–gas dispenser during the entire transfer operation.

(12) Additional standards. There shall be no smoking on the driveway of service stations in the dispensing areas or transport truck unloading areas. Conspicuous signs prohibiting smoking shall be posted within sight of the customer being served. Letters on such signs shall be not less than 4 inches high. The motors of all vehicles being fueled shall be shut off during the fueling operations.

(13) Electrical. Electrical equipment and installations shall conform to WAC 296–24–47505 (17) and (18).

(14) Fire protection. Each service station shall be provided with at least one approved portable fire extinguisher having at least an 8–B, C, rating.

[Order 73–5, § 296–24–47517, filed 5/9/73 and Order 73–4, § 296–24–47517, filed 5/7/73.]

Part F–2
STORAGE AND HANDLING OF ANHYDROUS AMMONIA

WAC

WAC 296–24–510 Storage and handling of anhydrous ammonia.

[Order 73-5, § 296-24-510, filed 5/9/73 and Order 73-4, § 296-24-510, filed 5/7/73.]

WAC 296-24-51001 Scope. (1) This standard is intended to apply to the design, construction, location, installation, and operation of anhydrous ammonia systems including refrigerated ammonia storage systems.

(2) This standard does not apply to:

(a) Ammonia manufacturing plants.

(b) Refrigeration plants where ammonia is used solely as a refrigerant. Such systems are covered in American National Standard Safety Code for Mechanical Refrigeration, B-9.1. (See Appendix C for availability.) The provisions of ANSI B-9.1 are not appropriate to refrigerated ammonia storage systems as covered in this standard.

(c) Ammonia transportation pipelines.

[Order 73-5, § 296-24-51001, filed 5/9/73 and Order 73-4, § 296-24-51001, filed 5/7/73.]

WAC 296-24-51003 General. (1) The term "anhydrous ammonia" as used in this standard refers to the compound formed by a combination of two gaseous elements, nitrogen and hydrogen, in the proportion of one part nitrogen to three parts hydrogen by volume. Anhydrous ammonia may be in either gaseous or liquid form. It is not to be confused with aqua ammonia which is a solution of ammonia gas in water. Whenever the term "ammonia" appears in this standard, it is understood to mean anhydrous ammonia.

(2) It is important that personnel understand the properties of this gas and that they be thoroughly trained in safe practices for its storage and handling. Some of the important physical properties of ammonia are listed in (4) of this section.

(3) Gaseous ammonia liquefies under pressure at ambient temperature. Advantage of this characteristic is taken by industry and for convenience this commodity is usually shipped and stored under pressure as a liquid. When refrigerated to or below its normal boiling point (-28°F) it may be shipped and stored as a liquid at atmospheric pressure.

(4) Physical properties of ammonia:

Molecular symbol	NH_3
Molecular weight	17.032
Boiling point at one atmosphere (one atmosphere = 14.7 psia)	-28°F
Melting point at one atmosphere	-107.9°F
Critical temperature	271.4°F
Critical pressure	1657 psia
Latent heat at -28°F and one atmosphere	589.3 BTU per pound
Relative density of vapor compared to dry air at 32°F and one atmosphere	0.5970
Vapor density at -28°F and one atmosphere	0.05555 lb. per cu. ft.
Specific gravity of liquid at -28°F compared to water at 39.2°F	0.6819
Liquid density at -28°F and one atmosphere	42.57 lb. per cu. ft.
Specific volume of vapor at 32°F and one atmosphere	20.78 cu. ft. per pound
Flammable limits by volume in air at atmospheric pressure	16% to 25%
Ignition temperature (in a standard quartz container)	1562°F
Specific heat, gas, 15 C, one atm at constant pressure, C_p	0.5232 Btu/lb. degree °F
at constant volume, C_v	0.3995 Btu/lb. degree °F

(5) Experience has shown that ammonia is extremely hard to ignite and under normal conditions is a very stable compound. It takes temperatures of 840-930°F to cause it to dissociate slightly at atmospheric pressure. The flammable limits at atmospheric pressure are 16% to 25% by volume of ammonia in air. Experiments conducted by a nationally recognized laboratory indicated that an ammonia-air mixture in a standard quartz test container does not ignite below 1562°F. Ammonia is classified by the United States Department of Transportation and the U.S. Coast Guard as a nonflammable compressed gas for the purpose of transportation.

(6) Ammonia should be handled only by properly trained personnel. In no case shall ammonia be used in conjunction with chemicals unless the possible reactions have first been adequately investigated. Under some circumstances ammonia and ammonium compounds can form explosive products with other chemicals. For additional information refer to NFPA 491M "Manual on Hazardous Chemical Reactions" (see Appendix C for availability) and CG-388, the "Chemical Data Guide for Bulk Shipment by Water" (1969 Edition).

(7) Ammonia gas irritates the skin and mucous membrane. At 50 ppm its odor is detectable by most people. The maximum allowable concentration for an 8 hour working exposure is specified as 50 PPM by the American Conference of Government Industrial Hygienists. Because it serves as its own warning agent, no person will voluntarily remain in concentrations which are hazardous. At 5000 ppm it is rapidly fatal. Since ammonia gas is lighter than air, adequate ventilation is the best means of preventing any accumulation.

(8) The common metals are not attacked by dry ammonia. Zinc, copper and copper base alloys such as brass are subject to rapid destructive action by ammonia in the presence of water.

[Order 73-5, § 296-24-51003, filed 5/9/73 and Order 73-4, § 296-24-51003, filed 5/7/73.]

WAC 296-24-51005 Definitions. The following definitions are applicable to all sections of this chapter which include WAC 296-24-510 in the section number and shall be construed to have the meanings below. (1) "Approved" as used in these standards means:

(a) Listed by a recognized testing laboratory, or

(b) Recommended by the manufacturer as suitable for use with anhydrous ammonia and so marked, or

(c) Accepted by the authority having jurisdiction.

(2) "Appurtenance" refers to all devices such as pumps, compressors, safety relief devices, liquid-level gaging devices, valves and pressure gages.

(3) "Capacity" refers to the total volume of the container measured in U.S. gallons, unless otherwise specified.

(4) "Cylinder" means a container of 1000 pounds water capacity or less constructed in accordance with United States Department of Transportation Specifications.

(5) The "code" refers to the Unfired Pressure Vessel Code of the American Society of Mechanical Engineers (Section VIII of the ASME Boiler Construction Code), 1952, 1956, 1959, 1962, 1965, 1968 and 1971 editions, the joint code of the American Petroleum Institute and the American Society of Mechanical Engineers (API-ASME Code) 1951 edition, and subsequent amendments to or later editions of the same, as adopted.

(6) "Container" includes all vessels, tanks, cylinders or spheres used for transportation, storage or application of anhydrous ammonia.

(7) "Design pressure" is identical to the term "maximum allowable working pressure" used in the code.

(8) An "implement of husbandry" is a farm wagon-type tank vehicle of not over 3000 gallons capacity, used as a field storage "nurse tank" supplying the fertilizer to a field applicator and moved on highways only for bringing the fertilizer from a local source of supply to farms or fields or from one farm or field to another.

(9) "Filling density" means the per cent ratio of the weight of the gas in a container to the weight of water at 60°F that the container will hold. One lb. H^2O = 27.737 cu. in. at 60°F. For determining the weight capacity of the tank in pounds, the weight of a gallon (231 cubic inches) of water at 60°F in air shall be 8.32828 pounds.

(10) "Gas" refers to anhydrous ammonia in either the gaseous or liquefied state.

(11) "Gas mask" refers to gas masks approved by the Bureau of Mines. See American National Standard for Respiratory Protection, Z88.2. (See Appendix C for availability.)

(12) "DOT regulations" refer to hazardous materials regulations of the department of transportation (Title 49—Transportation, Code of Federal Regulations, Parts 171 to 190), including Specifications for Shipping Containers.

(13) "Systems" as used in these standards refers to an assembly of equipment consisting essentially of the container or containers, appurtenances, pumps, compressors, and interconnecting piping.

(14) The abbreviations "psig" and "psia" refer to pounds per square inch gage and pounds per square inch absolute, respectively.

(15) The terms "charging" and "filling" are used interchangeably and have the same meaning.

(16) "Trailer" as used in these standards refers to every vehicle designed for carrying persons or property and for being drawn by a motor vehicle and so constructed that no part of its weight except the towing device rests upon the towing vehicle.

(17) "Tank motor vehicle" means any motor vehicle designed or used for the transportation of anhydrous ammonia in any tank designed to be permanently attached to any motor vehicle or any container not permanently attached to any motor vehicle which by reason of its size, construction or attachment to any motor vehicle must be loaded and/or unloaded without being removed from the motor vehicle.

(18) "Semitrailer" refers to every vehicle designed for carrying persons or property and for being drawn by a motor vehicle and so constructed that some part of its weight and that of its load rests upon or is carried by another vehicle.

(19) "Safety relief valve" refers to an automatic spring loaded or equivalent type pressure activated device for gas or vapor service characterized by pop action upon opening, sometimes referred to as a pop valve. (Refer to American National Standard Terminology for Pressure Relief Devices, B95.1.)

(20) "Hydrostatic relief valve" refers to an automatic pressure activated valve for liquid service characterized by throttle or slow weep opening (nonpop action). (Refer to American National Standard Terminology for Pressure Relief Devices, B95.1.)

[Order 74-27, § 296-24-51005, filed 5/7/74; Order 73-5, § 296-24-51005, filed 5/9/73 and Order 73-4, § 296-24-51005, filed 5/7/73.]

WAC 296-24-51007 Use of water in emergencies. (1) The concentration of ammonia vapor in air can effectively be reduced by the use of adequate volumes of water applied through spray or fog nozzles.

(2) Water should be used on liquid ammonia spills only if sufficient water is available. For the purpose of this section, sufficient water may be taken to be 100 parts of water to one part of ammonia.

(3) If an ammonia container is exposed to fire and cannot be removed, water should be used to cool it.

(4) Under some circumstances ammonia in a container is colder than the available water supply. Under these circumstances water should not be sprayed on the container walls since it would heat the ammonia and aggravate any gas leak.

(5) If it is found necessary to dispose of ammonia, as from a leaking container, liquid ammonia should be discharged into a vessel containing water sufficient to absorb it. Sufficient water may be taken to be ten parts of

water per part ammonia. The ammonia should be injected into the water as near the bottom of the vessel as practical.

[Order 73-5, § 296-24-51007, filed 5/9/73 and Order 73-4, § 296-24-51007, filed 5/7/73.]

WAC 296-24-51009 Basic rules. This section applies to all sections of this chapter which include WAC 296-24-510 in the section number unless otherwise noted.

(1) Approval of equipment and systems. Each appurtenance shall be approved in accordance with (a), (b), (c), and (d) of this subsection.

(a) It was installed before February 8, 1973 and was approved and tested, and installed in accordance with either the provisions of the American National Standard for the Storage and Handling of Anhydrous Ammonia, K61.1, or the Fertilizer Institute Standards for the Storage and Handling of Agricultural Anhydrous Ammonia, M-1, in effect at the time of installation; or

(b) It is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a nationally recognized testing laboratory; or

(c) It is a type which no nationally recognized testing laboratory does, or will undertake to accept, certify, list, label, or determine to be safe; and such equipment is inspected or tested by any federal, state, municipal, or other local authority responsible for enforcing occupational safety provisions of a federal, state, municipal or other local law, code, or regulation pertaining to the storage, handling, transport, and use of anhydrous ammonia, and found to be in compliance with either the provisions of the American National Standard for the Storage and Handling of Anhydrous Ammonia, K61.1, or the Fertilizer Institute Standards for the Storage and Handling of Agricultural Anhydrous Ammonia, M-1, in effect at the time of installation; or

(d) It is a custom-designed and custom-built unit, which no nationally recognized testing laboratory, or federal, state, municipal or local authority responsible for the enforcement of a federal, state, municipal, or local law, code or regulation pertaining to the storage, transportation and use of anhydrous ammonia is willing to undertake to accept, certify, list, label or determine to be safe, and the employer has on file a document attesting to its safe condition following the conduct of appropriate tests. The document shall be signed by a registered professional engineer or other person having special training or experience sufficient to permit him/her to form an opinion as to safety of the unit involved. The document shall set forth the test bases, test data and results, and also the qualifications of the certifying person.

(e) For the purposes of this section the word "listed" means that equipment is of a kind mentioned in a list which is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment, and states such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner. "Labeled" means there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment, and whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner. "Certified" means it has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner, or is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and it bears a label, tag, or other record of certification.

(f) For purposes of this section, refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.

(2) Requirements for construction, original test and requalification of not-refrigerated containers.

(a) Containers used with systems covered in WAC 296-24-51011 and 296-24-51017 through 296-24-51021 shall be constructed and tested in accordance with the code except that construction under Table UW-12 at a basic joint efficiency of under eighty percent is not authorized.

Containers built according to the code do not have to comply with paragraphs UG-125 to UG-128, inclusive, and paragraphs UG-132 and UG-133 of the code.

(b) Containers exceeding thirty-six inches in diameter or two hundred fifty gallons water capacity shall be constructed to comply with one or more of the following:

(i) Containers shall be stress relieved after fabrication in accordance with the code, or

(ii) Cold-formed heads, when used, shall be stress relieved or,

(iii) Hot-formed heads shall be used.

(c) Welding to the shell, head, or any other part of the container subject to internal pressure shall be done in compliance with WAC 296-24-51005(5). Other welding is permitted only on saddle plates, lugs, or brackets attached to the container by the container manufacturer.

(d) Containers used with systems covered by subsection (3)(b)(iv) of this section shall be constructed and tested in accordance with the DOT specifications.

(e) The provisions of (a) of this subsection shall not be construed as prohibiting the continued use or reinstallation of containers constructed and maintained in accordance with the 1949, 1950, 1952, 1956, 1959, 1962, 1965 and 1968 editions of the Unfired Pressure Vessel Code of the ASME or any revisions thereof in effect at the time of fabrication.

(3) Markings on nonrefrigerated containers and systems other than DOT containers.

(a) System nameplates, when required, shall be permanently attached to the system so as to be readily accessible for inspection and shall include markings as prescribed in (b) of this subsection.

(b) Each container or system covered in WAC 296-24-51011, 296-24-51017, 296-24-51019 and 296-24-51021 shall be marked as specified in the following:

(i) With a marking identifying compliance with the rules of the code under which the container is constructed.

(ii) With a notation on the container and system nameplate when the system is designed for underground installation.

(iii) With the name and address of the supplier of the container or the trade name of the container and with the date of fabrication.

(iv) With the water capacity of the container in pounds at 60°F or gallons, United States standard.

(v) With the design pressure in pounds per square inch gage.

(vi) With the wall thickness of the shell and heads.

(vii) With marking indicating the maximum level to which the container may be filled with liquid anhydrous ammonia at temperatures between 20°F and 100°F except on containers provided with fixed maximum level indicators, such as fixed length dip tubes, or containers that are filled by weight. Markings shall be in increments of not more than 20°F.

(viii) With the outside surface area in square feet.

(ix) With minimum temperature in Fahrenheit for which the container is designed.

(x) Marking specified on container shall be on the container itself or on a nameplate permanently affixed thereto.

(c) All main operating valves on permanently installed containers having a capacity of over three thousand water gallons shall be identified to show whether the valve is in liquid or vapor service. The recommended method of identification may be legend or color code as specified in (c)(i) and (ii) of this subsection:

(i) Legend: The legend LIQUID (or LIQUID VALVE), VAPOR (or VAPOR VALVE), as appropriate, shall be placed on or within twelve inches of the valve by means of a stencil tag, or decal.

(ii) Color code: Liquid valves shall be painted orange and vapor valves shall be painted yellow. The legend ORANGE–LIQUID, YELLOW–VAPOR shall be displayed in one or more conspicuous places at each permanent storage location. The legend shall have letters at least two inches high and shall be placed against a contrasting background. This is in accordance with American National Standard A13.1 "Schemes for Identification of Piping Systems"—1956, Page 5.

(4) Marking refrigerated containers. (See WAC 296–24–51013(3). Marking refrigerated containers.)

(5) Location of containers.

(a) Consideration shall be given to the physiological effects of ammonia as well as to adjacent fire hazards in selecting the location for a storage container. Containers shall be located outside of buildings or in buildings or sections thereof especially approved for this purpose.

(b) Containers shall be located at least fifty feet from a dug well or other sources of potable water supply, unless the container is a part of a water treatment installation.

(c) The location of permanent storage containers shall be outside densely populated areas.

(d) Container locations shall comply with the following table:

Nominal Capacity of Container	Minimum Distances (feet) from Container to: Line of Adjoining Property Which may be Built upon, Highways & Mainline of Railroad	Place of Public Assembly	Institution Occupancy
Over 500 to 2,000	25	150	250
Over 2,000 to 30,000	50	300	500
Over 30,000 to 100,000	50	450	750
Over 100,000	50	600	1,000

(e) Storage areas shall be kept free of readily ignitable materials such as waste, weeds and long dry grass.

(6) Container appurtenances.

(a) All appurtenances shall be designed for not less than the maximum working pressure of that portion of the system on which they are installed. All appurtenances shall be fabricated from materials proved suitable for anhydrous ammonia service.

(b) All connections to containers except safety relief devices, gaging devices, or those fitted with a No. 54 drill size orifice shall have shutoff valves located as close to the container as practicable.

(c) Excess flow valves where required by these standards shall close automatically at the rated flows of vapor or liquid as specified by the manufacturer. The connections and line including valves and fittings being protected by an excess flow valve shall have a greater capacity than the rated flow of the excess flow valve.

(d) Liquid level gaging devices that require bleeding of the product to the atmosphere and which are so constructed that outward flow will not exceed that passed by a No. 54 drill size opening need not be equipped with excess flow valves.

(e) Openings from container or through fittings attached directly on container to which pressure gage connections are made need not be equipped with excess flow valves if such openings are not larger than No. 54 drill size.

(f) Excess flow and back pressure check valves where required by these standards shall be located inside of the container or at a point outside as close as practicable to where the line enters the container. In the latter case, installation shall be made in such manner that any undue stress beyond the excess flow or back pressure check valve will not cause breakage between the container and the valve.

(g) Excess flow valves shall be designed with a bypass, not to exceed a No. 60 drill size opening to allow equalization of pressures.

(h) Shutoff valves provided with an excess flow valve shall be designed for proper installation in a container connection so that the excess flow valve will close should the shutoff valve break.

(i) All excess flow valves shall be plainly and permanently marked with the name or trademark of the manufacturer, the catalog number, and the rated capacity.

(7) Piping, tubing and fittings.

(a) All piping, tubing and fittings shall be made of material suitable for anhydrous ammonia service.

(b) All piping, tubing and fittings shall be designed for a pressure not less than the maximum pressure to which they may be subjected in service.

(c) All piping shall be well supported and provision shall be made for expansion and contraction. All refrigeration system piping shall conform to the Refrigeration Piping Code (ANSI B31.5 1966 addenda B31.1a–1968), a section of the American Standard Code for Pressure Piping, as it applies to ammonia.

(d) Piping used on nonrefrigerated systems shall be at least ASTM A–53–1969 Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal. Such pipe shall be at least Schedule 40 when joints are welded, or welded and flanged. Such pipe shall be at least Schedule 80 when joints are threaded. Brass, copper, or galvanized steel pipe or tubing shall not be used.

(e) All metal flexible connections for permanent installations shall have a minimum working pressure of 250 p.s.i.g. (safety factor of 4). For temporary installations, hose meeting the requirement of subsection (8) of this section may be used.

(f) Cast iron fittings shall not be used but this shall not prohibit the use of fittings made specially for ammonia service of malleable or nodular iron such as Specification ASTM A47 or ASTM A395.

(g) Provisions shall be made for expansion, contraction, jarring, vibration, and for settling.

(h) Adequate provisions shall be made to protect all exposed piping from physical damage that might result from moving machinery, the presence of automobiles or trucks, or any other undue strain that may be placed upon the piping.

(i) Joint compounds shall be resistant to ammonia.

(j) After assembly, all piping and tubing shall be tested and proved to be free from leaks at a pressure not less than the normal operating pressure of the system.

(8) Hose specification.

(a) Hose used in ammonia service and subject to container pressure shall conform to the joint Rubber Manufacturers Association and the Fertilizer Institute "Hose Specifications for Anhydrous Ammonia" (see Appendix B).

(b) Hose subject to container pressure shall be designed for a minimum working pressure of 350 p.s.i.g. and a minimum burst pressure of 1750 p.s.i.g. Hose assemblies, when made up, shall be capable of withstanding a test pressure of 500 p.s.i.g.

(c) Hose and hose connections located on the low pressure side of flow control or pressure reducing valves on devices discharging to atmospheric pressure shall be designed for the maximum low side working pressure. All connections shall be designed, constructed, and installed so that there will be no leakage when connected.

(d) Where liquid transfer hose is not drained of liquid upon completion of transfer operations, such hose shall be equipped with an approved shutoff valve at the discharge end. Provision shall be made to prevent excessive hydrostatic pressure in the hose. (See subsection (9)(j) of this section.)

(e) On all hose one–half inch O.D. and larger, used for the transfer of anhydrous ammonia liquid or vapor, there shall be etched, cast, or impressed at five–foot intervals the following information:

"Anhydrous Ammonia"
xxx p.s.i.g. (Maximum working pressure)
Manufacturer's Name or Trademark
Year of Manufacture

(9) Safety relief devices.

(a) Every container used in systems covered by WAC 296–24–51011, 296–24–51017, 296–24–51019 and 296–24–51021 shall be provided with one or more safety relief valves of the spring–loaded or equivalent type. The discharge from safety relief valves shall be vented away from the container, upward and unobstructed to the atmosphere. All safety relief valve discharge openings shall have suitable raincaps that will allow free discharge of the vapor and prevent the entrance of water. Provision shall be made for draining condensate which may accumulate. The rate of the discharge shall be in accordance with the provisions of Appendix A.

(b) Container safety relief valves shall be set to start–to–discharge as follows, with relations to the design pressure of the container.

Containers	Minimum	Maximum*
ASME U–68, U–69	110%	125%
ASME U–200, U–201	95%	100%
ASME 1952, 1956, 1959, 1962, 1965, 1968 or 1971	95%	100%
API–ASME	95%	100%
U.S. Coast Guard	(As required by USCG regulations)	
DOT	(As required by DOT regulations)	

*Note: A relief valve manufacturer's tolerance of plus ten percent is permitted.

(c) Safety relief devices used in systems covered by WAC 296–24–51011, 296–24–51017, 296–24–51019 and 296–24–51021 shall be constructed to discharge at not less than the rates required in (a) of this subsection before the pressure is in excess of one hundred twenty percent (not including the ten percent tolerance referred to in (b) of this subsection) of the maximum permitted start–to–discharge pressure setting of the device.

(d) Safety relief valves shall be so arranged that the possibility of tampering will be minimized. If the pressure setting adjustment is external, the relief valves shall be provided with means for sealing the adjustment.

(e) Shutoff valves shall not be installed between the safety relief valves and the containers or systems described in WAC 296–24–51011, 296–24–51017, 296–24–51019 and 296–24–51021, except that a shutoff valve may be used where the arrangement of this valve is such as always to afford required capacity flow through the relief valves.

Note: The above exception is made to cover such cases as a threeway valve installed under two safety relief valves, each of which has the required rate of discharge and is so installed as to allow either of the safety relief valves to be closed off, but does not allow both safety valves to be closed off at the same time. Another exception to this may be where two separate relief valves are installed with individual shutoff valves. In this case, the two shutoff valve stems shall be mechanically interconnected

in a manner which will allow full required flow of one safety relief valve at all times. Still another exception is a safety relief valve manifold which allows one valve of two, three, four or more to be closed off and the remaining valve or valves will provide not less than the rate of discharge shown on the manifold nameplate.

(f) Safety relief valves shall have direct communication with the vapor space of the container.

(g) Each safety relief valve used with systems described in WAC 296-24-51011, 296-24-51017, 296-24-51019 and 296-24-51021 shall be plainly and permanently marked as follows:

(i) With the letters "AA" or the symbol "NH3."

(ii) The pressure in pounds per square inch gage (p.s.i.g.) at which the valve is set to start-to-discharge.

(iii) The rate of discharge of the valve in cubic feet per minute of air at 60°F and atmospheric pressure (14.7 p.s.i.a.).

(iv) The manufacturer's name and catalog number.

For example, a safety relief valve marked AA-250-4200 (air) would mean that this valve is suitable for use on an anhydrous ammonia container; that it is set to start-to-discharge at 250 p.s.i.g.; and that its rate of discharge (see subsection (8)(a) through (c) of this section) is four thousand two hundred cubic feet per minute of air.

(h) The flow capacity of the safety relief valve shall not be restricted by any connection to it on either the upstream or downstream side.

(i) The manufacturer or supplier of a safety relief valve manifold shall publish complete data showing the flow rating through the combined assembly of the manifold with safety relief valves installed. The manifold flow rating shall be determined by testing the manifold with all but one valve discharging. If one or more openings have restrictions not present in the remaining openings, the restricted opening or openings or those having the lowest flow shall be used to establish the flow rate marked on the manifold nameplate. The marking shall be similar to that required in (g) of this subsection for individual valves.

(j) A hydrostatic relief valve shall be installed between each pair of valves in the liquid ammonia piping or hose where liquid may be trapped so as to relieve into the atmosphere at a safe location.

(k) Discharge from safety relief devices shall not terminate in or beneath any building.

(10) Safety. See CGA Pamphlet G-2, TFI Operational Safety Manual M-2 and MCA Safety Data Sheet SD-8 (see Appendix C for availability).

(a) Personnel required to handle ammonia shall be trained in safe operating practices and the proper action to take in the event of emergencies. Personnel shall be instructed to use the equipment listed in (c) of this subsection in the event of an emergency. (Rev. 1-22-76)

(b) If a leak occurs in an ammonia system, the personnel trained for and designated to act in such emergencies shall:

(i) See that persons not required to deal with an emergency are evacuated from the contaminated area.

(ii) Put on a suitable gas mask.

(iii) Wear gauntlet type plastic or rubber gloves and wear plastic or rubber suits in heavily contaminated atmospheres.

(iv) Shut off the appropriate valves.

(c) All storage systems shall have on hand, as a minimum, the following equipment for emergency and rescue purposes:

*(i) One full face gas mask with anhydrous ammonia refill canisters.

**(ii) One pair of protective gloves.

**(iii) One pair of protective boots.

**(iv) One protective slicker and/or protective pants and jacket.

(v) Easily accessible shower and/or at least fifty gallons of clean water in an open top container.

(vi) Tight fitting vented goggles or one full face shield.

*An ammonia canister is effective for short periods of time in light concentrations of ammonia vapor, generally fifteen minutes in concentrations of three percent and will not protect breathing in heavier concentrations. If ammonia vapors are detected when mask is applied the concentration is too high for safety. The life of a canister in service is controlled by the percentage of vapors to which it is exposed. Canisters must not be opened until ready for use and should be discarded after use. Unopened canisters may be guaranteed for as long as three years. All should be dated when received because of this limited life. In addition to this protection, an independently supplied air mask of the type used by fire departments may be used for severe emergencies.

**Gloves, boots, slickers, jackets and pants shall be made of rubber or other material impervious to ammonia.

(d) Where several persons are usually present, additional safety equipment may be desirable.

(e) Each tank motor vehicle transporting anhydrous ammonia, except farm applicator vehicles, shall carry a container of at least five gallons of water and shall be equipped with a full face gas mask, a pair of tight-fitting goggles or one full face shield. The driver shall be instructed in their use and the proper action to take to provide for his/her safety.

(f) If a leak occurs in transportation equipment and it is not practical to stop the leak, the driver should move the vehicle to an isolated location away from populated communities or heavily traveled highways.

(g) If liquid ammonia contacts the skin or eyes, the affected area should be promptly and thoroughly flushed with water. Do not use neutralizing solutions or ointments on affected areas. A physician shall treat all cases of eye exposure to liquid ammonia.

(11) Filling densities. (See WAC 296-24-51005(9).)

(a) The filling densities for nonrefrigerated containers shall not exceed the following:

	Aboveground	Underground
(i) Uninsulated	56%*	58%
(ii) Insulated	57%	
(iii) DOT containers shall be filled in accordance with DOT regulations.		

*This corresponds to 82% by volume at -28°F, 85% by volume at 5°F, 87.5% by volume at 30°F, and 90.6% by volume at 60°F.

(b) The filling density for refrigerated storage tanks temperature corresponding to the vapor pressure at the

start–to–discharge pressure setting of the safety relief valve.

(c) If containers are to be filled according to liquid level by any gaging method other than a fixed length dip tube gage, each container should have a thermometer well so that the internal liquid temperature can be easily determined and the amount of liquid and vapor in the container corrected to a 60°F basis.

(12) Transfer of liquids.

(a) Anhydrous ammonia shall always be at a temperature suitable for the material of construction and design of the receiving containers. Ordinary steels are not suitable for refrigerated ammonia. See Appendix R of API Standard 620 "Recommended Rules for Design and Construction of Large Welded Low–Pressure Storage Tanks" for materials for low temperature service.

(b) At least one attendant shall supervise the transfer of liquids from the time the connections are first made until they are finally disconnected.

(c) Flammable gases or gases which will react with ammonia (such as air) shall not be used to unload tank cars or transport trucks.

(d) Containers shall be charged or used only upon authorization of the owner.

(e) Containers shall be gaged and charged only in the open atmosphere or in buildings approved for that purpose.

(f) Pumps used for transferring ammonia shall be recommended and labeled for ammonia service by the manufacturer.

(i) Pumps shall be designed for at least 250 p.s.i.g. working pressure.

(ii) Positive displacement pumps shall have installed, off the discharge port, a constant differential relief valve discharging into the suction port of the pump through a line of sufficient size to carry the full capacity of the pump at relief valve setting, which setting and installation shall be according to pump manufacturer's recommendations.

(iii) On the discharge side of the pump, before the relief valve line, there shall be installed a pressure gage graduated from 0 to 400 p.s.i.g.

(iv) Plant piping shall contain shutoff valves located as close as practical to pump connections.

(g) Compressors used for transferring or refrigerating ammonia shall be recommended and labeled for ammonia service by the manufacturer.

(i) Compressors, except those used for refrigeration, shall be designed for at least 250 p.s.i.g. working pressure. Crank cases of compressors not designed to withstand system pressure shall be protected with a suitable safety relief valve.

(ii) Plant piping shall contain shutoff valves located as close as practical to compressor connections.

(iii) A safety relief valve large enough to discharge the full capacity of the compressor shall be connected to the discharge before any shutoff valve.

(iv) Compressors shall have pressure gages at suction and discharge graduated to at least one and one–half times the maximum pressure that can be developed.

(v) Adequate means, such as drainable liquid trap, may be provided on the compressor suction to minimize the entry of liquid into the compressor.

(vi) Where necessary to prevent contamination, an oil separator shall be provided on the discharge side of the compressor.

(h) Loading and unloading systems shall be protected by suitable devices to prevent emptying of the storage container or the container being loaded or unloaded in the event of severance of the hose. Backflow check valves or properly sized excess flow valves shall be installed where necessary to provide such protection. In the event that such valves are not practical, remotely operated shutoff valves may be installed.

(i) Meters used for the measurement of liquid anhydrous ammonia shall be recommended and labeled for ammonia service by the manufacturer.

(i) Liquid meters shall be designed for a minimum working pressure of 250 p.s.i.g.

(ii) The metering system shall incorporate devices that will prevent the inadvertent measurement of vapor.

(13) Tank car unloading points and operations.

(a) Provisions for unloading tank cars shall conform to the regulations of the department of transportation.

(b) Unloading operations shall be performed by reliable persons properly instructed and made responsible for careful compliance with all applicable procedures.

(c) Caution signs shall be so placed on the track or car as to give necessary warning to persons approaching car from open end or ends of siding and shall be left up until after car is unloaded and disconnected from discharge connections. Signs shall be of metal or other suitable material, at least twelve by fifteen inches in size and bear the words "STOP—Tank car connected" or "STOP—Men at work" the word "STOP," being in letters at least four inches high and the other words in letters at least two inches high. The letters shall be white on a blue background.

(d) The track of a tank car siding shall be substantially level.

(e) Brakes shall be set and wheels blocked on all cars being unloaded.

(f) Tank cars of anhydrous ammonia shall be unloaded only at approved locations meeting the requirements of subsections (9)(c) and (12)(h) of this section.

(14) Liquid level gaging device.

(a) Each container except those filled by weight shall be equipped with an approved liquid level gaging device.

(b) All gaging devices shall be arranged so that the maximum liquid level to which the container is filled is readily determined. (See subsection (4)(b)(vii) of this section.)

(c) Gaging devices that require bleeding of the product to the atmosphere such as the rotary tube, fixed tube, and slip tube devices, shall be designed so that the maximum opening of the bleed valve is not larger than No. 54 drill size unless provided with an excess flow valve. (This requirement does not apply to farm vehicles used for the application of ammonia as covered in WAC 296–24–51021.)

(d) Gaging devices shall have a design pressure equal to or greater than the design pressure of the container on which they are installed.

(e) Fixed liquid level gages shall be so designed that the maximum volume of the container filled by liquid shall not exceed eighty-five percent of its water capacity. The coupling into which the fixed liquid level gage is threaded must be placed at the eighty-five percent level of the container. If located elsewhere, the dip tube of this gage must be installed in such a manner that it cannot be readily removed.

Note: This does not apply to refrigerated storage.

(f) Gage glasses of the columnar type shall be restricted to stationary storage installation. They shall be equipped with shutoff valves having metallic handwheels, with excess-flow valves, and with extra heavy glass adequately protected with a metal housing applied by the gage manufacturer. They shall be shielded against the direct rays of the sun.

(15) Painting of containers. Aboveground uninsulated containers should have a reflective surface maintained in good condition. White is recommended for painted surfaces, but other light reflecting colors are acceptable.

(16) Electrical equipment and wiring.

(a) Electrical equipment and wiring for use in ammonia installations shall be general purpose or weather resistant as appropriate.

(b) Where concentrations of ammonia in air in excess of sixteen percent by volume are likely to be encountered, electrical equipment and wiring shall be of a type specified by and be installed in accordance with National Electrical Code, NFPA 70 (ANSI-C1), for Class I, Group D locations.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-51009, filed 11/14/88. 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), § 296-24-51009, filed 11/13/80; Order 76-6, § 296-24-51009, filed 3/1/76; Order 74-27, § 296-24-51009, filed 5/7/74; Order 73-5, § 296-24-51009, filed 5/9/73 and Order 73-4, § 296-24-51009, filed 5/7/73.]

WAC 296-24-51011 Systems utilizing stationary, pier-mounted or skid-mounted aboveground or underground, nonrefrigerated storage. This section applies to stationary, pier-mounted, skid-mounted, aboveground or underground, nonrefrigerated storage installations utilizing containers other than those constructed in accordance with department of transportation specifications. All basic rules of WAC 296-24-51009 apply to this section unless otherwise noted.

(1) Design pressure and construction of containers. The minimum design pressure for nonrefrigerated aboveground containers shall be 250 psig. (See WAC 296-24-51009 (2)(a)(i).)

Note: U-68 and U-69 ASME Code containers with a design pressure of 200 psig are acceptable if recertified to 250 psig and equipped with safety relief valves set at 250 psig as permitted in WAC 296-24-51009 (9)(b).

(2) Container valves and accessories, filling and discharging connections.

(a) Each filling connection shall be provided with combination back-pressure check valve and excess flow valve; one double or two single back-pressure check valves; or a positive shutoff valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve.

(b) All vapor and liquid connections, except safety relief valves and those specifically exempt in WAC 296-24-51009 (6)(d) and (e) shall be equipped with approved excess flow valves; or in lieu thereof, may be fitted with approved quick-closing internal valves which, except during operating periods, shall remain closed.

(c) Each storage container shall be provided with a pressure gage graduated from 0 to 400 psig. Gages shall be designated for use in ammonia service.

(d) All containers shall be equipped with an approved vapor return valve.

(e) All containers shall be equipped with a fixed maximum liquid level gage.

(3) Safety relief devices.

(a) Every container shall be provided with one or more safety relief valves of spring-loaded or equivalent type and shall comply with the following:

(i) The discharge from safety relief valves shall be directed away from the container upward and unobstructed to the open air. Vent pipes shall not be restrictive or smaller in size than the safety relief outlet connection. All safety relief valve discharges shall have suitable rain caps that will allow free discharge of the vapor and prevent the entrance of water. Suitable provision shall be made for draining condensate which may accumulate.

(ii) If desired, vent pipes from two or more safety relief devices located on the same unit, or similar lines from two or more different units, may be run into a common header, provided the cross-sectional area of such header is at least equal to the sum of the cross-sectional areas of the individual vent pipes.

(b) The rate of discharge of spring-loaded safety relief valves installed on underground containers may be reduced to a minimum of 30 percent of the rate of discharge specified in Appendix A. Containers so protected shall not be uncovered after installation until the liquid ammonia has been removed. Containers which may contain liquid ammonia before being installed underground and before being completely covered with earth are to be considered aboveground containers when determining the rate of discharge requirements of the safety relief valves.

(c) On underground installations where there is a probability of the manhole or housing becoming flooded, the discharge from vent lines shall be located above the high water level. All manholes or housings shall be provided with ventilated louvres or their equivalent, the area of such openings equaling or exceeding combined discharge areas of safety relief valves and vent lines which discharge their content into the manhole housing.

(4) Installation of storage containers.

(a) Containers installed aboveground shall be provided with substantial reinforced concrete footings and

foundations or structural steel supports mounted on reinforced concrete foundations. In either case, the reinforced concrete foundations or footings shall extend below the established frost line and shall be of sufficient width and thickness to support the total weight of the containers and contents adequately. The foundation shall maintain the lowest point of the tank at not less than 18 inches above the ground. Floating type foundations shall also be acceptable providing the foundations are designed to adequately support the tank, contents and pumping equipment. (See WAC 296-24-51009(7).)

(b) Horizontal aboveground containers shall be mounted on foundations in such a manner as to permit expansion and contraction. Every container shall be supported so as to prevent the concentration of excessive loads on the supporting portion of the shell. The bearing afforded by the saddles shall extend over at least one third of the circumference of the shell. Suitable means for preventing corrosion shall be provided on that portion of the container in contact with the foundations or saddles.

(c) Containers buried underground shall be placed so that the top of the container is at least one foot below the surface of the ground. Should ground conditions make compliance with these requirements impracticable, precautions shall be taken to prevent physical damage to the container. It is not necessary to cover the portion of the container to which a manhole and other connections are affixed when necessary to prevent floating, containers shall be securely anchored or weighted.

(d) Underground containers shall be set on firm foundations (firm earth may be used) and surrounded with soft earth or sand well tamped in place. As a further means of resisting corrosion, the container, prior to being placed underground, shall be given a protective coating satisfactory to the authority having jurisdiction. Such protective coating shall be equivalent to hot dip galvanizing, or to two preliminary coatings of red lead followed by a heavy coating of coal tar or asphalt. The container thus coated shall be lowered into place in such a manner as to prevent abrasion or other damage to the coating.

(e) Distance between aboveground and underground containers of over 1,200 gallons capacity shall be at least five feet.

(f) Secure anchorage or adequate pier height shall be provided against container flotation wherever sufficiently high flood water might occur.

(5) Reinstallation of containers.

(a) Containers once installed underground shall not later be reinstalled aboveground or underground, unless they successfully withstand hydrostatic pressure retests at the pressure specified for the original hydrostatic test as required by the code under which the tank was constructed and show no evidence of serious corrosion.

(b) Where containers are reinstalled underground, the corrosion resistant coating shall be put in good condition; see WAC 296-24-51011 (4)(d). Where containers are reinstalled aboveground, safety relief devices or gaging devices shall comply with WAC 296-24-51009(9) and 296-24-51011(3) respectively for aboveground containers.

(6) Marking of containers. Each container or group of containers shall be marked on at least two sides with the words "anhydrous ammonia" or "caution—ammonia" in sharply contrasting colors with letters not less than four inches high.

(7) Protection of container appurtenances.

(a) Valves and other appurtenances shall be protected against physical damage. Main container shut-off valves shall be kept closed and locked when the installation is unattended. If the facility is protected against tampering by fencing or other suitable means, valve locks are not required.

(b) All connections to underground containers should be located within a substantial dome, housing or manhole fitted with a substantial removable cover. Appurtenances shall also be protected during the transit of containers intended for installation underground.

(c) Storage containers need not be grounded.

(8) Identification. A sign shall be displayed in a conspicuous place stating the name, address, and phone number of the nearest representative, agent, or owner of the storage system.

[Order 76-6, § 296-24-51011, filed 3/1/76; Order 73-5, § 296-24-51011, filed 5/9/73 and Order 73-4, § 296-24-51011, filed 5/7/73.]

WAC 296-24-51013 Refrigerated storage. This section applies specifically to systems utilizing tanks for the storage of anhydrous ammonia under refrigerated conditions. All basic rules of WAC 296-24-51009 apply to this section unless inconsistent with the requirements of this section.

(1) Design of tanks.

(a) Tanks may be designed for any storage pressure desired as determined by economical design of the refrigerated system.

(b) The design temperature shall be the minimum temperature to which the container will be refrigerated and shall be so designated.

(c) Containers with a design pressure exceeding 15 p.s.i.g. shall be constructed in accordance with WAC 296-24-51009(2) and the material shall be selected from those listed in API Standards 620, 4th edition 1970, Recommended Rules for Design and Construction of Large, Welded Low-Pressure Storage Tanks, Tables 2.02, R.2.1, R.2.2, R.2.3 or R.2.4.

(d) Tanks with a design pressure of 15 p.s.i.g. and less shall be constructed in accordance with the general requirements of API Standard 620, 4th edition, 1970, including Appendix R.

(e) When austenitic steels or nonferrous materials are used, the ASME Code shall be used as a guide in selection of materials for use at the design temperature.

(f) The filling density for refrigerated storage containers shall be such that the container will not be liquid full at a liquid temperature corresponding to the vapor pressure at the start-to-discharge pressure setting of the safety-relief valve. (New 1-22-76)

(2) Installation of storage tanks.

(a) Tanks shall be supported on suitable noncombustible foundations designed to accommodate the type of tank being used.

(b) Adequate protection against flotation or other water damage shall be provided wherever high flood water might occur.

(c) Tanks for product storage at less than 32°F shall be supported in such a way, or heat shall be supplied, to prevent the effects of freezing and consequent frost heaving.

(d) The area surrounding a refrigerated tank or group of tanks shall be provided with drainage, or shall be diked to prevent accidental discharge of liquid from spreading to uncontrolled areas.

(e) When drainage is employed, a slope of not less than one percent shall be provided. The drainage system shall terminate in an impounding basin having a capacity as large as the largest tank served.

(f) Provision shall be made for drainage of rain water from the diked or impounding area. Such drainage shall not permit the release of ammonia.

(g) When a dike surrounding the tank is employed, the capacity of the diked enclosure shall be as large as the largest tank served.

(h) The walls of a diked enclosure or the wall of an impounding basin used in a drainage system shall be of earth, steel or concrete designed to be liquid tight and to withstand the hydrostatic pressure and the temperature. Earth walls shall have a flat top at least 2 feet wide. The slope shall be stable and consistent with the angle of repose of the earth used.

(i) The ground in an impounding basin or within a diked enclosure, should be graded so that small spills, or the early part of a large spill, will accumulate at one side or corner contacting a relatively small area of ground and exposing a relatively small surface area for heat gain. Shallow channels in the ground surface or low curbs of earth can help guide the liquid to these low areas without contacting a large ground area.

(3) Marking refrigerated containers.

Each refrigerated container shall be marked with a nameplate on the outer covering in an accessible place as specified in the following:

(a) With the name and address of the builder and the date of fabrication.

(b) With the maximum volume or weight of the product whichever is most meaningful to user.

(c) With the design pressure.

(d) With the minimum temperature in degrees Fahrenheit for which the container was designed.

(e) With the maximum allowable water level to which the container may be filled for the test purposes.

(f) With the density of the product in pounds per cubic foot for which the container was designed.

(g) With the maximum level to which the container may be filled with liquid anhydrous ammonia.

(4) Tank valves, fill pipes and discharge pipes.

(a) Shut-off valves shall be:

(i) Provided for all connections except those with a No. 54 drill size restriction, plugs, safety valves, thermometer wells, and

(ii) Located as close to the tank as practicable.

(b) When operating conditions make it advisable, a check valve shall be installed on the fill connection and a remotely operated shut-off valve on other connections located below the maximum liquid level.

(5) Safety relief devices.

(a) Safety relief valves shall be set to start-to-discharge at a pressure not in excess of the design pressure of the tank and shall have a total relieving capacity sufficient to prevent a maximum pressure in a tank of more than one hundred twenty percent of the design pressure.

(b) The total relieving capacity shall be the larger requirement of (b)(i) or (ii) of this subsection.

(i) Possible refrigeration system upset such as (A) cooling water failure, (B) power failure, (C) instrument air or instrument failure, (D) mechanical failure of any equipment, (E) excessive pumping rates, (F) changing atmospheric conditions.

(ii) Either one of the following formulas for fire exposure, (A) for valve manufacturers who use weight of vapors to be relieved as basis for classifying valves:

$$W = \frac{34{,}500\ F\ A^{0.82}}{L}$$

or (B) for valve manufacturers that classify valves on the basis of air flow:

$$Q_a = \frac{633{,}000\ F\ A^{0.82}}{L\ C}\sqrt{\frac{Z\ T}{M}}$$

Where

- W = weight of vapors to be relieved in pounds/hour at relieving conditions;
- Q_a = air flow in cubic feet per minute at standard conditions (60F and 14.7 psi);
- F = fireproofing credit. Use $F = 1.0$ except when an approved fireproofing material of recommended thickness is used, then use $F = 0.2$.
- A = total surface area in square feet up to 25 feet above grade or to the equator of a sphere, whichever is greater;
- Z = compressibility factor of ammonia at relieving conditions (if not known, use $Z = 1.0$);
- T = temperature in degrees R (460 + temperature in degrees F of gas at relieving conditions);
- M = molecular weight = 17 for ammonia;
- L = latent heat of ammonia at relieving conditions;
- C = constant based on relation of specific heats. (C may be obtained from the following table.)

(If K is not known use C = 315.)

K	C	K	C	K	C
1.00	315	1.26	343	1.52	366
1.02	318	1.28	345	1.54	368

K	C	K	C	K	C
1.04	320	1.30	347	1.56	369
1.06	322	1.32	349	1.58	371
1.08	324	1.34	351	1.60	372
1.10	327	1.36	352	1.62	374
1.12	329	1.38	354	1.64	376
1.14	331	1.40	356	1.66	377
1.16	333	1.42	358	1.68	379
1.18	335	1.44	359	1.70	380
1.20	337	1.46	361	2.00	400
1.22	339	1.48	363	2.20	412
1.24	341	1.50	364		

Where $K = C_p/C_v$ at atmospheric conditions and

C_p = specific heat of vapor at constant pressure.
C_v = specific heat of vapor at constant volume.

(c) Shut–off valves of adequate flow capacity may be provided and used to facilitate inspection and repair of safety relief valves. When a shut–off valve is provided it shall be so arranged that it can be locked or sealed open, and it shall not be closed except by an authorized person who shall remain stationed there while the valve remains closed, and who shall again lock or seal the valve open when leaving the station.

(d) Safety relief devices shall comply with the following:

(i) If stacks are used they shall be suitably designed to prevent obstruction by rain, snow, ice or condensate. The outlet size shall not be smaller than the nominal size of the safety relief valve outlet connection.

(ii) Discharge lines may be used if desired. Multiple safety relief valves on the same storage unit may be run into a common discharge header. The discharge line and header shall be designed to accommodate the maximum flow and a back pressure not exceeding ten percent of the design pressure of the storage container. This back pressure shall be included in the one hundred twenty percent total maximum pressure given in (a) of this subsection. No other container or system shall exhaust into this discharge line or header. The vent lines shall be installed to prevent accumulation of liquid in the lines.

(e) Atmospheric storage shall be provided with vacuum breakers. Ammonia gas may be used to provide a pad.

(6) Protection of container appurtenances. Refrigerated storage containers shall comply with the provisions of WAC 296–24–51011(7).

(7) Reinstallation of containers. Containers of such size as to require field fabrication shall, when moved and reinstalled, be reconstructed and reinspected in complete accordance with the code under which they were constructed. The containers shall be subjected to a pressure retest, and if rerating is necessary, it shall be done in accordance with the applicable code pressures.

(8) Damage from vehicles. Precaution shall be taken to avoid any damage by trucks, tractors, or other vehicles.

(9) Refrigeration load and equipment.

(a) The total refrigeration load shall be computed as the sum of the following:

(i) Load imposed by heat flow into the container caused by the temperature differential between the ambient temperature and the design storage temperature.

(ii) Load imposed by heat flow into the tank caused by maximum sun radiation.

(iii) Maximum load imposed by filling the tank with ammonia warmer than the design storage temperature.

(b) More than one storage tank may be handled by the same refrigeration system.

(c) Compressors. (See also WAC 296–24–51009 (12)(g).)

(i) A minimum of two compressors shall be provided, either of which is of sufficient size to handle the loads listed in (a)(i) and (ii) of this subsection. Where more than two compressors are provided, minimum standby equipment equal to the largest normally operating equipment shall be installed. Compressors required for (a)(iii) of this subsection may be used as standby equipment for compressors required in (a)(i) and (ii) of this subsection.

(ii) Compressors shall be sized to operate with a suction pressure at least ten percent below the minimum setting of the safety relief valve(s) on the storage tank and shall withstand a suction pressure at least equal to one hundred twenty percent of the design pressure of the tank. Discharge pressure will be governed by condensing conditions.

(d) Compressor drives.

(i) Each compressor shall have its individual driving unit.

(ii) Any standard drive consistent with good design may be used.

(iii) An emergency source of power of sufficient capacity to handle the loads listed in (a)(i) and (ii) of this subsection shall be provided, unless facilities are provided to safely dispose of vented vapors while the refrigeration system is not operating.

(e) Automatic control equipment.

(i) The refrigeration system shall be arranged with suitable controls to govern the compressor operation in accordance with the load as evidenced by the pressure in the container(s).

(ii) An emergency alarm system shall be installed to function in the event the pressure in the container(s) rises to the maximum or falls to the minimum allowable operating pressure.

(iii) An emergency alarm and shut–off shall be located in the condenser system to respond to excess discharge pressure caused by failure of the cooling medium.

(iv) All automatic controls shall be installed in a manner to preclude operation of alternate compressors unless the controls will function with the alternate compressors.

(f) Separators.

(i) An entrainment separator of suitable size and design pressure shall be installed in the compressor suction line. The separator shall be equipped with a drain and gaging device.

(ii) An oil separator of suitable size shall be installed in the compressor discharge line. It shall be designed for at least 250 p.s.i.g. and shall be equipped with a gaging device and drain valve.

(g) Condensers. The condenser system may be cooled by air or water or both. The condenser shall be designed for at least 250 p.s.i.g. Provision shall be made for purging noncondensibles either manually or automatically.

(h) Receiver and liquid drain. A receiver shall be provided which is equipped with an automatic float valve to discharge the liquid ammonia to storage or with a high pressure liquid drain trap of suitable capacity. The receiver shall be designed for at least 250 p.s.i.g. operating pressure and be equipped with the necessary connections, safety relief valves and gaging device.

(i) Insulation. Refrigerated containers and pipe lines which are insulated shall be covered with a material of suitable quality and thickness for the temperatures encountered. Insulation shall be suitably supported and protected against the weather. Weatherproofing shall be of a type which will not support flame propagation.

(10) Safety equipment. All refrigerated storage plants shall have on hand the minimum safety equipment required under WAC 296-24-51009 (10)(c).

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-51013, filed 11/14/88. 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), § 296-24-51013, filed 11/13/80; Order 76-6, § 296-24-51013, filed 3/1/76; Order 73-5, § 296-24-51013, filed 5/9/73 and Order 73-4, § 296-24-51013, filed 5/7/73.]

WAC 296-24-51015 Systems utilizing portable DOT containers. This section applies specifically to systems utilizing cylinders, portable tanks (DOT-51), or "ton containers" (DOT-106A, DOT-110A), constructed in accordance with department of transportation specifications. All basic rules of WAC 296-24-51009 apply to this section, unless otherwise noted.

(1) Containers.

(a) Containers shall comply with department of transportation specifications and shall be maintained, filled, packaged, marked, labeled and shipped to comply with current DOT regulations and American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1. (See Appendix C for availability.)

(b) Containers shall be stored in an area free from ignitable debris and in such manner as to prevent external corrosion. (Storage may be indoors or outdoors.)

(c) Containers shall not be buried below ground.

(d) Containers shall be set upon firm foundations or otherwise firmly secured. The possible effect of settling on the outlet piping shall be guarded against by a flexible connection or special fitting.

(e) Containers shall be protected from heat sources such as radiant flame and steam pipes. Do not apply heat directly to containers to raise the pressure.

(f) Containers shall be stored in such manner as to protect them from moving vehicles or external damage.

(g) Any container which is designed to have a valve protection cap shall have the cap securely in place when the container is not in service.

(2) Container valves and regulating equipment.

(a) Container valves and pressure regulating equipment shall be protected against tampering when installed for use.

(b) Container valves shall be protected while in transit, in storage, and while being moved into final utilizations, as follows:

(i) By setting them into a recess of the container, or

(ii) By ventilated cap or collar, fastened to the container, capable of withstanding a blow from any direction equivalent to that of a 30-lb. weight dropped four feet. Construction must be such that a blow will not be transmitted to the valves or other connections.

(c) When containers are not connected for service, the outlet valves shall be kept tightly closed even though containers are considered empty.

(3) Safety relief devices. Containers shall be provided with safety relief devices as required by department of transportation regulations.

[Order 73-5, § 296-24-51015, filed 5/9/73 and Order 73-4, § 296-24-51015, filed 5/7/73.]

WAC 296-24-51017 Systems mounted on trucks, semi-trailers, and trailers for transportation of ammonia. This section applies specifically to systems mounted on trucks, semi-trailers and trailers (other than those covered under WAC 296-24-51019 and 296-24-51021) used for the transportation of ammonia. All basic rules of WAC 296-24-51009 apply to this section unless otherwise noted. Systems for trucks and trailers for transportation of anhydrous ammonia, in addition to complying with the requirements of these standards, shall also comply where required, with the requirements of the department of transportation and those of any other regulatory body which may apply.

(1) Design pressure of containers.

(a) Containers used in intrastate commerce shall be constructed in accordance with WAC 296-24-51009(2) with a minimum design pressure of 250 psig. Containers used in interstate commerce shall meet DOT regulations.

(b) The shell or head thickness of any container shall not be less than 3/16 inch.

(c) All container openings, except safety relief valves, liquid level gaging devices and pressure gages, shall be labeled to designate whether they communicate with liquid or vapor space. Labels may be on valves.

(d) Baffles are not required for cargo tanks.

(2) Mounting containers on truck.

(a) The means of attachment of any container to the cradle, frame or chassis of a vehicle shall be designed on a basis of two "g" loading in either direction, using a safety factor of not less than 4, based on the ultimate strength of the material used. For purposes of this requirement, two "g" of load support is equivalent to three times the static weight of the articles supported; two "g" of loading and bending, acceleration, and torsion is equivalent to twice the static weight support applied horizontally at the road surface.

(b) "Hold-down" devices, when used, shall anchor the container to the cradle, frame or chassis in a suitable

and safe manner that will not introduce undue concentration of stresses. These devices shall incorporate positive means for drawing the container down tight, and suitable stops or anchors shall be provided to prevent relative movement between container and framing due to stopping, starting or changes in direction.

(c) Vehicles designed and constructed so that the cargo tanks constitute in whole or in part the stress member used in lieu of the frame shall be supported by external cradles suspending at least 120° of the shell circumference. The design calculation shall include beam stress, shear stress, torsion stress, bending moment and acceleration stress, in addition to those covered by the code under which the cargo tank was designed.

(d) If a liquid withdrawal line is installed in the bottom of a container, the connections thereto, including hose, shall not be lower than the lowest horizontal edge of the trailer axle.

(e) Provisions shall be made to secure both ends of the hose while in transit.

(f) When the cradle and the container are not welded together, suitable material shall be used between them to eliminate metal–to–metal friction.

(3) Container appurtenances.

(a) Nonrecessed container fittings and appurtenances shall be protected against physical damage by either: (i) A protected location, (ii) the vehicle frame or bumper, or (iii) a protective housing. The protective housing, if used, shall comply with the requirements under which the containers are fabricated with respect to design and construction, and shall be designed to withstand static loadings in any direction equal to twice the weight of the container and attachments when filled with the lading using a safety factor of not less than 4, based on the ultimate strength of the material to be used. The protective housing if used shall be protected with a weather cover, if necessary, to insure proper operation of valves and safety relief devices.

(b) All connections to containers, except filling connections (see WAC 296–24–51017 (3)(c)), safety relief devices, and liquid level and pressure gage connections, shall be provided with suitable automatic excess flow valves, or in lieu thereof, may be fitted with quick–closing internal valves, which shall remain closed except during delivery operations. The control mechanism for such valves may be provided with a secondary control remote from the delivery connections and such control mechanism shall be provided with a fusible section (melting point 208F to 220F) which will permit the internal valve to close automatically in case of fire.

(c) Filling connections shall be provided with automatic back–pressure check valves, excess–flow check valves, or quick–closing internal valves, to prevent back–flow in case the filling connection is broken. Where the filling and discharge connect to a common opening in the container shell and that opening is fitted with a quick–closing internal valve as specified in WAC 296–24–51017 (3)(b), the automatic valve shall not be required.

(d) All containers shall be equipped for spray loading (filling in the vapor space) or with an approved vapor return valve of adequate capacity.

(e) All containers shall be equipped with a fixed maximum liquid level gage.

(f) All containers shall be equipped with a pressure–indicating gage having a dial graduated from 0–400 psig.

(4) Piping and fittings.

(a) All piping, tubing and fittings shall be securely mounted and protected against physical damage.

(b) Piping used on nonrefrigerated systems shall be at least ASTM A–53 Grade B electric resistance welded and electric flash welded pipe or equal. Such pipe shall be at least Schedule 40 when joints are welded, or welded and flanged. Such pipe shall be at least Schedule 80 when joints are threaded. Brass, copper, or galvanized steel pipe or tubing shall not be used.

(c) The truck unloading line shall be provided with an excess flow valve at the hose connection unless an approved quick closing internal valve is provided in the container unloading connection. (See WAC 296–24–51017 (3)(b).)

(5) Safety relief devices. The discharge from container safety relief valves shall be vented away from the container upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container; loose fitting rain caps shall be used. Size of discharge lines from safety relief valves shall not be smaller than the nominal size of the safety relief valve outlet connection. Suitable provision shall be made for draining condensate which may accumulate in the discharge pipe.

(6) Marking of container. Every container, whether loaded or empty, shall be conspicuously and legibly marked on each side and rear thereof on a background of sharply contrasting color with the words "COMPRESSED GAS" in letters at least four inches high; or with the words "ANHYDROUS AMMONIA" in letters at least four inches high; or in compliance with department of transportation regulations.

(7) Transfer of liquids.

(a) The content of tank motor vehicle containers shall be determined by weight, by suitable liquid level gaging devices, meters, or other approved methods.

Note: If the content of a container is to be determined by liquid level measurement, the container shall have a thermometer well so that the internal liquid temperature can be easily determined. This volume when converted to weight shall not exceed the filling density specified by the department of transportation regulations.

(b) Pumps or compressors shall be designed and installed in accordance with WAC 296–24–51009(12) and protected against physical damage when mounted upon ammonia tank trucks and trailers.

(c) Tank motor vehicles of greater than 3500 water gallons capacity shall be unloaded only at approved locations meeting the requirements of WAC 296–24–51009 (10)(c) and (12)(h).

(8) Trailers and semi–trailers.

(a) Trailers shall be firmly and securely attached to the vehicle drawing them by means of suitable drawbars, supplemented by suitable safety chain (or chains) or safety cables.

(b) Every trailer and semi-trailer shall be equipped with an emergency braking system to be activated in the event of hitch failure.

(c) Trailers shall be of a type of construction which will prevent the towed vehicle from whipping or swerving dangerously from side to side and which will cause it to follow substantially in the path of the towing vehicle.

(d) Where a fifth wheel is employed on a semi-trailer, it shall be ruggedly designed, securely fastened to both units, and equipped with a positive locking mechanism which will prevent separation of the two units except by manual release.

(e) Every trailer or semi-trailer shall be provided with side lights and a tail light.

(9) Electrical equipment and lighting. Tank trucks, tank trailers, and tank semi-trailers, may not be equipped with any artificial light other than electric light. Electric lighting circuits shall have suitable overcurrent protection (fuses or automatic circuit breakers). The wiring shall have sufficient carrying capacity and mechanical strength, and shall be suitably secured, insulated and protected against physical damage.

(10) Protection against collision. Each tank motor vehicle shall be provided with properly attached bumpers or chassis extensions arranged to protect the tank, piping, valves and fittings from physical damage in case of collision.

(11) Chock blocks. At least two chock blocks shall be provided. These blocks shall be placed to prevent rolling of the vehicle whenever it is parked during loading and unloading operations.

(12) Portable tanks (including skid tanks). When portable tanks are used in lieu of cargo tanks and are permanently mounted on tank motor vehicles for the transportation of ammonia, they shall comply with the requirements of WAC 296-24-51017. Where portable tanks, including those built to DOT Specification 51, 106A or 110A, are used for farm storage they shall comply with WAC 296-24-51011. When portable tanks are used as shipping containers in interstate commerce they shall comply with WAC 296-24-51015.

(13) Safety equipment.

(a) All tank trucks, trailers, and semi-trailers should be equipped with the following for emergency and rescue purposes:

(i) One full face gas mask with anhydrous ammonia refill canisters.

(ii) One pair of protective gloves made of rubber or other material impervious to ammonia.

(iii) Tight-fitting goggles or one full face shield.

(iv) A container of not less than five gallons of readily available clean water.

*An ammonia canister is effective for short periods of time in light concentrations of ammonia vapor, generally 15 minutes in concentrations of 3% and will not protect breathing in heavier concentrations. If ammonia vapors are detected when mask is applied the concentration is too high for safety. The life of a canister in service is controlled by the percentage of vapors to which it is exposed. Canisters must not be opened until ready for use and should be discarded after us. Unopened canisters may be guaranteed for as long as three years. All should be dated when received because of this limited life. In addition to this protection, an independently supplied air mask of the type used by fire departments may be used for severe emergencies.

[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), § 296-24-51017, filed 11/13/80; Order 76-6, § 296-24-51017, filed 3/1/76; Order 73-5, § 296-24-51017, filed 5/9/73 and Order 73-4, § 296-24-51017, filed 5/7/73.]

WAC 296-24-51019 Systems mounted on farm wagons (implements of husbandry) for the transportation of ammonia. This section applies to containers of 3000 gallons capacity or less and pertinent equipment mounted on farm wagons (implements of husbandry) and used for the transportation of ammonia. All basic rules of WAC 296-24-51009 apply to this section unless otherwise noted.

(1) Design of containers. Containers shall be constructed in accordance with WAC 296-24-51009(2).

(2) Mounting containers.

(a) A suitable "stop" or "stops" shall be mounted on the farm wagon or on the container in such a way that the container shall not be dislodged from its mounting due to farm wagon coming to a sudden stop.

(b) A suitable "hold-down" device shall be provided which will anchor the container to the farm wagon at one or more places on each side of the container.

(c) When containers are mounted on four-wheel farm wagons, care shall be taken to insure that the weight is distributed evenly over both axles.

(d) When the cradle and the container are not welded together, suitable material shall be used between them to eliminate metal-to-metal friction.

(3) Container appurtenances.

(a) All containers shall be equipped with a fixed maximum liquid level gage.

(b) All containers with a capacity exceeding 250 gallons shall be equipped with a pressure gage having a dial graduated from 0-400 psi.

(c) The filling connection shall be fitted with combination back-pressure check valve and excess-flow valve; one double or two single back-pressure check valves; or a positive shut-off valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve.

(d) All containers with a capacity exceeding 250 gallons shall be equipped for spray loading or with an approved vapor return valve.

(e) All vapor and liquid connections, except safety relief valves and those specifically exempt in WAC 296-24-51009 (6)(e), shall be equipped with approved excess flow valves or may be fitted with quick-closing internal valves which, except during operating periods, shall remain closed.

(f) Fittings shall be protected from physical damage by means of a rigid guard designed to withstand static loading in any direction equal to twice the weight of the container and lading using a safety factor of four based upon the ultimate strength of the material used. If the

guard is fully enclosed, the safety relief valves shall be properly vented through the guard.

(g) If a liquid withdrawal line is installed in the bottom of a container, the connections thereto, including hose, shall not be lower than the lowest horizontal edge of the farm wagon axle.

(h) Both ends of the hose shall be made secure while in transit.

(4) Marking of container. There shall appear on each side and on the rear end of the container in letters at least four inches high, the words "ANHYDROUS AMMONIA " or, "CAUTION—AMMONIA" or the container shall be marked in accordance with department of transportation regulations.

(5) Farm wagons (implements of husbandry).

(a) Farm wagons (implements of husbandry) shall conform with state regulations.

(b) All farm wagons shall be securely attached to the vehicle drawing them by means of drawbars supplemented by suitable safety chains.

(c) A farm wagon shall be constructed so that it will follow substantially in the path of the towing vehicle and will prevent the towed farm wagon from whipping or swerving dangerously from side to side.

(d) All farm wagons shall have five gallons or more of readily available clean water.

[Order 73-5, § 296-24-51019, filed 5/9/73 and Order 73-4, § 296-24-51019, filed 5/7/73.]

WAC 296-24-51021 Systems mounted on farm equipment (implements of husbandry) for the application of ammonia. This section applies to systems mounted on farm equipment and used for the field application of ammonia. All basic rules of WAC 296-24-51009 apply to this section unless otherwise noted.

(1) Design of containers. The minimum design for containers shall be in accordance with WAC 296-24-51009(2).

(2) Mounting of containers. All containers shall be securely mounted.

(3) Container valves and appurtenances.

(a) Each container shall have a fixed maximum liquid-level gage.

(b) The filling connection shall be fitted with combination back-pressure check valve and excess-flow valve; one double or two single back-pressure check valves; or a positive shut-off valve in conjunction with either an internal back-pressure check valve or an internal excess-flow valve.

(c) An excess-flow valve is not required in the vapor connection, provided the controlling orifice is not in excess of seven-sixteenths of an inch in diameter and the valve is hand-operated (attached hand wheel or equivalent) shut-off valve. To assist in filling applicator tanks, it is permissible to bleed vapors to the open air, providing the preceding requirements are met.

(d) Metering devices may be connected directly to the tank withdrawal valve. A union type connection is permissible between the tank valve and metering device. Remote mounting of metering devices is permissible using hose which meets with specifications set out in Appendix B. When the applicator tank is trailed and the metering device is remotely mounted, such as on the tractor tool bar, an automatic break-a-way type, self-closing, coupling must be used.

(e) No excess-flow valve is required in the liquid withdrawal line provided the controlling orifice between the contents of the container and the outlet of the shut-off valve (see WAC 296-24-51009 (6)(b)) does not exceed 7/16 inch in diameter.

APPENDIX A

Minimum required rate of discharge in cubic feet per minute of air at 120 percent of the maximum permitted start-to-discharge pressure for safety relief valves to be used on containers other than those constructed in accordance with United States Department of Transportation cylinder specifications.

Surface Area sq. ft.	Flow Rate CFM Air
20	258
25	310
30	360
35	408
40	455
45	501
50	547
55	591
60	635
65	678
70	720
75	762
80	804
85	845
90	885
95	925
100	965
105	1,010
110	1,050
115	1,090
120	1,120
125	1,160
130	1,200
135	1,240
140	1,280
145	1,310
150	1,350
155	1,390
160	1,420
165	1,460
170	1,500
175	1,530
180	1,570
185	1,600
190	1,640
195	1,670
200	1,710
210	1,780

Surface Area sq. ft.	Flow Rate CFM Air
220	1,850
230	1,920
240	1,980
250	2,050
260	2,120
270	2,180
280	2,250
290	2,320
300	2,380
310	2,450
320	2,510
330	2,570
340	2,640
350	2,700
360	2,760
370	2,830
380	2,890
390	2,950
400	3,010
450	3,320
500	3,620
550	3,910
600	4,200
650	4,480
700	4,760
750	5,040
800	5,300
850	5,590
900	5,850
950	6,120
1,000	6,380
1,050	6,640
1,100	6,900
1,150	7,160
1,200	7,410
1,250	7,660
1,300	7,910
1,350	8,160
1,400	8,410
1,450	8,650
1,500	8,900
1,550	9,140
1,600	9,380
1,650	9,620
1,700	9,860
1,750	10,090
1,800	10,330
1,850	10,560
1,900	10,800
1,950	11,030
2,000	11,260
2,050	11,490
2,100	11,720
2,150	11,950
2,200	12,180
2,250	12,400
2,300	12,630
2,350	12,850
2,400	13,080
2,450	13,300
2,500	13,520

Surface area = total outside surface area of container in square feet. When the surface area is not stamped on the name plate or when the marking is not legible, the area can be calculated by using one of the following formulas:

(1) Cylindrical container with hemispherical heads
Area = overall length in feet times outside diameter in feet times 3.1416.

(2) Cylindrical container with other than hemispherical heads
Area = (overall length in feet plus 0.3 outside diameter in feet) times outside diameter in feet times 3.1416.

(3) Spherical container
Area = outside diameter in feet squared times 3.1416.

Flow rate — CFM air = cubic feet per minute of air required at standard conditions, 60F and atmospheric pressure (14.7 psia).

The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater that 2,500 sq. ft., the required flow rate can be calculated using the formula, flow rate CFM air = 22.11 A0.82 where A = outside surface area of the container in square feet.

APPENDIX B

TFI-RMA SPECIFICATION FOR ANHYDROUS AMMONIA HOSE
TFI-RMA STANDARD NO. M-5

(1) **Scope.** This specification covers hose and hose assemblies commonly referred to as "pressure transfer hose," used to convey anhydrous ammonia liquid or to convey anhydrous ammonia gas where the gas is in contact with liquid ammonia. This specification primarily covers hose and hose assemblies which have a minimum burst pressure of 1750 psig, a safety factor of 5, and a maximum working pressure of 350 psig. These figures should not be misconstrued to mean that they are the maximum pressures to which anhydrous ammonia hose and hose assemblies are built, since higher pressure hose and hose assemblies are available for special applications.

(2) **Sizes and tolerances.** Anhydrous ammonia hose shall be made with the following dimensions and tolerances:

RUBBER COVERED HOSE FOR USE WITH TWO–PIECE SCREW TYPE COUPLINGS

I.D.	Tolerance	O.D.	Tolerance
1/2"	± 1/32"	15/16"	± 1/32"
3/4"	± 1/32"	1 1/4"	± 1/32"
1 "	± 1/16"	1 1/2"	± 1/16"

NONRUBBER COVERED AND RUBBER COVERED HOSE FOR USE WITH FULL FLOW COUPLINGS

I.D.	Tolerance	O.D.	Tolerance	Nominal Tubing O.D.
13/32"	+.039" – .015"	49/64"	± .031"	1/2"
1/2"	+.047" – .015"	59/64"	± .031"	5/8"
5/8"	+.047" – .015"	1–5/64"	± .031"	3/4"
7/8"	+.047" – .015"	1–15/64"	± .031"	1 "
1 1/8"	+.062" – .015"	1 1/2"	± .047"	1 1/4"
1 3/8"	+.062" – .015"	1 3/4"	± .047"	1 1/2"
1–13/16"	+.062" – .015"	2–7/32"	± .047"	2 "

HOSE FOR USE WITH OTHER TYPES OF COUPLINGS*

I.D.	Tolerance
1/2"	± 1/32"
3/4"	± 1/32"
1 "	± 1/16"
1 1/4"	± 1/16"
1 1/2"	± 1/16"
2 "	± 1/16"

*The O.D. dimension and tolerance were intentionally omitted from this tabulation to provide for developments in both hose and couplings.

(3) **Construction.**

(a) Inner tube. The tube shall be uniform in quality and thickness and free from injurious defects. It shall meet the physical requirements of (4) of Appendix B. The material shall be resistant to hardening or other deterioration due to the action of ammonia.

(b) Reinforcement. The reinforcement shall consist of any material not adversely affected by permeating ammonia. The reinforcement shall be applied evenly and uniformly, and in such a way that it will meet the physical requirements of (4) of Appendix B. In constructions utilizing a ply or plies of wire reinforcement, the composition of the wire shall be a suitable corrosion resistant stainless steel.

(c) Cover. A rubber cover if used shall be uniform in quality and thickness and free from injurious defects. It shall meet the physical requirements of (4) of Appendix B. The cover shall be so compounded or constructed that it will not blister in service, and will be resistant to deterioration due to the action of ammonia. A gas tight cover shall be pricked to relieve pressure build–up between inner tube and cover. The cover shall be resistant to deterioration due to exposure to the elements.

(4) **Physical tests.**

(a) Tension test of tube and cover.

	Tube	Cover
Tensile, psi. min.	800	1200
Elongation, percent, min.	150	200

(b) Adhesion test

	Tube	Ply	Cover
Adhesion lbs./in.	10	8	10

(i) In constructions having braided wire or woven wire filler reinforcing members, only the cover adhesion requirement will apply, as it is impractical to prepare adhesion test specimens except for determining cover adhesion.

(c) Burst test. All sizes have a minimum burst of 1750 psig. (See scope.)

(d) Ammonia performance test. During the conditioning and flexing described in (7)(d) and (7)(d)(ii) of Appendix B there shall be no evidence of cover blistering or leakage. At the conclusion of the conditioning and at the conclusion of the flexing test, the burst must still meet the requirements of (4)(c) of Appendix B. There shall be no evidence of separation of the component parts when the remainder of the samples are examined.

(e) Low temperatures test. The hose shall not fail at minus 40F plus or minus 2°, when tested as described in (7)(e) of Appendix B.

(5) **Types of tests.**

(a) Acceptance inspection. This includes all the test specified, with the exception of the ammonia performance test.

(b) Qualification tests. The qualification tests are intended to establish that the hose is properly designed and constructed to give satisfactory service life. These tests shall be conducted by a recognized independent laboratory. The qualification tests shall consist of all the tests specified herein including the ammonia performance test.

(6) **Method of sampling.**

(a) Acceptance inspection. A 24–inch sample of each size and type hose, representative of the lot, shall be selected from each lot manufactured at one time, or from each 25,000 feet, whichever is smaller.

(b) Qualification test. In addition to the samples specified in (6)(a) of Appendix B, two 12–foot lengths of each size hose shall be selected for the ammonia performance test. Each new hose shall be subjected to a qualification test, and again whenever there has been a design change.

(7) **Methods of testing.**

(a) Tension test of tube and rubber cover. The tension test shall be made in accordance with ASTM D–380.

(b) Friction test. The friction test shall be made in accordance with ASTM D–380.

(c) Burst test. The burst test shall be made in accordance with ASTM D–380 using the method entitled "straight bursting test."

(d) Ammonia performance test. Two 12–foot lengths of hose, to be marked "A" and "B" shall be filled with liquid anhydrous ammonia by connecting to a tank and

flushing out with ammonia to remove all the air. One end of each length shall be sealed and the other end left connected to the liquid space of a tank of anhydrous ammonia. The hose shall then be conditioned for 14 days at ambient temperature of 60 to 100F. A valve between the ammonia tank and the hose may be closed providing it is opened at least once each day to completely fill the hose with liquid anhydrous ammonia. The hose shall be examined each day for visible defects. There shall be no evidence of the cover blistering or perceptible leakage. If the hose is valved off at each end when liquid full, a hydrostatic relief valve should be provided between the block valves.

(i) Conditioned hose burst test. A 24–inch sample cut from hose marked "A" shall be subjected to a straight hydrostatic bursting test in accordance with (7)(c) of Appendix B.

(ii) Conditioned hose flexing test.

(A) The 12–foot hose length marked "B" shall be installed in flexing test machine (Fig. 1). One end of the hose is to be connected to the traveling block and the free end passed around two pulleys with diameters as shown in Table 1. A 30–pound weight shall then be attached to the free end.

(B) From the remainder of hose length marked "A", (sizes 1 inch and under only), cut a section to length indicated in Table 1. Connect one end to the vertically traveling block as shown in Fig. 1 and connect the other end to the liquid space of a tank of anhydrous ammonia. Maintain the temperature of hose and ammonia between 70F and 90F. The test on the feeder hose does not apply to sizes over 1 inch. To conduct the flex test on the larger sizes any convenient hose may be used as a feeder hose.

(C) The flexing test shall continue for 72 hours at a rate of approximately 470 cycles per hour with a 42–inch vertical movement of the traveling block. A valve between the ammonia tank and the hose may be closed providing it is opened at least once each day to pressurize the hose. The hose shall be examined each day for visible defect. There shall be no evidence of cover blistering or leakage.

(D) At the conclusion of the flexing period, cut a 24–inch sample from hose "A" and from hose "B" and subject each sample to a straight burst test in accordance with (7)(c) of Appendix B. All samples shall have a minimum burst of 1750 psig.

TABLE 1

Hose Size	Pulley Diameter	Feeder Hose Length
1/2"	14" ± 1/4"	36"
3/4"	14" ± 1/4"	36"
1 "	14" ± 1/4"	36"
1 1/4"	15" ± 1/4"	
1 1/2"	18" ± 1/4"	
2 "	24" ± 1/4"	

(E) Low temperature test. A straight piece of hose at least 24 inches long, conditioned to minus 40F plus or minus 2F for 5 hours, and bent 180° within two seconds around a mandrel 12 times the nominal inside diameter of the hose, shall not break or show cracks in the tube or cover.

(8) **Retests and rejections.** Any hose which fails in one or more tests may be resampled and retested, for which purpose two additional samples shall be selected from the hose for the test that failed to meet the requirements. Failure of either of the retested samples shall be cause for final rejection.

(9) **Hose assemblies.** The couplings must be so designed and constructed, that an assembly shall have sufficient strength that it will reach the minimum burst pressure, as required by (4)(c) of Appendix B, before the end fittings leak or come off when pressure is applied as specified in ASTM D–380 for hydrostatic tests. Fittings must be resistant to the action of anhydrous and aqueous ammonia and in no case may assemblies be supplied with copper alloy fittings.

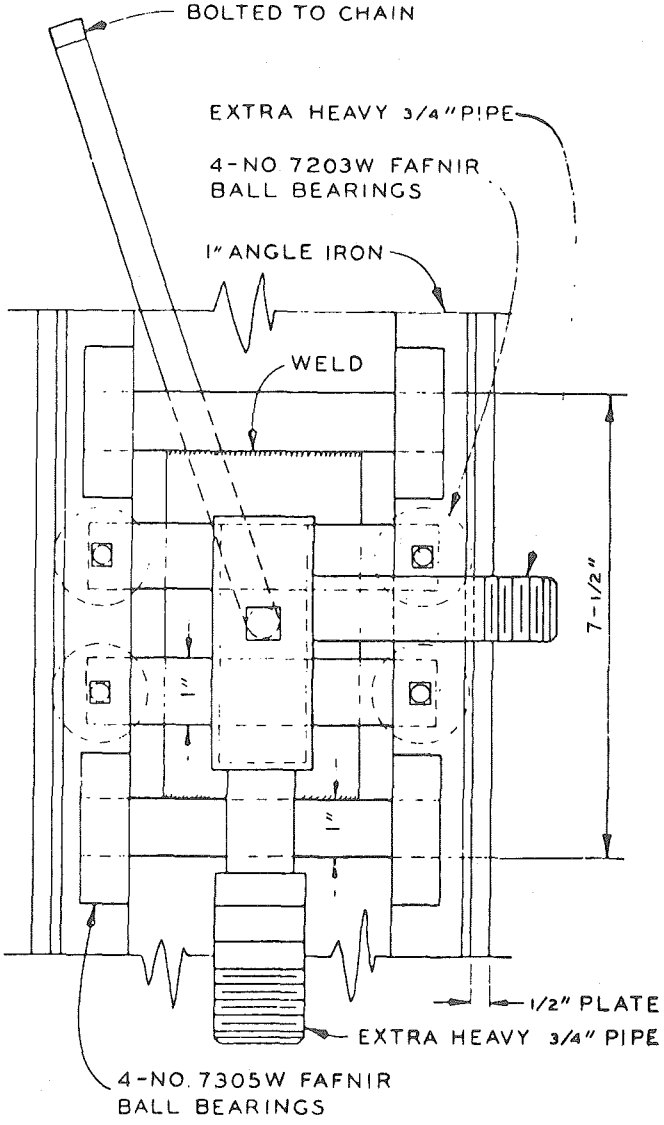
(10) **Markings.** Hose shall be clearly marked at least once every five feet with manufacturer's name or trademark, "anhydrous ammonia," the maximum working pressure in psig, year of manufacturer, and "TFI–RMA Spec.," for all hose manufactured after January 1, 1964. As indicated in the scope, the maximum working pressure must not be less than 350 psig.

(11) **Packaging.**

(a) Packing. Unless otherwise specified, hose shall be packed in substantial commercial containers of the type, size and kind commonly used for the purpose, so constructed as to insure acceptance and safe delivery to common or other carriers, at the lowest rate, to the point of delivery specified on the order.

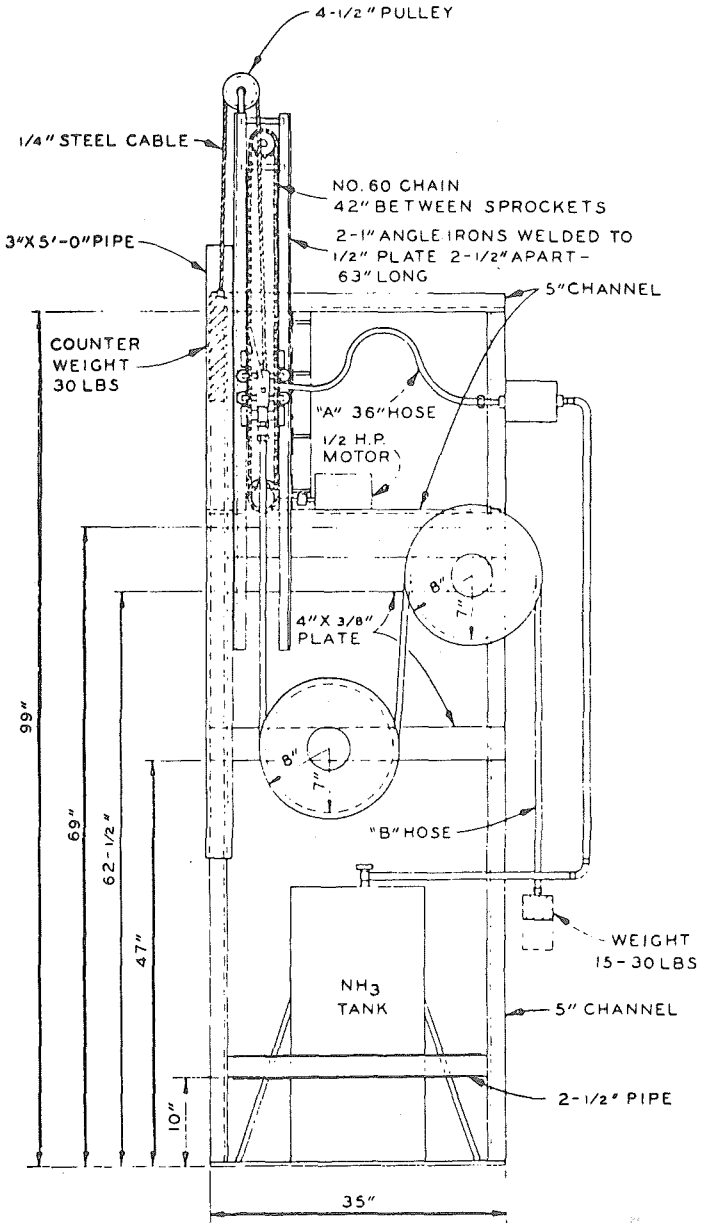
(b) Identification. Unless otherwise specified, shipping containers shall be marked with the size and quantity of hose therein, the name of the manufacturer, and the number of the order.

Figure 1



Note: 1/2 H.P. electric motor–1750 RPM 20:1 gear reduction unit sprockets–14 teeth.

TROLLEY



TYPICAL HOSE FLEXING MACHINE

[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), § 296-24-51021, filed 11/13/80; Order 73-5, § 296-24-51021, filed 5/9/73 and Order 73-4, § 296-24-51021, filed 5/7/73.]

WAC 296-24-51099 Appendix C--Availability of reference material.

APPENDIX C

AVAILABILITY OF REFERENCE MATERIAL

American National Standards Institute, Inc. (ANSI) [formerly United States of America Standards Institute (USASI) formerly American Standards Association (ASA)]
1430 Broadway
New York, New York 10018

American Petroleum Institute (API)
1801 "K" Street, N.W.
Washington, D.C. 20006

American Society of Mechanical Engineers (ASME)
345 East 47th Street
New York, New York 10017

American Society for Testing and Materials (ASTM)
1916 Race Street
Philadelphia, Pennsylvania 19103

Bureau of Explosives*
1920 "L" Street, N.W.
Washington, D.C. 20036

Compressed Gas Association, Incorporated (CGA)
500 Fifth Avenue
New York, New York 10036

The Fertilizer Institute (TFI) (formerly Agricultural Nitrogen Institute——National Plant Food Institute)
1015 – 18th Street N.W.
Washington, D.C. 20036

Manufacturing Chemists' Association (MCA)
Universal Building
1825 Connecticut Ave., N.W.
Washington, D.C. 20009

National Fire Protection Association (NFPA)
60 Batterymarch Street
Boston, Massachusetts 02110

Bureau of Mines U.S. Department of the Interior
4800 Forbes Avenue
Pittsburgh, Pennsylvania 15213

Superintendent of Documents*
U.S. Government Printing Office
Washington, D.C. 20402

*DOT regulations available at nominal cost.

[Order 76-6, § 296-24-51099, filed 3/1/76.]

Part G-1
MEANS OF EGRESS

WAC

WAC 296-24-550 Means of egress. Requirements for means of egress for all new and existing buildings shall be in accordance with specifications of National Fire Code, Volume 5, NFPA 101, Chapter 5, 1985 Ed., which is approved by the American National Standards Institute.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-550, filed 1/11/90, effective 2/26/90; Order 73-5, § 296-24-550, filed 5/9/73 and Order 73-4, § 296-24-550, filed 5/7/73.]

WAC 296-24-55001 Definitions. (1) Means of egress. A means of egress is a continuous and unobstructed way of exit travel from any point in a building or structure to a public way and consists 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.

(2) Exit access. Exit access is that portion of a means of egress which leads to an entrance to an exit.

(3) Exit. Exit is that portion of a means of egress which is separated from all other spaces of the building or structure by construction or equipment as required in these standards to provide a protected way of travel to the exit of discharge.

(4) Exit discharge. Exit discharge is that portion of a means of egress between the termination of an exit and a public way.

(5) Low hazard contents. Low hazard contents shall be classified as those of such low combustibility that no self-propagating fire therein can occur and that consequently the only probable danger requiring the use of emergency exits will be from panic, fumes, or smoke, or fire from some external source.

(6) High-hazard contents. High-hazard contents shall be classified as those which are liable to burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in the event of fire.

(7) Ordinary hazard contents. Ordinary hazard contents shall be classified as those which are liable to burn with moderate rapidity and to give off a considerable volume of smoke but from which neither poisonous fumes nor explosions are to be feared in case of fire.

(8) Approved. For the purposes of WAC 296-24-550 through 296-24-56701, Part G-1, WAC 296-24-585 through 296-24-58517, Part G-2, and WAC 296-24-590 through 296-24-63599, Part G-3, approved shall mean listed or approved equipment by a nationally recognized testing laboratory. Refer to WAC 296-24-

58501(19) for definition of listed, and federal regulation 29 CFR 1910.7 for nationally recognized testing laboratory.

(9) Emergency action plan. A plan for a workplace, or parts thereof, describing what procedures the employer and employees must take to ensure employee safety from fire or other emergencies.

(10) Emergency escape route. The route that employees are directed to follow in the event they are required to evacuate the workplace or seek a designated refuge area.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-55001, filed 11/14/88. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-55001, filed 12/24/81; Order 73-5, § 296-24-55001, filed 5/9/73 and Order 73-4, § 296-24-55001, filed 5/7/73.]

WAC 296-24-55003 General requirements. (1) Application. WAC 296-24-550 through 296-24-55005 contain general fundamental requirements essential to providing a safe means of egress from fire and like emergencies. Nothing in these standards shall be construed to prohibit a better type of building construction, more exits, or otherwise safer conditions than the minimum requirements specified in these standards. Exits from vehicles, vessels, or other mobile structures are not covered by these standards.

[Order 73-5, § 296-24-55003, filed 5/9/73 and Order 73-4, § 296-24-55003, filed 5/7/73.]

WAC 296-24-55005 Fundamental requirements. (1) Every building or structure, new or old, designed for human occupancy shall be provided with exits sufficient to permit the prompt escape of occupants in case of fire or other emergency. The design of exits and other safeguards shall be such that reliance for safety to life in case of fire or other emergency will not depend solely on any single safeguard; additional safeguards shall be provided for life safety in case any single safeguard is ineffective due to some human or mechanical failure.

(2) Every building or structure shall be so constructed, arranged, equipped, maintained, and operated as to avoid undue danger to the lives and safety of its occupants from fire, smoke, fumes, or resulting panic during the period of time reasonably necessary for escape from the building or structure in case of fire or other emergency.

(3) Every building or structure shall be provided with exits of kinds, numbers, location, and capacity appropriate to the individual building or structure, with due regard to the character of the occupancy, the number of persons exposed, the fire protection available, and the height and type of construction of the building or structure, to afford all occupants convenient facilities for escape.

(4) In every building or structure exits shall be so arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied. No lock or fastening to prevent free escape from the inside of any building shall be installed except in mental, penal, or corrective institutions where supervisory personnel are continually on duty and effective provisions are made to remove occupants in case of fire or other emergency.

(5) Every exit shall be clearly visible or the route to reach it shall be conspicuously indicated in such a manner that every occupant of every building or structure who is physically and mentally capable will readily know the direction of escape from any point, and each path of escape, in its entirety, shall be so arranged or marked that the way to a place of safety outside is unmistakable. Any doorway or passageway not constituting an exit or way to reach an exit, but of such a character as to be subject to being mistaken for an exit, shall be so arranged or marked as to minimize its possible confusion with an exit and the resultant danger of persons endeavoring to escape from fire finding themselves trapped in a dead-end space, such as a cellar or storeroom, from which there is no other way out.

(6) In every building or structure equipped for artificial illumination, adequate and reliable illumination shall be provided for all exit facilities.

(7) In every building or structure of such size, arrangement, or occupancy that a fire may not itself provide adequate warning to occupants, fire alarm facilities shall be provided where necessary to warn occupants of the existence of fire so that they may escape, or to facilitate the orderly conduct of fire exit drills.

(8) Every building or structure, section, or area thereof of such size, occupancy, and arrangement that the reasonable safety of numbers of occupants may be endangered by the blocking of any single means of egress due to fire or smoke, shall have at least two means of egress remote from each other, so arranged as to minimize any possibility that both may be blocked by any one fire or other emergency conditions.

(9) Compliance with WAC 296-24-550 through 296-24-55005 shall not be construed as eliminating or reducing the necessity for other provisions for safety of persons using a structure under normal occupancy conditions, nor shall any provision of these standards be construed as requiring or permitting any condition that may be hazardous under normal occupancy conditions.

(10) Freezer rooms or refrigerated rooms. The opening device on all doors of walk-in refrigerated or freezer rooms must be the type, when locked from the outside with a lock, can be opened from inside.

[Order 74-27, § 296-24-55005, filed 5/7/74; Order 73-5, § 296-24-55005, filed 5/9/73 and Order 73-4, § 296-24-55005, filed 5/7/73.]

WAC 296-24-55007 Protection of employees exposed by construction and repair operations. (1) No building or structure under construction shall be occupied in whole or in part until all exit facilities required for the part occupied are completed and ready for use.

(2) No existing building shall be occupied during repairs or alterations unless all existing exits and any existing fire protection are continuously maintained, or in lieu thereof other measures are taken which provide equivalent safety.

(3) No flammable or explosive substances or equipment for repairs or alterations shall be introduced in a

building of normally low or ordinary hazard classification while the building is occupied, unless the condition of use and safeguards provided are such as not to create any additional danger or handicap to egress beyond the normally permissible conditions in the building.

[Order 73-5, § 296-24-55007, filed 5/9/73 and Order 73-4, § 296-24-55007, filed 5/7/73.]

WAC 296-24-55009 Maintenance. (1) Every required exit, way of approach thereto, and way of travel from the exit into the street or open space, shall be continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.

(2) Every automatic sprinkler system, fire detection and alarm system, exit lighting, fire door, and other item of equipment, where provided, shall be continuously in proper operating condition.

[Order 73-5, § 296-24-55009, filed 5/9/73 and Order 73-4, § 296-24-55009, filed 5/7/73.]

WAC 296-24-565 Means of egress, general.

[Order 73-5, § 296-24-565, filed 5/9/73 and Order 73-4, § 296-24-565, filed 5/7/73.]

WAC 296-24-56501 Permissible exit components. An exit shall consist only of the approved components. Exit components shall be constructed as an integral part of the building or shall be permanently affixed thereto.

[Order 73-5, § 296-24-56501, filed 5/9/73 and Order 73-4, § 296-24-56501, filed 5/7/73.]

WAC 296-24-56503 Protective enclosure of exits. When an exit is protected by separation from other parts of the building the separating construction shall meet the following requirements.

(1) The separation shall have at least a 1-hour fire resistance rating when the exit connects three stories or less. This applies whether the stories connected are above or below the story at which exit discharge begins.

(2) The separation shall have at least a 2-hour fire resistance rating when the exit connects four or more stories, whether above or below the floor of discharge. It shall be constructed of noncombustible materials, and shall be supported by construction having at least a 2-hour fire resistance rating.

(3) Any opening therein shall be protected by an approved self-closing fire door.

(4) Openings in exit enclosures shall be confined to those necessary for access to the enclosure from normally occupied spaces and for egress from the enclosure.

[Order 73-5, § 296-24-56503, filed 5/9/73 and Order 73-4, § 296-24-56503, filed 5/7/73.]

WAC 296-24-56505 Width and capacity of means of egress. (1) The capacity in number of persons per unit of exit width for approved components of means of egress shall be as follows:

(a) Level egress components (including Class A ramps) 100 persons.

(b) Inclined egress components (including Class B ramps) 60 persons.

(c) A ramp shall be designated as Class A or Class B in accordance with the following Table E-1:

TABLE E-1

	Class A	Class B
Width	44 inches and greater.	30 to 44 inches.
Slope	1 to 1 3/16 inches in 12 inches.	1 3/16 to 2 inches in 12 inches.
Maximum height between landings	No limit.	12 feet.

(2) Means of egress shall be measured in units of exit width of 22 inches. Fractions of a unit shall not be counted, except that 12 inches added to one or more full units shall be counted as one-half a unit of exit width.

(3) Units of exit width shall be measured in the clear at the narrowest point of the means of egress except that a handrail may project inside the measured width on each side not more than 5 inches and a stringer may project inside the measured width not more than 1 1/2 inches. An exit or exit access door swinging into an aisle or passageway shall not restrict the effective width thereof at any point during its swing to less than the minimum widths hereafter specified.

[Order 73-5, § 296-24-56505, filed 5/9/73 and Order 73-4, § 296-24-56505, filed 5/7/73.]

WAC 296-24-56507 Egress capacity and occupant load. (1) The capacity of means of egress for any floor, balcony, tier, or other occupied space shall be sufficient for the occupant load thereof. The occupant load shall be the maximum number of persons that may be in the space at any time.

(2) Where exits serve more than one floor, only the occupant load of each floor considered individually need be used in computing the capacity of the exits at that floor, provided that exit capacity shall not be decreased in the direction of exit travel.

[Order 73-5, § 296-24-56507, filed 5/9/73 and Order 73-4, § 296-24-56507, filed 5/7/73.]

WAC 296-24-56509 Arrangement of exits. When more than one exit is required from a story, at least two of the exits shall be remote from each other and so arranged as to minimize any possibility that both may be blocked by any one fire or other emergency condition.

[Order 73-5, § 296-24-56509, filed 5/9/73 and Order 73-4, § 296-24-56509, filed 5/7/73.]

WAC 296-24-56511 Access to exits. (1) Exits shall be so located and exit access shall be so arranged that exits are readily accessible at all times. Where exits are not immediately accessible from an open floor area, safe and continuous passageways, aisles, or corridors leading

directly to every exit and so arranged as to provide convenient access for each occupant to at least two exits by separate ways of travel, except as a single exit or limited dead ends are permitted by other provisions of these standards shall be maintained.

(2) A door from a room to an exit or to a way of exit access shall be of the side-hinged, swinging type. It shall swing with exit travel when the room is occupied by more than 50 persons or used for a high hazard occupancy.

(3) In no case shall access to an exit be through a bathroom, or other room subject to locking, except where the exit is required to service only the room subject to locking.

(4) Ways of exit access and the doors to exits to which they lead shall be so designed and arranged as to be clearly recognizable as such. Hangings or draperies shall not be placed over exit doors or otherwise so located as to conceal or obscure any exit. Mirrors shall not be placed on exit doors. Mirrors shall not be placed in or adjacent to any exit in such a manner as to confuse the direction of exit.

(5) Exit access shall be so arranged that it will not be necessary to travel toward any area of high hazard occupancy in order to reach the nearest exit, unless the path of travel is effectively shielded from the high hazard location by suitable partitions or other physical barriers.

(6) The minimum width of any way of exit access shall in no case be less than 28 inches. Where a single way of exit access leads to an exit, its capacity in terms of width shall be at least equal to the required capacity of the exit to which it leads. Where more than one way of exit access leads to an exit, each shall have a width adequate for the number of persons it must accommodate.

[Order 73-5, § 296-24-56511, filed 5/9/73 and Order 73-4, § 296-24-56511, filed 5/7/73.]

WAC 296-24-56513 Exterior ways of exit access. (1) Access to an exit may be by means of any exterior balcony, porch, gallery, or roof that conforms to the requirements of this section.

(2) Exterior ways of exit access shall have smooth, solid floors, substantially level, and shall have guards on the unenclosed sides.

(3) Where accumulation of snow or ice is likely because of the climate, the exterior way of exit access shall be protected by a roof, unless it serves as the sole normal means of access to the rooms or spaces served, in which case it may be assumed that snow and ice will be regularly removed in the course of normal occupancy.

(4) A permanent, reasonably straight path of travel shall be maintained over the required exterior way of exit access. There shall be no obstruction by railings, barriers, or gates that divide the open space into sections appurtenant to individual rooms, apartments, or other uses. Where the director or his/her duly authorized representative finds the required path of travel to be obstructed by furniture or other movable objects, he/she may require that they be fastened out of the way or he/she may require that railings or other permanent barriers by installed to protect the path of travel against encroachment.

(5) An exterior way of exit access shall be so arranged that there are no dead ends in excess of 20 feet. Any unenclosed exit served by an exterior way of exit access shall be so located that no part of the exit extends past a vertical plane 20 feet and one-half the required width of the exit from the end of and at right angles to the way of exit access.

(6) Any gallery, balcony, bridge, porch or other exterior exit access that projects beyond the outside wall of the building shall comply with the requirements of this section as to width and arrangement.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-56513, filed 11/14/88; Order 73-5, § 296-24-56513, filed 5/9/73 and Order 73-4, § 296-24-56513, filed 5/7/73.]

WAC 296-24-56515 Discharge from exits. (1) All exits shall discharge directly to the street, or to a yard, court, or other open space that gives safe access to a public way. The streets to which the exits discharge shall be of width adequate to accommodate all persons leaving the building. Yards, courts, or other open spaces to which exits discharge shall also be of adequate width and size to provide all persons leaving the building with ready access to the street.

(2) Stairs and other exits shall be so arranged as to make clear the direction of egress to the street. Exit stairs that continue beyond the floor of discharge shall be interrupted at the floor of discharge by partitions, doors, or other effective means.

(3) Where a doorway or corner of a building is located near a railroad or trolley track so that a workman is liable to walk upon the track in front of an approaching engine or cars a standard safeguard shall be installed with a warning sign.

[Order 73-5, § 296-24-56515, filed 5/9/73 and Order 73-4, § 296-24-56515, filed 5/7/73.]

WAC 296-24-56517 Headroom. Means of egress shall be so designed and maintained as to provide adequate headroom, but in no case shall the ceiling height be less than 7 feet 6 inches nor any projection from the ceiling be less than 6 feet 8 inches from the floor.

[Order 73-5, § 296-24-56517, filed 5/9/73 and Order 73-4, § 296-24-56517, filed 5/7/73.]

WAC 296-24-56519 Changes in elevation. Where a means of egress is not substantially level, such differences in elevation shall be negotiated by stairs or ramps.

[Order 73-5, § 296-24-56519, filed 5/9/73 and Order 73-4, § 296-24-56519, filed 5/7/73.]

WAC 296-24-56521 Maintenance and workmanship. (1) Doors, stairs, ramps, passages, signs, and all other components of means of egress shall be of substantial, reliable construction and shall be built or installed in a workmanlike manner.

(2) Means of egress shall be continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.

(3) Any device or alarm installed to restrict the improper use of an exit shall be so designed and installed that it cannot, even in cases of failure, impede or prevent emergency use of such exit.

[Order 73-5, § 296-24-56521, filed 5/9/73 and Order 73-4, § 296-24-56521, filed 5/7/73.]

WAC 296-24-56523 Furnishings and decorations. (1) No furnishings, decorations, or other objects shall be so place as to obstruct exits, access thereto, egress therefrom, or visibility thereof.

(2) No furnishings or decorations of an explosive or highly flammable character shall be used in any occupancy.

[Order 73-5, § 296-24-56523, filed 5/9/73 and Order 73-4, § 296-24-56523, filed 5/7/73.]

WAC 296-24-56525 Automatic sprinkler systems. All automatic sprinkler systems shall be continuously maintained in reliable operating condition at all times, and such periodic inspections and tests shall be made as are necessary to assure proper maintenance.

[Order 73-5, § 296-24-56525, filed 5/9/73 and Order 73-4, § 296-24-56525, filed 5/7/73.]

WAC 296-24-56527 Fire alarm signaling systems. The employer shall assure that fire alarm signaling systems are maintained and tested in accordance with the requirements of WAC 296-24-63107.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-56527, filed 12/24/81; Order 73-5, § 296-24-56527, filed 5/9/73 and Order 73-4, § 296-24-56527, filed 5/7/73.]

WAC 296-24-56529 Fire retardant paints. Fire retardant paints or solutions shall be renewed at such intervals as necessary to maintain the necessary flame retardant properties.

[Order 73-5, § 296-24-56529, filed 5/9/73 and Order 73-4, § 296-24-56529, filed 5/7/73.]

WAC 296-24-56531 Exit marking. (1) Exits shall be marked by a readily visible sign. Access to exits shall be marked by readily visible signs in all cases where the exit or way to reach it is not immediately visible to the occupants.

(2) Any door, passage, or stairway which is neither an exit nor a way of exit access, and which is so located or arranged as to be likely to be mistaken for an exit, shall be identified by a sign reading "not an exit" or similar designation, or shall be identified by a sign indicating its actual character, such as "to basement," "storeroom," "linen closet," or the like.

(3) Every required sign designating an exit or way of exit access shall be so located and of such size, color, and design as to be readily visible. No decorations, furnishings, or equipment which impair visibility of an exit sign shall be permitted, nor shall there be any brightly illuminated sign (for other than exit purposes), display, or object in or near the line of vision to the required exit sign of such a character as to so detract attention from the exit sign that it may not be noticed.

(4) Every exit sign shall be distinctive in color and shall provide contrast with decorations, interior finish, or other signs.

(5) A sign reading "exit," or similar designation, with an arrow indicating the direction, shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.

(6) Every exit sign shall be suitably illuminated by a reliable light source giving a value of not less than 5-foot candles on the illuminated surface. Artificial lights giving illumination to exit signs other than the internally illuminated types shall have screens, discs, or lenses of not less than 25 square inches area made of translucent material to show red or other specified designating color on the side of the approach.

(7) Each internally illuminated exit sign shall be provided in all occupancies where reduction of normal illumination is permitted.

(8) Every exit sign shall have the word "exit" in plainly legible letters not less than 6 inches high, with the principal strokes of letters not less than three-fourths-inch wide.

[Order 73-5, § 296-24-56531, filed 5/9/73 and Order 73-4, § 296-24-56531, filed 5/7/73.]

WAC 296-24-567 Employee emergency plans and fire prevention plans. (1) Emergency action plan.

(a) Scope and application. This subdivision applies to all emergency action plans required by a particular WISHA standard. The emergency action plan shall be in writing, and shall cover those designated actions employers and employees must take to ensure employee safety from fire and other emergencies.

(b) Elements. The following elements, at a minimum, shall be included in the plan:

(i) Emergency escape procedures and emergency escape route assignments;

(ii) Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;

(iii) Procedures to account for all employees after emergency evacuation has been completed;

(iv) Rescue and medical duties for those employees who are to perform them;

(v) The preferred means of reporting fires and other emergencies; and

(vi) Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.

(c) Alarm systems.

(i) The employer shall establish an employee alarm system which complies with WAC 296-24-631.

(ii) If the employee alarm system is used for alerting fire brigade members, or for other purposes, a distinctive signal for each purpose shall be used.

(d) Evacuation. The employer shall establish in the emergency action plan the types of evacuation to be used in emergency circumstances.

(e) Training.

(i) Before implementing the emergency action plan, the employer shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees.

(ii) The employer shall review the plan with each employee covered by the plan at the following times:

(A) Initially when the plan is developed;

(B) Whenever the employee's responsibilities or designated actions under the plan change; and

(C) Whenever the plan is changed.

(iii) The employer shall review with each employee upon initial assignment those parts of the plan which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept at the workplace and made available for employee review.

(2) Fire prevention plan.

(a) Scope and application. This subsection applies to all fire prevention plans required by a particular WISHA standard. The fire prevention plan shall be in writing.

(b) Elements. The following elements, at a minimum, shall be included in the fire prevention plan:

(i) A list of the major workplace fire hazards and their proper handling and storage procedures, potential ignition sources (such as welding, smoking and others) and their control procedures, and the type of fire protection equipment or systems which can control a fire involving them;

(ii) Names or regular job titles of those personnel responsible for maintenance of equipment and systems installed to prevent or control ignitions or fires; and

(iii) Names or regular job titles of those personnel responsible for control of fuel source hazards.

(c) Housekeeping. The employer shall control accumulations of flammable and combustible waste materials and residues so that they do not contribute to a fire emergency. The housekeeping procedures shall be included in the written fire prevention plan.

(d) Training.

(i) The employer shall apprise employees of the fire hazards of the materials and processes to which they are exposed.

(ii) The employer shall review with each employee upon initial assignment those parts of the fire prevention plan which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept in the workplace and made available for employee review.

(e) Maintenance. The employer shall regularly and properly maintain, according to established procedures, equipment and systems installed on heat producing equipment to prevent accidental ignition of combustible materials. The maintenance procedures shall be included in the written fire prevention plan.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-24-567, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-567, filed 12/24/81.]

WAC 296-24-56701 Appendix. This appendix serves as a nonmandatory guideline to assist employers in complying with the appropriate requirements.

(1) Employee emergency plans. Emergency action plan elements. The emergency action plan should address emergencies that the employer may reasonably expect in the workplace. Examples are: Fire, toxic chemical releases; hurricanes; tornadoes; blizzards; floods; and others. The elements of the emergency action plan presented in WAC 296-24-567 (1)(b) can be supplemented by the following to more effectively achieve employee safety and health in an emergency. The employer should list in detail the procedures to be taken by those employees who have been selected to remain behind to care for essential plant operations until their evacuations become absolutely necessary. Essential plant operations may include the monitoring of plant power supplies, water supplies, and other essential services which cannot be shut down for every emergency alarm. Essential plant operations may also include chemical or manufacturing processes which must be shut down in stages or steps where certain employees must be present to assure that safe shut down procedures are completed.

The use of floor plans or workplace maps which clearly show the emergency escape routes should be included in the emergency action plan. Color coding will aid employees in determining their route assignments.

The employer should also develop and explain in detail what rescue and medical first aid duties are to be performed and by whom. All employees are to be told what actions they are to take in these emergency situations that the employer anticipates may occur in the workplace.

(2) Emergency evacuation. At the time of an emergency, employees should know what type of evacuation is necessary and what their role is in carrying out the plan. In some cases where the emergency is very grave, total and immediate evacuation of all employees is necessary. In other emergencies, a partial evacuation of nonessential employees with a delayed evacuation of others may be necessary for continued plant operation. In some cases, only those employees in the immediate area of the fire may be expected to evacuate or move to a safe area such as when a local application fire suppression system discharge employee alarm is sounded. Employees must be sure that they know what is expected of them in all such emergency possibilities which have been planned in order to provide assurance of their safety from fire or other emergency.

The designation of refuge or safe areas for evacuation should be determined and identified in the plan. In a building divided into fire zones by fire walls, the refuge area may still be within the same building but in a different zone from where the emergency occurs.

Exterior refuge or safe areas may include parking lots, open fields or streets which are located away from the site of the emergency and which provide sufficient space to accommodate the employees. Employees should be instructed to move away from the exit discharge doors of the building, and to avoid congregating close to the building where they may hamper emergency operations.

(3) Emergency action plan training. The employer should assure that an adequate number of employees are available at all times during working hours to act as evacuation wardens so that employees can be swiftly moved from the danger location to the safe areas. Generally, one warden for each twenty employees in the workplace should be able to provide adequate guidance and instruction at the time of a fire emergency. The employees selected or who volunteer to serve as wardens should be trained in the complete workplace layout and the various alternative escape routes from the workplace. All wardens and fellow employees should be made aware of handicapped employees who may need extra assistance, such as using the buddy system, and of hazardous areas to be avoided during emergencies. Before leaving, wardens should check rooms and other enclosed spaces in the workplace for employees who may be trapped or otherwise unable to evacuate the area.

After the desired degree of evacuation is completed, the wardens should be able to account for or otherwise verify that all employees are in the safe areas.

In buildings with several places of employment, employers are encouraged to coordinate their plans with the other employers in the building. A building-wide or standardized plan for the whole building is acceptable provided that the employers inform their respective employees of their duties and responsibilities under the plan. The standardized plan need not be kept by each employer in the multi-employer building provided there is an accessible location within the building where the plan can be reviewed by affected employees. When multi-employer, building-wide plans are not feasible, employers should coordinate their plans with the other employers within the building to assure that conflicts and confusion are avoided during time of emergencies. In multistory buildings where more than one employer is on a single floor, it is essential that these employers coordinate their plans with each other to avoid conflicts and confusion.

(4) Fire prevention housekeeping. The standard calls for the control of accumulations of flammable and combustible waste materials.

It is the intent of this standard to assure that hazardous accumulations of combustible waste materials are controlled so that a fast developing fire, rapid spread of toxic smoke, or an explosion will not occur. This does not necessarily mean that each room has to be swept each day. Employers and employees should be aware of the hazardous properties of materials in their workplaces, and the degree of hazard each poses. Certainly, oil soaked rags have to be treated differently than general paper trash in office areas. However, large accumulations of waste paper or corrugated boxes, etc., can pose a significant fire hazard. Accumulations of materials which can cause large fires or generate dense smoke that are easily ignited or may start from spontaneous combustion, are the types of materials with which this standard is concerned. Such combustible materials may be easily ignited by matches, welder's sparks, cigarettes, and similar low level energy ignition sources.

(5) Maintenance of equipment under the fire prevention plan. Certain equipment is often installed in workplaces to control heat sources or to detect fuel leaks. An example is a temperature limit switch often found on deep-fat food fryers found in restaurants. There may be similar switches for high temperature dip tanks, or flame failure and flashback arrester devices on furnaces and similar heat producing equipment. If these devices are not properly maintained or if they become inoperative, a definite fire hazard exists. Again employees and supervisors should be aware of the specific type of control devices on equipment involved with combustible materials in the workplace and should make sure, through periodic inspection or testing, that these controls are operable. Manufacturers' recommendations should be followed to assure proper maintenance procedures.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-56701, filed 12/24/81.]

Part G-2
FIRE PROTECTION

WAC

WAC 296-24-585 Fire protection.

[Order 73-5, § 296-24-585, filed 5/9/73 and Order 73-4, § 296-24-585, filed 5/7/73.]

WAC 296-24-58501 Definitions applicable to fire protection. (1) "Class A fires" are fires in ordinary combustible materials, such as wood, cloth, paper, and rubber.

(2) "Class B fires" are fires in flammable liquids, gases, and greases.

(3) "Class C fires" are fires which involve energized electrical equipment where the electrical nonconductivity of the extinguishing media is of importance. (When electrical equipment is deenergized, extinguisher for Class A or B fires may be used safely.)

(4) "Class D fires" are fires in combustible metals, such as magnesium, titanium, zirconium, sodium, and potassium.

(5) Classification of portable fire extinguishers: "Portable fire extinguishers" are classified for use on certain classes of fires and rated for relative extinguishing effectiveness at a temperature of plus 70°F by nationally recognized testing laboratories. This is based upon the preceding classification of fires and the fire extinguishment potentials as determined by fire tests.

Note: The classification and rating system described in this section is that used by Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada and is based on extinguishing preplanned fires of determined size and description as follows:

(a) Class A rating—Wood and excelsior fires excluding deep-seated conditions.

(b) Class B rating—Two-inch depth gasoline fires in square pans.

(c) Class C rating—No fire test. Agent must be a nonconductor of electricity.

(d) Class D rating—Special tests on specific combustible metal fires.

(6) A "light hazard" is a situation where the amount of combustibles or flammable liquids present is such that fires of small size may be expected. These may include offices, schoolrooms, churches, assembly halls, telephone exchanges, etc.

(7) An "ordinary hazard" is a situation where the amount of combustibles or flammable liquids present is such that fires of moderate size may be expected. These may include mercantile storage and display, auto showrooms, parking garages, light manufacturing, warehouses not classified as extra hazard, school shop areas, etc.

(8) An "extra hazard" is a situation where the amount of combustibles or flammable liquids present is such that fires of severe magnitude may be expected. These may include woodworking, auto repair, aircraft servicing, warehouses with high-piled (14 feet or higher) combustibles, and processes such as flammable liquid handling, painting, dipping, etc.

(9) Sprinkler system: A "sprinkler system," for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply, such as a gravity tank, fire pump, reservoir, or pressure tank and/or connection by underground piping to a city main. The portion of the sprinkler system above ground is a network of specially sized or hydraulically designed piping installed in a building, structure or area, generally overhead, and to which sprinklers are connected in a systematic pattern. The system includes a controlling valve and a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area.

Note: The design and installation of water supply facilities such as gravity tanks, fire pumps, reservoirs, or pressure tanks, and underground piping are covered by NFPA Standards No. 22-1970, Water Tanks for Private Fire Protection; No. 20-1970, Installation of Centrifugal Fire Pumps and No. 24-1970, Outside Protection.

(10) Sprinkler alarms: A "sprinkler alarm" unit is an assembly of apparatus approved for the service and so constructed and installed that any flow of water from a sprinkler system equal to or greater than that from a single automatic sprinkler will result in an audible alarm signal on the premises.

(11) Class of service—Standpipe systems: "Standpipe systems" are grouped into three general classes of service for the intended use in the extinguishment of fire.

(a) Class I: For use by fire departments and those trained in handling heavy fire streams (2 1/2-inch hose).

(b) Class II: For use primarily by the building occupants until the arrival of the fire department (small hose).

(c) Class III: For use by either fire departments and those trained in handling heavy hose streams or by the building occupants.

(12) Class I service: "Class I service" is a standpipe system capable of furnishing the effective fire streams required during the more advanced stages of fire on the inside of buildings or for exposure fire.

(13) Class II service: "Class II service" is a standpipe system which affords a ready means for the control of incipient fires by the occupants of buildings during working hours and by watchmen and those present during the night time and holidays.

(14) Class III service: "Class III service" is a standpipe system capable of furnishing the effective fire streams required during the more advanced stages of fire on the inside of buildings as well as providing a ready means for the control of fires by the occupants of the building.

(15) Standpipe system: "Standpipe systems" are usually of the following types:

(a) A wet standpipe system having a supply valve open and water pressure maintained at all times.

(b) A standpipe system so arranged through the use of approved devices as to admit water to the system automatically by opening a hose valve.

(c) A standpipe system arranged to admit water to the system through manual operation of approved remote control devices located at each hose station.

(d) Dry standpipe having no permanent water supply. See also (11) of this section.

(16) Type I storage: "Type I storage" is that in which combustible commodities or noncombustible commodities involving combustible packaging or storage aids are stored over 15 feet but not more than 21 feet high in solid piles or over 12 feet but not more that 21 feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification.

(17) Type II storage: "Type II storage" is that in which combustible commodities or noncombustible commodities involving combustible packaging or storage aids are stored not over 15 feet high in solid piles or not over 12 feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification.

(18) Type III storage: "Type III storage" is that in which the stored commodities, packaging, and storage aids are noncombustible or contain only a small concentration of combustibles which are incapable of producing a fire that would cause appreciable damage to the commodities stored or to noncombustible wall, floor or roof construction. Ordinary combustible commodities in completely sealed noncombustible containers may qualify in this classification. General commodity storage that

is subject to frequent changing and storage of combustible packaging and storage aids is excluded from this category.

(19) Approved: "Approved" means listed or approved by: (a) At least one of the following nationally recognized testing laboratories: Factory Mutual Engineering Corp.; Underwriters' Laboratories, Inc., or (b) federal agencies such as Bureau of Mines, Department of the Interior; Department of Transportation; or U.S. Coast Guard, which issue approvals for such equipment.

[Order 74-27, § 296-24-58501, filed 5/7/74; Order 73-5, § 296-24-58501, filed 5/9/73 and Order 73-4, § 296-24-58501, filed 5/7/73.]

WAC 296-24-58503 Scope, application and definitions applicable. (1) Scope. This section contains requirements for fire brigades, and all portable and fixed fire suppression equipment, fire detection systems, and fire or employee alarm systems installed to meet the fire protection requirements of this chapter.

(2) Application. This section applies to all employments except for maritime, construction, and agriculture.

(3) Definitions applicable to this section.

(a) "After-flame," means the time a test specimen continues to flame after the flame source has been removed.

(b) "Aqueous film forming foam (AFFF)," means a fluorinated surfactant with a foam stabilizer which is diluted with water to act as a temporary barrier to exclude air from mixing with the fuel vapor by developing an aqueous film on the fuel surface of some hydrocarbons which is capable of suppressing the generation of fuel vapors.

(c) "Approved," means acceptable to the director under the following criteria:

(i) If it is accepted, or certified, or listed, or labeled or otherwise determined to be safe by a nationally recognized testing laboratory; or

(ii) With respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another federal agency and found in compliance with the provisions of the applicable National Fire Protection Association Fire Code; or

(iii) With respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the director; and

(iv) For the purposes of (c) of this subsection:

(A) Equipment is listed if it is of a kind mentioned in a list which is published by a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment and which states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner;

(B) Equipment is labeled if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment and whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner;

(C) Equipment is accepted if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes;

(D) Equipment is certified if it has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner or is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and if it bears a label, tag, or other record of certification; and

(E) Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.

(d) "Automatic fire detection device," means a device designed to automatically detect the presence of fire by heat, flame, light, smoke or other products of combustion.

(e) "Buddy-breathing device," means an accessory to self-contained breathing apparatus which permits a second person to share the same air supply as that of the wearer of the apparatus.

(f) "Carbon dioxide," means a colorless, odorless, electrically nonconductive inert gas (chemical formula CO_2) that is a medium for extinguishing fires by reducing the concentration of oxygen or fuel vapor in the air to the point where combustion is impossible.

(g) "Class A fire," means a fire involving ordinary combustible materials such as paper, wood, cloth, and some rubber and plastic materials.

(h) "Class B fire," means a fire involving flammable or combustible liquids, flammable gases, greases and similar materials, and some rubber and plastic materials.

(i) "Class C fire," means a fire involving energized electrical equipment where safety to the employee requires the use of electrically nonconductive extinguishing media.

(j) "Class D fire," means a fire involving combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium.

(k) "Dry chemical," means an extinguishing agent composed of very small particles of chemicals such as, but not limited to, sodium bicarbonate, potassium bicarbonate, urea-based potassium bicarbonate, potassium chloride, or monoammonium phosphate supplemented by special treatment to provide resistance to packing and moisture absorption (caking) as well as to provide proper flow capabilities. Dry chemical does not include dry powders.

(l) "Dry powder," means a compound used to extinguish or control Class D fires.

(m) "Education," means the process of imparting knowledge or skill through systematic instruction. It does not require formal classroom instruction.

(n) "Enclosed structure," means a structure with a roof or ceiling and at least two walls which may present fire hazards to employees, such as accumulations of smoke, toxic gases and heat similar to those found in buildings.

(o) "Extinguisher classification," means the letter classification given an extinguisher to designate the class or classes of fire on which an extinguisher will be effective.

(p) "Extinguisher rating," means the numerical rating given to an extinguisher which indicates the extinguishing potential of the unit based on standardized tests developed by Underwriters' Laboratories, Inc.

(q) "Fire brigade," (private fire department, industrial fire department) means an organized group of employees who are knowledgeable, trained, and skilled in at least basic fire fighting operations.

(r) "Fixed extinguishing system," means a permanently installed system that either extinguishes or controls a fire at the location of the system.

(s) "Flame resistance," is the property of materials, or combinations of component materials, to retard ignition and restrict the spread of flame.

(t) "Foam," means a stable aggregation of small bubbles which flow freely over a burning liquid surface and form a coherent blanket which seals combustible vapors and thereby extinguishes the fire.

(u) "Gaseous agent," is a fire extinguishing agent which is in the gaseous state at normal room temperature and pressure. It has low viscosity, can expand or contract with changes in pressure and temperature, and has the ability to diffuse readily and to distribute itself uniformly throughout an enclosure.

(v) "Halon 1211," means a colorless, faintly sweet smelling, electrically nonconductive liquefied gas (chemical formula $CBrC1F_2$) which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromochlorodifluoromethane.

(w) "Halon 1301," means a colorless, odorless, electrically nonconductive gas (chemical formula $CBrF_3$) which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromotrifluoromethane.

(x) "Helmet," is a head protective device consisting of a rigid shell, energy absorption system and chin strap intended to be worn to provide protection for the head or portions thereof, against impact, flying or falling objects, electric shock, penetration, heat and flame.

(y) "Incipient stage fire," means a fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, Class II standpipe or small hose systems without the need for protective clothing or breathing apparatus.

(z) "Inspection," means a visual check of fire protection systems and equipment to ensure that they are in place, charged, and ready for use in the event of a fire.

(aa) "Interior structural fire fighting," means the physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures which are involved in a fire situation beyond the incipient stage.

(bb) "Lining," means a material permanently attached to the inside of the outer shell of a garment for the purpose of thermal protection and padding.

(cc) "Local application system," means a fixed fire suppression system which has a supply of extinguishing agent, with nozzles arranged to automatically discharge extinguishing agent directly on the burning material to extinguish or control a fire.

(dd) "Maintenance," means the performance of services on fire protection equipment and systems to assure that they will perform as expected in the event of a fire. Maintenance differs from inspection in that maintenance requires the checking of internal fitting, devices and agent supplies.

(ee) "Multipurpose dry chemical," means a dry chemical which is approved for use on Class A, Class B and Class C fires.

(ff) "Outer shell," is the exterior layer of material on the fire coat and protective trousers which forms the outermost barrier between the fire fighter and the environment. It is attached to the vapor barrier and liner and is usually constructed with a storm flap, suitable closures, and pockets.

(gg) "Positive–pressure breathing apparatus," means self–contained breathing apparatus in which the pressure in the breathing zone is positive in relation to the immediate environment during inhalation and exhalation.

(hh) "Predischarge employee alarm," means an alarm which will sound at a set time prior to actual discharge of an extinguishing system so that employees may evacuate the discharge area prior to system discharge.

(ii) "Quick disconnect valve," means a device which starts the flow of air by inserting of the hose (which leads from the facepiece) into the regulator of self–contained breathing apparatus, and stops the flow of air by disconnection of the hose from the regulator.

(jj) "Sprinkler alarm," means an approved device installed so that any waterflow from a sprinkler system equal to or greater than that from single automatic sprinkler will result in an audible alarm signal on the premises.

(kk) "Sprinkler system," means a system of piping designed in accordance with fire protection engineering standards and installed to control or extinguish fires. The system includes an adequate and reliable water supply, and a network of specially sized piping and sprinklers which are interconnected. The system also includes a control valve and a device for actuating an alarm when the system is in operation.

(ll) "Standpipe systems:"

(i) "Class I standpipe system," means a two and one–half–inch (6.3 cm) hose connection for use by fire departments and those trained in handling heavy fire streams.

(ii) "Class II standpipe system," means a one and one–half–inch (3.8 cm) hose system which provides a means for the control or extinguishment of incipient stage fires.

(iii) "Class III standpipe system," means a combined system of hose which is for the use of employees trained in the use of hose operations and which is capable of furnishing effective water discharge during the more advanced stages of fire (beyond the incipient stage) in the interior of workplaces. Hose outlets are available for both one and one–half–inch (3.8 cm) and two and one–half–inch (6.3 cm) hose.

(iv) "Small hose system," means a system of hose ranging in diameter from five–eighths–inch (1.6 cm) up to one and one–half–inch (3.8 cm) which is for the use of employees and which provides a means for the control and extinguishment of incipient stage fires.

(mm) "Total flooding system," means a fixed suppression system which is arranged to automatically discharge a predetermined concentration of agent into an enclosed space for the purpose of fire extinguishment or control.

(nn) "Training," means the process of making proficient through instruction and hands–on practice in the operation of equipment, including respiratory protection equipment, that is expected to be used in the performance of assigned duties.

(oo) "Vapor barrier," means that material used to prevent or substantially inhibit the transfer of water, corrosive liquids and steam or other hot vapors from the outside of a garment to the wearer's body.

[Statutory Authority: Chapter 49.17 RCW. 88–23–054 (Order 88–25), § 296–24–58503, filed 11/14/88; 87–24–051 (Order 87–24), § 296–24–58503, filed 11/30/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 82–02–003 (Order 81–32), § 296–24–58503, filed 12/24/81.]

WAC 296-24-58505 Fire brigades. Scope and application.

(1) Scope. This section contains requirements for the organization, training and personal protective equipment of fire brigades whenever they are established by an employer.

(2) Application. The requirements of this section apply to fire brigades, industrial fire departments and private or contractual type fire departments. Personal protective equipment requirements apply only to members of fire brigades performing interior structural fire fighting. The requirements of this section do not apply to airport crash rescue or forest fire fighting operations.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82–02–003 (Order 81–32), § 296–24–58505, filed 12/24/81.]

WAC 296-24-58507 Organization. (1) Organizational statement. The employer shall prepare and maintain a statement or written policy which establishes the existence of a fire brigade; the basic organizational structure; the type, amount, and frequency of training to be provided to fire brigade members; the expected number of members in the fire brigade; and the functions that the fire brigade is to perform at the workplace. The organizational statement shall be available for inspection by the director and by employees or their designated representatives.

(2) Personnel. The employer shall assure that employees who are expected to do interior structural fire fighting are physically capable of performing duties which may be assigned to them during emergencies. The employer shall not permit employees with known heart disease, epilepsy, or emphysema, to participate in fire brigade emergency activities unless a physician's certificate of the employees' fitness to participate in such activities is provided. For employees assigned to fire brigades before September 15, 1980, this section is effective on September 15, 1990. For employees assigned to fire brigades on or after September 15, 1980, this section is effective thirty days after filing with the code reviser.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82–02–003 (Order 81–32), § 296–24–58507, filed 12/24/81.]

WAC 296-24-58509 Training and education. (1) The employer shall provide training and education for all fire brigade members commensurate with those duties and functions that fire brigade members are expected to perform. Such training and education shall be provided to fire brigade members before they perform fire brigade emergency activities. Fire brigade leaders and training instructors shall be provided with training and education which is more comprehensive than that provided to the general membership of the fire brigade.

(2) The employer shall assure that training and education is conducted frequently enough to assure that each member of the fire brigade is able to perform the member's assigned duties and functions satisfactorily and in a safe manner so as not to endanger fire brigade members or other employees. All fire brigade members shall be provided with training at least annually. In addition, fire brigade members who are expected to perform interior structural fire fighting shall be provided with an education session or training at least quarterly.

(3) The quality of the training an education program for fire brigade members shall be similar to those conducted by such fire training schools as the Maryland Fire and Rescue Institute; Iowa Fire Service Extension; West Virginia Fire Service Extension; Georgia Fire Academy; New York State Department, Fire Prevention and Control; Louisiana State University Firemen Training Program; or Washington State's Fire Service Training Commission for Vocational Education. (For example, for the oil refinery industry, with its unique hazards, the training and education program for those fire brigade members shall be similar to those conducted by Texas A and M University, Lamar University, Reno Fire School, or the Delaware State Fire School.)

(4) The employer shall inform fire brigade members about special hazards such as storage and use of flammable liquids and gases, toxic chemicals, radioactive sources, and water reactive substances, to which they may be exposed during fire and other emergencies. The fire brigade members shall also be advised of any changes that occur in relation to the special hazards. The employer shall develop and make available for inspection by fire brigade members, written procedures that describe the actions to be taken in situations involving the special hazards and shall include these in the training and education program.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82–02–003 (Order 81–32), § 296–24–58509, filed 12/24/81.]

WAC 296-24-58511 Fire fighting equipment. The employer shall maintain and inspect, at least annually, fire fighting equipment to assure the safe operational condition of the equipment. Portable fire extinguishers

and respirators shall be inspected at least monthly. Fire fighting equipment that is in damaged or unserviceable condition shall be removed from service and replaced.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-58511, filed 12/24/81.]

WAC 296-24-58513 Protective clothing. The following requirements apply to those employees who perform interior structural fire fighting. The requirements do not apply to employees who use fire extinguishers or standpipe systems to control or extinguish fires only in the incipient stage.

(1) General.

(a) The employer shall provide at no cost to the employee and assure the use of protective clothing which complies with the requirements of this section. The employer shall assure that protective clothing ordered or purchased after January 1, 1982, meets the requirements contained in this section. As the new equipment is provided, the employer shall assure that all fire brigade members wear the equipment when performing interior structural fire fighting. After July 1, 1985, the employer shall assure that all fire brigade members wear protective clothing meeting the requirements of this section when performing interior structural fire fighting.

(b) The employer shall assure that protective clothing protects the head, body, and extremities, and consists of at least the following components: Foot and leg protection; hand protection; body protection; eye, face and head protection.

(2) Foot and leg protection.

(a) Foot and leg protection shall meet the requirements of (b) and (c) of this subsection, and may be achieved by either of the following methods:

(i) Fully extended boots which provide protection for the legs; or

(ii) Protective shoes or boots worn in combination with protective trousers that meet the requirements of subsection (3) of this section.

(b) Protective footwear shall meet the requirements of WAC 296-24-088 for Class 75 footwear. In addition, protective footwear shall be water-resistant for at least five inches (12.7 cm) above the bottom of the heel and shall be equipped with slip-resistant outer soles.

(c) Protective footwear shall be tested in accordance with paragraph (1) Appendix E, and shall provide protection against penetration of the midsole by a size 8D common nail when at least 300 pounds (1330 N) of static force is applied to the nail.

(3) Body protection.

(a) Body protection shall be coordinated with foot and leg protection to ensure full body protection for the wearer. This shall be achieved by one of the following methods:

(i) Wearing of a fire-resistive coat meeting the requirements of (b) of this subsection, in combination with fully extended boots meeting the requirements of subsection (2)(b) and (c) of this section; or

(ii) Wearing of fire-resistive coat in combination with protective trousers both of which meet the requirements of (b) of this subsection.

(b) The performance, construction, and testing of fire-resistive coats and protective trousers shall be at least equivalent to the requirements of the National Fire Protection Association (NFPA) standard NFPA No. 1971-1975, "Protective Clothing for Structural Fire Fighting," (see WAC 296-24-63499, Appendix D) with the following permissible variations from those requirements:

(i) Tearing strength of the outer shell shall be a minimum of eight pounds (35.6 N) in any direction when tested in accordance with paragraph (2) of WAC 296-24-63599, Appendix E; and

(ii) The outer shell may discolor but shall not separate or melt when placed in a forced air laboratory oven at a temperature of 500°F (260°C) for a period of five minutes. After cooling to ambient temperature and using the test method specified in paragraph (3) of WAC 296-24-63599 Appendix E, char length shall not exceed 4.0 inches (10.2 cm) and after-flame shall not exceed 2.0 seconds.

(4) Hand protection.

(a) Hand protection shall consist of protective gloves or glove system which will provide protection against cut, puncture, and heat penetration. Gloves or glove system shall be tested in accordance with the test methods contained in the National Institute for Occupational Safety and Health (NIOSH) 1976 publication, "The Development of Criteria for Fire Fighter's Gloves; Vol. II, Part II: Test Methods," (see WAC 296-24-63499, Appendix D to Subpart L) and shall meet the following criteria for cut, puncture, and heat penetration:

(i) Materials used for gloves shall resist surface cut by a blade with an edge having a 60 degree included angle and a .001 inch (.0025 cm.) radius, under an applied force of 16 lbf (72N) and at a slicing velocity of greater or equal to 60 in/min. (2.5 cm/sec);

(ii) Materials used for the palm and palm side of the fingers shall resist puncture by a penetrometer (simulating a 4d lath nail), under an applied force of 13.2 lbf (60N) and at a velocity greater or equal to 20 in/min. (.85 cm/sec); and

(iii) The temperature inside the palm and gripping surface of the fingers of gloves shall not exceed 135°F (57°C) when gloves or glove system are exposed to 932°F (500°C) for five seconds at 4 psi (28 kPa) pressure.

(b) Exterior materials of gloves shall be flame resistant and shall be tested in accordance with paragraph (3) of Appendix E. Maximum allowable after-flame shall be 2.0 seconds, and the maximum char length shall be 4.0 inches (10.2 cm).

(c) When design of the fire-resistive coat does not otherwise provide protection for the wrists, protective gloves shall have wristlets of at least 4.0 inches (10.2 cm) in length to protect the wrist area when the arms are extended upward and outward from the body.

(5) Head, eye and face protection.

(a) Head protection shall consist of a protective head device with ear flaps and chin strap which meet the performance, construction, and testing requirements of the

National Fire Safety and Research Office of the National Fire Prevention and Control Administration, United States Department of Commerce (now known as the United States Fire Administration), which are contained in, "Model Performance Criteria for Structural Firefighters' Helmets," (August 1977) (see WAC 296-24-63499, Appendix D).

(b) Protective eye and face devices which comply with WAC 296-24-078 shall be used by fire brigade members when performing operations where the hazards of flying or falling materials which may cause eye and face injuries are present. Protective eye and face devices provided as accessories to protective head devices (face shields) are permitted when such devices meet the requirements of WAC 296-24-078.

(c) Full facepieces, helmets, or hoods of breathing apparatus which meet the requirements of WAC 296-62-071 and 296-24-58515, shall be acceptable as meeting the eye and face protection requirements of (b) of this subsection.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-58513, filed 1/11/90, effective 2/26/90; 88-14-108 (Order 88-11), § 296-24-58513, filed 7/6/88; 87-24-051 (Order 87-24), § 296-24-58513, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-58513, filed 12/24/81.]

WAC 296-24-58515 Respiratory protection devices. (1) General requirements.

(a) The employer shall provide at no cost to the employee and assure the use of respirators which comply with the requirements of this paragraph. The employer shall assure that respiratory protective devices worn by brigade members meet the requirements contained in WAC 296-62-071, and the requirements contained in this paragraph, and are certified under 30 CFR Part II.

(b) Approved self-contained breathing apparatus with full-facepiece, or with approved helmet or hood configuration, shall be provided to and worn by fire brigade members while working inside buildings or confined spaces where toxic products of combustion or an oxygen deficiency may be present. Such apparatus shall also be worn during emergency situations involving toxic substances.

(c) Approved self-contained breathing apparatus may be equipped with either a "buddy-breathing" device or a quick disconnect valve, even if these devices are not certified by NIOSH. If these accessories are used, they shall not cause damage to the apparatus, or restrict the air flow of the apparatus, or obstruct the normal operation of the apparatus.

(d) 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 shall meet DOT and NIOSH criteria.

(e) Self-contained breathing apparatus shall have a minimum service life rating of thirty minutes in accordance with the methods and requirements of the mine safety and health administration (MSHA) and NIOSH, except for escape self-contained breathing apparatus (ESCBA) used only for emergency escape purposes.

(f) Self-contained breathing apparatus shall be provided with an indicator which automatically sounds an audible alarm when the remaining service life of the apparatus is reduced to within a range of twenty to twenty-five percent of its rated service time.

(2) Positive-pressure breathing apparatus.

(a) The employer shall assure that self-contained breathing apparatus ordered or purchased after January 1, 1982, for use by fire brigade members performing interior structural fire fighting operations, are of the pressure-demand or other positive-pressure type. Effective July 1, 1983, only pressure-demand or other positive-pressure self-contained breathing apparatus shall be worn by fire brigade members performing interior structural fire fighting.

(b) This section does not prohibit the use of a self-contained breathing apparatus where the apparatus can be switched from a demand to a positive-pressure mode. However, such apparatus shall be in the positive-pressure mode when fire brigade members are performing interior structural fire fighting operations.

(c) Negative-pressure self-contained breathing apparatus with a rated service life of more than two hours and which have a minimum protection factor of 5,000, as determined by an acceptable quantitative fit test performed on each individual, is acceptable for use only during those interior structural fire fighting situations for which the employer demonstrates that long duration breathing apparatus is necessary. Quantitative fit test procedures shall be available for inspection by the director or authorized representative. Such negative-pressure breathing apparatus will continue to be acceptable for eighteen months after a positive-pressure breathing apparatus with the same or longer rated service life is certified by NIOSH. After this eighteen-month period, all self-contained breathing apparatus used for these long duration situations shall be of the positive-pressure type.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-58515, filed 12/24/81.]

WAC 296-24-58517 Appendix A--Fire brigades. (1) Scope. This section does not require an employer to organize a fire brigade. However, if an employer does decide to organize a fire brigade, the requirements of this section apply.

(2) Prefire planning. It is suggested that prefire planning be conducted by the local fire department and/or the workplace fire brigade in order for them to be familiar with the workplace and process hazards. Involvement with the local fire department or fire prevention bureau is encouraged to facilitate coordination and cooperation between members of the fire brigade and those who might be called upon for assistance during a fire emergency.

(3) Organizational statement. In addition to the information required in the organizational statement, WAC 296-24-58507(1), it is suggested that the organizational statement also contain the following information: A description of the duties that the fire brigade

members are expected to perform; the line authority of each fire brigade officer; the number of the fire brigade officers and number of training instructors; and a list and description of the types of awards or recognition that brigade members may be eligible to receive.

(4) Physical capability. The physical capability requirement applies only to those fire brigade members who perform interior structural fire fighting. Employees who cannot meet the physical capability requirement may still be members of the fire brigade as long as such employees do not perform interior structural fire fighting. It is suggested that fire brigade members who are unable to perform interior structural fire fighting be assigned less stressful and physically demanding fire brigade duties, e.g., certain types of training, recordkeeping, fire prevention inspection and maintenance, and fire pump operations.

Physically capable can be defined as being able to perform those duties specified in the training requirements of WAC 296-24-58509. Physically capable can also be determined by physical performance tests or by a physical examination when the examining physician is aware of the duties that the fire brigade member is expected to perform.

It is also recommended that fire brigade members participate in a physical fitness program. There are many benefits which can be attributed to being physically fit. It is believed that physical fitness may help to reduce the number of sprain and strain injuries as well as contributing to the improvement of the cardiovascular system.

(5) Training and education. The paragraph on training and education does not contain specific training and education requirements because the type, amount, and frequency of training and education will be as varied as are the purposes for which fire brigades are organized. However, the paragraph does require that training and education be commensurate with those functions that the fire brigade is expected to perform; i.e., those functions specified in the organizational statement. Such a performance requirement provides the necessary flexibility to design a training program which meets the needs of individual fire brigades.

At a minimum, hands-on training is required to be conducted annually for all fire brigade members. However, for those fire brigade members who are expected to perform interior structural fire fighting, some type of training or education session must be provided at least quarterly.

In addition to the required hands-on training, it is strongly recommended that fire brigade members receive other types of training and education such as: Classroom instruction, review of emergency action procedures, prefire planning, review of special hazards in the workplace, and practice in the use of self-contained breathing apparatus.

It is not necessary for the employer to duplicate the same training or education that a fire brigade member receives as a member of a community volunteer fire department, rescue squad, or similar organization. However, such training or education must have been provided to the fire brigade member within the past year and it must be documented that the fire brigade member has received the training or education. For example: There is no need for a fire brigade member to receive another training class in the use of positive-pressure self-contained breathing apparatus if the fire brigade member has recently completed such training as a member of a community fire department. Instead, the fire brigade member should receive training or education covering other important equipment or duties of the fire brigade as they relate to the workplace hazards, facilities and processes.

It is generally recognized that the effectiveness of fire brigade training and education depends upon the expertise of those providing the training and education as well as the motivation of the fire brigade members. Fire brigade training instructors must receive a higher level of training and education than the fire brigade members they will be teaching. This includes being more knowledgeable about the functions to be performed by the fire brigade and the hazards involved. The instructors should be qualified to train fire brigade members and demonstrate skills in communication, methods of teaching, and motivation. It is important for instructors and fire brigade members alike to be motivated toward the goal of the fire brigade and be aware of the importance of the service that they are providing for the protection of other employees and the workplace.

It is suggested that publications from the International Fire Service Training Association, the National Fire Protection Association (NFPA-1041), the International Society of Fire Service Instructors and other fire training sources be consulted for recommended qualifications of fire brigade training instructors.

In order to be effective, fire brigades must have competent leadership and supervision. It is important for those who supervise the fire brigade during emergency situations, e.g., fire brigade chiefs, leaders, etc., to receive the necessary training and education for supervising fire brigade activities during these hazardous and stressful situations. These fire brigade members with leadership responsibilities should demonstrate skills in strategy and tactics, fire suppression and prevention techniques, leadership principles, prefire planning, and safety practices. It is again suggested that fire service training sources be consulted for determining the kinds of training and education which are necessary for those with fire brigade leadership responsibilities.

It is further suggested that fire brigade leaders and fire brigade instructors receive more formalized training and education on a continuing basis by attending classes provided by such training sources as universities and university fire extension services.

The following recommendations should not be considered to be all of the necessary elements of a complete comprehensive training program, but the information may be helpful as a guide in developing a fire brigade training program.

All fire brigade members should be familiar with exit facilities and their location, emergency escape routes for

handicapped workers, and the workplace "emergency action plan."

In addition, fire brigade members who are expected to control and extinguish fires in the incipient stage should, at a minimum, be trained in the use of fire extinguishers, standpipes, and other fire equipment they are assigned to use. They should also be aware of first aid medical procedures and procedures for dealing with special hazards to which they may be exposed. Training and education should include both classroom instruction and actual operation of the equipment under simulated emergency conditions. Hands–on type training must be conducted at least annually but some functions should be reviewed more often.

In addition to the above training, fire brigade members who are expected to perform emergency rescue and interior structural fire fighting should, at a minimum, be familiar with the proper techniques in rescue and fire suppression procedures. Training and education should include fire protection courses, classroom training, simulated fire situations including "wet drills" and, when feasible, extinguishment of actual mock fires. Frequency of training or education must be at least quarterly, but some drills or classroom training should be conducted as often as monthly or even weekly to maintain the proficiency of fire brigade members.

There are many excellent sources of training and education that the employer may want to use in developing a training program for the workplace fire brigade. These sources include publications, seminars, and courses offered by universities.

There are also excellent fire school courses by such facilities as Texas A and M University, Delaware State Fire School, Lamar University, and Reno Fire School, that deal with those unique hazards which may be encountered by fire brigades in the oil and chemical industry. These schools, and others, also offer excellent training courses which would be beneficial to fire brigades in other types of industries. These courses should be a continuing part of the training program, and employers are strongly encouraged to take advantage of these excellent resources.

It is also important that fire brigade members be informed about special hazards to which they may be exposed during fire and other emergencies. Such hazards as storage and use areas of flammable liquids and gases, toxic chemicals, water–reactive substances, etc., can pose difficult problems. There must be written procedures developed that describe the actions to be taken in situations involving special hazards. Fire brigade members must be trained in handling these special hazards as well as keeping abreast of any changes that occur in relation to these special hazards.

(6) Fire fighting equipment. It is important that fire fighting equipment that is in damaged or unserviceable condition be removed from service and replaced. This will prevent fire brigade members from using unsafe equipment by mistake.

Fire fighting equipment, except portable fire extinguishers and respirators, must be inspected at least annually. Portable fire extinguishers and respirators are required to be inspected at least monthly.

(7) Protective clothing.

(a) General. WAC 296–24–58513 does not require all fire brigade members to wear protective clothing. It is not the intention of these standards to require employers to provide a full ensemble of protective clothing for every fire brigade member without consideration given to the types of hazardous environments to which the fire brigade member might be exposed. It is the intention of these standards to require adequate protection for those fire brigade members who might be exposed to fires in an advanced stage, smoke, toxic gases, and high temperatures. Therefore, the protective clothing requirements only apply to those fire brigade members who perform interior structural fire fighting operations.

Additionally, the protective clothing requirements do not apply to the protective clothing worn during outside fire fighting operations (brush and forest fires, crash crew operations) or other special fire fighting activities. It is important that the protective clothing to be worn during these types of fire fighting operations reflect the hazards which are expected to be encountered by fire brigade members.

(b) Foot and leg protection. WAC 296–24–58505 permits an option to achieve foot and leg protection.

The section recognizes the interdependence of protective clothing to cover one or more parts of the body. Therefore, an option is given so that fire brigade members may meet the foot and leg requirements by either wearing long fire–resistive coats in combination with fully extended boots, or by wearing shorter fire–resistive coats in combination with protective trousers and protective shoes or shorter boots.

(c) Body protection. WAC 296–24–58513(3) provides an option for fire brigade members to achieve body protection. Fire brigade members may wear a fire–resistive coat in combination with fully extended boots, or they may wear a fire–resistive coat in combination with protective trousers.

Fire–resistive coats and protective trousers meeting all of the requirements contained in NFPA 1971–1975, "Protective Clothing for Structural Fire Fighters," are acceptable as meeting the requirements of this standard.

The lining is required to be permanently attached to the outer shell. However, it is permissible to attach the lining to the outer shell material by stitching in one area such as at the neck. Fastener tape or snap fasteners may be used to secure the rest of the lining to the outer shell to facilitate cleaning. Reference to permanent lining does not refer to a winter liner which is a detachable extra lining used to give added protection to the wearer against the effects of cold weather and wind.

(d) Hand protection. The requirements of subsection (4) of this section on hand protection may be met by protective gloves or a glove system. A glove system consists of a combination of different gloves. The usual components of a glove system consist of a pair of gloves, which provide thermal insulation to the hand, worn in

combination with a second pair of gloves which provide protection against flame, cut and puncture.

It is suggested that protective gloves provide dexterity and a sense of feel for objects. Criteria and test methods for dexterity are contained in the NIOSH publications, "The Development of Criteria for Firefighters' Gloves; Vol. I: Glove Requirements," and "Vol. II: Glove Criteria and Test Methods." These NIOSH publications also contain a permissible modified version of Federal Test Method 191, Method 5903, (paragraph (3) of Appendix E) for flame resistance when gloves, rather than glove material, are tested for flame resistance.

(e) Head, eye and face protection. Head protective devices which meet the requirements contained in NFPA No. 1972 are acceptable as meeting the requirements of this standard for head protection.

Head protective devices are required to be provided with ear flaps so that the ear flaps will be available if needed. It is recommended that ear protection always be used while fighting interior structural fires.

Many head protective devices are equipped with face shields to protect the eyes and face. These face shields are permissible as meeting the eye and face protection requirements of this paragraph as long as such face shields meet the requirements of WAC 296-24-078 of the general safety and health standards.

Additionally, full facepieces, helmets or hoods of approved breathing apparatus which meet the requirements of WAC 296-62-071 and 296-24-58515 are also acceptable as meeting the eye and face protection requirements.

It is recommended that a flame resistant protective head covering such as a hood or snood, which will not adversely affect the seal of a respirator facepiece, be worn during interior structural fire fighting operations to protect the sides of the face and hair.

(8) Respiratory protective devices. Respiratory protection is required to be worn by fire brigade members while working inside buildings or confined spaces where toxic products of combustion or an oxygen deficiency is likely to be present; respirators are also to be worn during emergency situations involving toxic substances. When fire brigade members respond to emergency situations, they may be exposed to unknown contaminants in unknown concentrations. Therefore, it is imperative that fire brigade members wear proper respiratory protective devices during these situations. Additionally, there are many instances where toxic products of combustion are still present during mop-up and overhaul operations. Therefore, fire brigade members should continue to wear respirators during these types of operations.

Self-contained breathing apparatus are not required to be equipped with either buddy-breathing device or a quick disconnect valve. However, these accessories may be very useful and are acceptable as long as such accessories do not cause damage to the apparatus, restrict the air flow of the apparatus, or obstruct the normal operation of the apparatus.

Buddy-breathing devices are useful for emergency situations where a victim or another fire brigade member can share the same air supply with the wearer of the apparatus for emergency escape purposes.

The employer is encouraged to provide fire brigade members with an alternative means of respiratory protection to be used only for emergency escape purposes if the self-contained breathing apparatus becomes inoperative. Such alternative means of respiratory protection may be either a buddy-breathing device or an escape self-contained breathing apparatus (ESCBA). The ESCBA is a short-duration respiratory protective device which is approved for only emergency escape purposes. It is suggested that if ESCBA units are used, that they be of at least five minutes service life.

Quick disconnect valves are devices which start the flow of air by insertion of the hose (which leads to the facepiece) into the regulator of self-contained breathing apparatus, and stop the flow of air by disconnecting the hose from the regulator. These devices are particularly useful for those positive-pressure self-contained breathing apparatus which do not have the capability of being switched from the demand to the positive-pressure mode.

The use of a self-contained breathing apparatus where the apparatus can be switched from a demand to a positive-pressure mode is acceptable as long as the apparatus is in the positive-pressure mode when performing interior structural fire fighting operations. Also acceptable are approved respiratory protective devices which have been converted to the positive-pressure type when such modification is accomplished by trained and experienced persons using kits or parts approved by NIOSH and provided by the manufacturer and by following the manufacturer's instructions.

There are situations which require the use of respirators which have a duration of two hours or more. Presently, there are no approved positive-pressure apparatus with a rated service life of more than two hours. Consequently, negative-pressure self-contained breathing apparatus with a rated service life of more than two hours and which have a minimum protection factor of 5,000 as determined by an acceptable quantitative fit test performed on each individual, will be acceptable for use during situations which require long duration apparatus. Long duration apparatus may be needed in such instances as working in tunnels, subway systems, etc. Such negative-pressure breathing apparatus will continue to be acceptable for a maximum of eighteen months after a positive-pressure apparatus with the same or longer rated service life of more than two hours is certified by NIOSH/MSHA. After this eighteen-month phase-in period, all self-contained breathing apparatus used for these long duration situations will have to be of the positive-pressure type.

Protection factor (sometimes called fit factor) is defined as the ratio of the contaminant concentrations outside of the respirator to the contaminant concentrations inside the facepiece of the respirator.

$$PF = \frac{\text{Concentration outside respirator}}{\text{Concentration inside facepiece}}$$

Protection factors are determined by quantitative fit tests. An acceptable quantitative fit test should include the following elements:

(a) A fire brigade member who is physically and medically capable of wearing respirators, and who is trained in the use of respirators, dons a self-contained breathing apparatus equipped with a device that will monitor the concentration of a contaminant inside the facepiece.

(b) The fire brigade member then performs a qualitative fit test to assure the best face-to-facepiece seal as possible. A qualitative fit test can consist of a negative-pressure test, positive-pressure test, isoamyl acetate vapor (banana oil) test, or an irritant smoke test. For more details on respirator fitting see the NIOSH booklet entitled, "A Guide to Industrial Respiratory Protection," June 1976, and HEW publication No. (NIOSH) 76-189.

(c) The wearer should then perform physical activity which reflects the level of work activity which would be expected during fire fighting activities. The physical activity should include simulated fire-ground work activity or physical exercise such as running-in-place, a step test, etc.

(d) Without readjusting the apparatus, the wearer is placed in a test atmosphere containing a nontoxic contaminant with a known, constant concentration.

The protection factor is then determined by dividing the known concentration of the contaminant in the test atmosphere by the concentration of the contaminant inside the facepiece when the following exercises are performed:

(i) Normal breathing with head motionless for one minute;

(ii) Deep breathing with head motionless for thirty seconds;

(iii) Turning head slowly from side to side while breathing normally, pausing for at least two breaths before changing direction. Continue for at least one minute;

(iv) Moving head slowly up and down while breathing normally, pausing for at least two breaths before changing direction. Continue for at least two minutes;

(v) Reading from a prepared text, slowly and clearly, and loudly enough to be heard and understood. Continue for one minute; and

(vi) Normal breathing with head motionless for at least one minute.

The protection factor which is determined must be at least 5,000. The quantitative fit test should be conducted at least three times. It is acceptable to conduct all three tests on the same day. However, there should be at least one hour between tests to reflect the protection afforded by the apparatus during different times of the day.

The above elements are not meant to be a comprehensive, technical description of a quantitative fit test protocol. However, quantitative fit test procedures which include these elements are acceptable for determining protection factors. Procedures for a quantitative fit test are required to be available for inspection by the director or authorized representative.

Organizations such as Los Alamos Scientific Laboratory, Lawrence Livermore Laboratory, NIOSH, and American National Standards Institute (ANSI) are excellent sources for additional information concerning qualitative and quantitative fit testing.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-58517, filed 12/24/81.]

Part G-3
FIRE SUPPRESSION EQUIPMENT

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS SUBCHAPTER

296-24-590 Portable fire suppression equipment—Portable fire extinguishers. [Order 73-5, § 296-24-590, filed 5/9/73 and Order 73-4, § 296-24-590, filed 5/7/73.] Repealed by 88-11-021 (Order 88-04), filed 5/11/88. Statutory Authority: Chapter 49.17 RCW.

296-24-59001 General requirements. [Order 73-5, § 296-24-59001, filed 5/9/73 and Order 73-4, § 296-24-59001, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-59003 Selection of extinguishers. [Order 74-27, § 296-24-59003, filed 5/7/74; Order 73-5, § 296-24-59003, filed 5/9/73 and Order 73-4, § 296-24-59003, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-59005 Distribution of portable fire extinguishers. [Order 73-5, § 296-24-59005, filed 5/9/73 and Order 73-4, § 296-24-59005, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-59007 Inspection, maintenance, and hydrostatic tests. [Order 74-27, § 296-24-59007, filed 5/7/74; Order 73-5, § 296-24-59007, filed 5/9/73 and Order 73-4, § 296-24-59007, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-600 Standpipe and hose systems. [Order 73-5, § 296-24-600, filed 5/9/73 and Order 73-4, § 296-24-600, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60001 General requirements. [Order 73-5, § 296-24-60001, filed 5/9/73 and Order 73-4, § 296-24-60001, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60003 Hose outlets. [Order 74-27, § 296-24-60003, filed 5/7/74; Order 73-5, § 296-24-60003, filed 5/9/73 and Order 73-4, § 296-24-60003, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60005 Water supplies. [Order 73-5, § 296-24-60005, filed 5/9/73 and Order 73-4, § 296-24-60005, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60007 Tests and maintenance. [Order 73-5, § 296-24-60007, filed 5/9/73 and Order 73-4, § 296-24-60007, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-605 Fixed fire suppression equipment—Automatic sprinkler systems. [Order 73-5, § 296-24-605, filed 5/9/73 and Order 73-4, § 296-24-605, filed 5/7/73.] Repealed by 88-11-021 (Order 88-04), filed 5/11/88. Statutory Authority: Chapter 49.17 RCW.

296-24-60501 General requirements. [Order 73-5, § 296-24-60501, filed 5/9/73 and Order 73-4, § 296-24-60501, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60503 Fire department connections. [Order 73-5, § 296-24-60503, filed 5/9/73 and Order 73-4, § 296-24-60503, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60505 Sprinkler alarms. [Order 73-5, § 296-24-60505, filed 5/9/73 and Order 73-4, § 296-24-60505, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60507 Maintenance of sprinkler system. [Order 76-6, § 296-24-60507, filed 3/1/76; Order 73-5, § 296-24-60507, filed 5/9/73 and Order 73-4, § 296-24-60507, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-60509 Sprinkler head clearance. [Order 73-5, § 296-24-60509, filed 5/9/73 and Order 73-4, § 296-24-60509, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-615 Fixed dry chemical extinguishing systems. [Order 73-5, § 296-24-615, filed 5/9/73 and Order 73-4, § 296-24-615, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-61501 General requirements. [Order 73-5, § 296-24-61501, filed 5/9/73 and Order 73-4, § 296-24-61501, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-61503 Alarms and indicators. [Order 74-27, § 296-24-61503, filed 5/7/74; Order 73-5, § 296-24-61503, filed 5/9/73 and Order 73-4, § 296-24-61503, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-61505 Inspection and maintenance. [Order 76-6, § 296-24-61505, filed 3/1/76; Order 73-5, § 296-24-61505, filed 5/9/73 and Order 73-4, § 296-24-61505, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-620 Carbon dioxide extinguishing systems. [Order 73-5, § 296-24-620, filed 5/9/73 and Order 73-4, § 296-24-620, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-62001 General requirements. [Order 73-5, § 296-24-62001, filed 5/9/73 and Order 73-4, § 296-24-62001, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-62003 Inspection and maintenance. [Order 74-27, § 296-24-62003, filed 5/7/74; Order 73-5, § 296-24-62003, filed 5/9/73 and Order 73-4, § 296-24-62003, filed 5/7/73.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

296-24-625 Local fire alarm signaling systems. [Order 74-27, § 296-24-625, filed 5/7/74.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

WAC 296-24-592 Portable fire extinguishers. All sections of this chapter which include WAC 296-24-592 in the section number apply to portable fire extinguishers.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-592, filed 12/24/81.]

WAC 296-24-59201 Scope and application. The requirements of this section apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees. WAC 296-24-59207

does not apply to extinguishers provided for employee use on the outside of workplace buildings or structures. Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan and a fire prevention plan which meet the requirements of WAC 296-24-567, then only the requirements of WAC 296-24-59209 and 296-24-59211 apply.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59201, filed 12/24/81.]

WAC 296-24-59203 Exemptions. (1) Where the employer has established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal and which includes an emergency action plan and a fire prevention plan which meet the requirements of WAC 296-24-567, and when extinguishers are not available in the workplace, the employer is exempt from all requirements of this section unless a specific standard in chapter 296-24 WAC requires that a portable fire extinguisher be provided.

(2) Where the employer has an emergency action plan meeting the requirements of WAC 296-24-567, which designates certain employees to be the only employees authorized to use the available portable fire extinguishers, and which requires all other employees in the fire area to immediately evacuate the affected work area upon the sounding of the fire alarm, the employer is exempt from the distribution requirements in WAC 296-24-59207.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59203, filed 12/24/81.]

WAC 296-24-59205 General requirements. (1) The employer shall provide portable fire extinguishers and shall mount, locate and identify them so that they are readily accessible to employees without subjecting the employees to possible injury.

(2) Only approved portable fire extinguishers shall be used to meet the requirements of this section.

(3) The employer shall not provide or make available in the workplace portable fire extinguishers using carbon tetrachloride or chlorobromomethane extinguishing agents.

(4) The employer shall assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times except during use.

(5) The employer shall permanently remove from service by January 1, 1982, all soldered or riveted shell self-generating soda acid or self-generating foam or gas cartridge water type portable fire extinguishers which are operated by inverting the extinguisher to rupture the cartridge or to initiate an uncontrollable pressure generating chemical reaction to expel the agent.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59205, filed 12/24/81.]

WAC 296-24-59207 Selection and distribution. (1) Portable fire extinguishers shall be provided for employee use and selected and distributed based on the classes of anticipated workplace fires and on the size and degree of hazard which would affect their use.

(2) The employer shall distribute portable fire extinguishers for use by employees on Class A fires so that the travel distance for employees to any extinguisher is 75 feet (22.9 m) or less.

(3) The employer may use uniformly spaced standpipe systems or hose stations connected to a sprinkler system installed for emergency use by employees instead of Class A portable fire extinguishers, provided that such systems meet the respective requirements of WAC 296-24-602 or 296-24-607, that they provide total coverage of the area to be protected, and that employees are trained at least annually in their use.

(4) The employer shall distribute portable fire extinguishers for use by employees on Class B fires so that the travel distance from the Class B hazard area to any extinguisher is 50 feet (15.2 m) or less.

(5) The employer shall distribute portable fire extinguishers used for Class C hazards on the basis of the appropriate pattern for the existing Class A or Class B hazards.

(6) The employer shall distribute portable fire extinguishers or other containers of Class D extinguishing agent for use by employees so that the travel distance from the combustible metal working area to any extinguishing agent is 75 feet (22.9 m) or less. Portable fire extinguishers for Class D hazards are required in those combustible metal working areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every two weeks.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59207, filed 12/24/81.]

WAC 296-24-59209 Inspection, maintenance and testing. (1) The employer shall be responsible for the inspection, maintenance and testing of all portable fire extinguishers in the workplace.

(2) Portable extinguishers or hose used in lieu thereof under WAC 296-24-59207(3) shall be visually inspected monthly.

(3) The employer shall assure that portable fire extinguishers are subjected to an annual maintenance check. Stored pressure extinguishers do not require an internal examination. The employer shall record the annual maintenance date and retain this record for one year after the last entry or the life of the shell, whichever is less. The record shall be available to the director upon request.

(4) The employer shall assure that stored-pressure dry chemical extinguishers that require a twelve-year hydrostatic test are emptied and subjected to applicable maintenance procedures every six years. Dry chemical extinguishers having nonrefillable disposable containers are exempt from this requirement. When recharging or hydrostatic testing is performed, the six-year requirement begins from that date.

(5) The employer shall assure that alternate equivalent protection is provided when portable fire extinguishers are removed from service for maintenance and recharging.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59209, filed 12/24/81.]

WAC 296-24-59211 Hydrostatic testing. (1) The employer shall assure that hydrostatic testing is performed by trained persons with suitable testing equipment and facilities.

(2) The employer shall assure that portable extinguishers are hydrostatically tested at the intervals listed in Table I of this section, except under any of the following conditions:

(a) When the unit has been repaired by soldering, welding, brazing, or use of patching compounds;

(b) When the cylinder or shell threads are damaged;

TABLE I

Type of Extinguishers	Test Interval (Years)
Soda acid (soldered brass shells) (until January 1, 1982)	(1)
Soda acid (stainless steel shell)	5
Cartridge operated water and/or antifreeze	5
Stored pressure water and/or antifreeze	5
Wetting agent	5
Foam (soldered brass shells) (until January 1, 1982)	(1)
Foam (stainless steel shell)	5
Aqueous film forming form (AFFF)	5
Loaded stream	5
Dry chemical with stainless steel	5
Carbon dioxide	5
Dry chemical, stored pressure, with mild steel, brazed brass or aluminum shells	12
Dry chemical, cartridge or cylinder operated, with mild steel shells	12
Halon 1211	12
Halon 1301	12
Dry powder, cartridge or cylinder operated, with mild steel shell	12

(1) Extinguishers having shells constructed of copper or brass joined by soft solder or rivets shall not be hydrostatically tested and shall be removed from service by January 1, 1982. (Not permitted.)

(c) When there is corrosion that has caused pitting, including corrosion under removable name plate assemblies;

(d) When the extinguisher has been burned in a fire; or

(e) When a calcium chloride extinguishing agent has been used in a stainless steel shell.

(3) In addition to an external visual examination, the employer shall assure that an internal examination of cylinders and shells to be tested is made prior to the hydrostatic tests.

(4) The employer shall assure that portable fire extinguishers are hydrostatically tested whenever they show new evidence of corrosion or mechanical injury, except under the conditions listed in subsection (2)(a) through (e) of this section.

(5) The employer shall assure that hydrostatic tests are performed on extinguisher hose assemblies which are equipped with a shut-off nozzle at the discharge end of the hose. The test interval shall be the same as specified for the extinguisher on which the hose is installed.

(6) The employer shall assure that carbon dioxide hose assemblies with a shut-off nozzle are hydrostatically tested at 1,250 psi (8,620 kPa).

(7) The employer shall assure that dry chemical and dry powder hose assemblies with a shut-off nozzle are hydrostatically tested at 300 psi (2,070 kPa).

(8) Hose assemblies passing a hydrostatic test do not require any type of recording or stamping.

(9) The employer shall assure that hose assemblies for carbon dioxide extinguishers that require a hydrostatic test are tested within a protective cage device.

(10) The employer shall assure that carbon dioxide extinguishers and nitrogen or carbon dioxide cylinders used with wheeled extinguishers are tested every five years at 5/3 of the service pressure as stamped into the cylinder. Nitrogen cylinders which comply with DOT 173.39(e)(15) may be hydrostatically tested every ten years.

(11) The employer shall assure that all stored pressure and Halon 1211 types of extinguishers are hydrostatically tested at the factory test pressure not to exceed two times the service pressure.

(12) The employer shall assure that acceptable self-generating type soda acid and foam extinguishers are tested at 350 psi (2,410 kPa).

(13) Air or gas pressure may not be used for hydrostatic testing.

(14) Extinguisher shells, cylinders, or cartridges which fail a hydrostatic pressure test, or which are not fit for testing shall be removed from service and from the workplace.

(15)(a) The equipment for testing compressed gas type cylinders shall be of the water-jacket type. The equipment shall be provided with an expansion indicator which operates with an accuracy within one percent of the total expansion or 0.1 cc (.1 mL) of liquid.

(b) The equipment for testing noncompressed gas type cylinders shall consist of the following:

(i) A hydrostatic test pump, hand or power operated, capable of producing not less than one hundred fifty percent of the test pressure, which shall include appropriate check valves and fittings;

(ii) A flexible connection for attachment to fittings to test through the extinguisher nozzle, test bonnet, or hose outlet, as is applicable; and

(iii) A protective cage or barrier for personal protection of the tester, designed to provide visual observation of the extinguisher under test.

(16) The employer shall maintain and provide upon request to the director evidence that the required hydrostatic testing of fire extinguishers has been performed at the time intervals shown in Table I. Such evidence shall include the date of test, the test pressure used, and the person or agency performing the test. Such records shall be kept until the extinguisher is hydrostatically retested

at the time interval specified in Table I, or until the extinguisher is taken out of service, whichever is less.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-24-59211, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59211, filed 12/24/81.]

WAC 296-24-59213 Training and education. (1) Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.

(2) The employer shall provide the education required in subsection (1) of this section upon initial employment and at least annually thereafter.

(3) The employer shall provide employees who have been designated to use fire fighting equipment as part of an emergency action plan with training in the use of the appropriate equipment.

(4) The employer shall provide the training required in subsection (3) of this section upon initial assignment to the designated group of employees and at least annually thereafter.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59213, filed 12/24/81.]

WAC 296-24-59215 Appendix A--Portable fire extinguishers. (1) Scope and application. The scope and application of this section is written to apply to three basic types of workplaces. First, there are those workplaces where the employer has chosen to evacuate all employees from the workplace at the time of a fire emergency. Second, there are those workplaces where the employer has chosen to permit certain employees to fight fires and to evacuate all other nonessential employees at the time of a fire emergency. Third, there are those workplaces where the employer has chosen to permit all employees in the workplace to use portable fire extinguishers to fight fires.

The section also addresses two kinds of work areas. The entire workplace can be divided into outside (exterior) work areas and inside (interior) work areas. This division of the workplace into two areas is done in recognition of the different types of hazards employees may be exposed to during fire fighting operations. Fires in interior workplaces, pose a greater hazard to employees; they can produce greater exposure to quantities of smoke, toxic gases, and heat because of the capability of a building or structure to contain or entrap these products of combustion until the building can be ventilated. Exterior work areas, normally open to the environment, are somewhat less hazardous, because the products of combustion are generally carried away by the thermal column of the fire. Employees also have a greater selection of evacuation routes if it is necessary to abandon fire fighting efforts.

In recognition of the degree of hazard present in the two types of work areas, the standards for exterior work areas are somewhat less restrictive in regards to extinguisher distribution. WAC 296-24-59201 explains this by specifying which paragraphs in the section apply.

(2) Portable fire extinguisher exemptions. In recognition of the three options given to employers in regard to the amount of employee evacuation to be carried out, the standards permit certain exemptions based on the number of employees expected to use fire extinguishers.

Where the employer has chosen to totally evacuate the workplace at the time of a fire emergency and when fire extinguishers are not provided, the requirements of this section do not apply to that workplace.

Where the employer has chosen to partially evacuate the workplace or the effected area at the time of a fire emergency and has permitted certain designated employees to remain behind to operate critical plant operations or to fight fires with extinguishers, then the employer is exempt from the distribution requirements of this section. Employees who will be remaining behind to perform incipient fire fighting or members of a fire brigade must be trained in their duties. The training must result in the employees becoming familiar with the locations of fire extinguishers. Therefore, the employer must locate the extinguishers in convenient locations where the employees know they can be found. For example, they could be mounted in the fire truck or cart that the fire brigade uses when it responds to a fire emergency. They can also be distributed as set forth in the National Fire Protection Association's Standard No. 10, "Portable Fire Extinguishers."

Where the employer has decided to permit all employees in the workplace to use fire extinguishers, then the entire WISHA standard applies.

(3) Portable fire extinguisher mounting. Previous standards for mounting fire extinguishers have been criticized for requiring specific mounting locations. In recognition of this criticism, the standard has been rewritten to permit as much flexibility in extinguisher mounting as is acceptable to assure that fire extinguishers are available when needed and that employees are not subjected to injury hazards when they try to obtain an extinguisher.

It is the intent of WISHA to permit the mounting of extinguishers in any location that is accessible to employees without the use of portable devices such as a ladder. This limitation is necessary because portable devices can be moved or taken from the place where they are needed and, therefore, might not be available at the time of an emergency.

Employers are given as much flexibility as possible to assure that employees can obtain extinguishers as fast as possible. For example, an acceptable method of mounting extinguishers in areas where fork lift trucks or tow-motors are used is to mount the units on retractable board which, by means of counterweighting, can be raised above the level where they could be struck by vehicular traffic. When needed, they can be lowered quickly for use. This method of mounting can also reduce vandalism and unauthorized use of extinguishers. The extinguishers may also be mounted as outlined in

the National Fire Protection Association's Standard No. 10, "Portable Fire Extinguishers."

(4) Selection and distribution. The employer is responsible for the proper selection and distribution of fire extinguishers and the determination of the necessary degree of protection. The selection and distribution of fire extinguishers must reflect the type and class of fire hazards associated with a particular workplace.

Extinguishers for protecting Class A hazards may be selected from the following types: Water, foam, loaded stream, or multipurpose dry chemical. Extinguishers for protecting Class B hazards may be selected from the following types: Halon 1301, Halon 1211, carbon dioxide, dry chemicals, foam, or loaded stream. Extinguishers for Class C hazards may be selected from the following types: Halon 1301, Halon 1211, carbon dioxide, or dry chemical.

Combustible metal (Class D hazards) fires pose a different type of fire problem in the workplace. Extinguishers using water, gas, or certain dry chemicals cannot extinguish or control this type of fire. Therefore, certain metals have specific dry powder extinguishing agents which can extinguish or control this type of fire. Those agents which have been specifically approved for use on certain metal fires provide the best protection; however, there are also some "universal" type agents which can be used effectively on a variety of combustible metal fires if necessary. The "universal" type agents include: Foundry flux, Lith-X powder, TMB liquid, pyromet powder, TEC powder, dry talc, dry graphite powder, dry sand, dry sodium chloride, dry soda ash, lithium chloride, zirconium silicate, and dry dolomite.

Water is not generally accepted as an effective extinguishing agent for metal fires. When applied to hot burning metal, water will break down into its basic atoms of oxygen and hydrogen. This chemical breakdown contributes to the combustion of the metal. However, water is also a good universal coolant and can be used on some combustible metals, but only under proper conditions and application, to reduce the temperature of the burning metal below the ignition point. For example, automatic deluge systems in magnesium plants can discharge such large quantities of water on burning magnesium that the fire will be extinguished. The National Fire Protection Association has specific standards for this type of automatic sprinkler system. Further information on the control of metal fires with water can be found in the National Fire Protection Association's *Fire Protection Handbook.*

An excellent source of selection and distribution criteria is found in the National Fire Protection Association's Standard No. 10. Other sources of information include the National Safety Council and the employer's fire insurance carrier.

(5) Substitution of standpipe systems for portable fire extinguishers. The employer is permitted to substitute acceptable standpipe systems for portable fire extinguishers under certain circumstances. It is necessary to assure that any substitution will provide the same coverage that portable units provide. This means that fire hoses, because of their limited portability, must be spaced throughout the protected area so that they can reach around obstructions such as columns, machinery, etc., and so that they can reach into closets and other enclosed areas.

(6) Inspection, maintenance and testing. The ultimate responsibility for the inspection, maintenance and testing of portable fire extinguishers lies with the employer. The actual inspection, maintenance, and testing may, however, be conducted by outside contractors with whom the employer has arranged to do the work. When contracting for such work, the employer should assure that the contractor is capable of performing the work that is needed to comply with this standard.

If the employer should elect to perform the inspection, maintenance, and testing requirements of this section in-house, then the employer must make sure that those persons doing the work have been trained to do the work and to recognize problem areas which could cause an extinguisher to be inoperable. The National Fire Protection Association provides excellent guidelines in its standard for portable fire extinguishers. The employer may also check with the manufacturer of the unit that has been purchased and obtain guidelines on inspection, maintenance, and testing. Hydrostatic testing is a process that should be left to contractors or individuals using suitable facilities and having the training necessary to perform the work.

Any time the employer has removed an extinguisher from service to be checked or repaired, alternate equivalent protection must be provided. Alternate equivalent protection could include replacing the extinguisher with one or more units having equivalent or equal ratings, posting a fire watch, restricting the unprotected area from employee exposure, or providing a hose system ready to operate.

(7) Hydrostatic testing. As stated before, the employer may contract for hydrostatic testing. However, if the employer wishes to provide the testing service, certain equipment and facilities must be available. Employees should be made aware of the hazards associated with hydrostatic testing and the importance of using proper guards and water pressures. Severe injury can result if extinguisher shells fail violently under hydrostatic pressure.

Employers are encouraged to use contractors who can perform adequate and reliable service. Firms which have been certified by the Materials Transportation Board (MTB) of the United States Department of Transportation (DOT), or state licensed extinguisher servicing firms, or recognized by the National Association of Fire Equipment Distributors in Chicago, Illinois, are generally acceptable for performing this service.

(8) Training and education. This part of the standard is of the utmost importance to employers and employees if the risk of injury or death due to extinguisher use is to be reduced. If an employer is going to permit an employee to fight a workplace fire of any size, the employer must make sure that the employee knows everything necessary to assure the employee's safety.

Training and education can be obtained through many channels. Often, local fire departments in larger cities

have fire prevention bureaus or similar organizations which can provide basic fire prevention training programs. Fire insurance companies will have data and information available. The National Fire Protection Association and the National Safety Council will provide, at a small cost, publications that can be used in a fire prevention program.

Actual fire fighting training can be obtained from various sources in the country. The Texas A and M University, the University of Maryland's Fire and Rescue Institute, West Virginia University's Fire Service Extension, Iowa State University's Fire Service Extension and other state training schools and land grant colleges have fire fighting programs directed to industrial applications. Some manufacturers of extinguishers, such as the Ansul Company and Safety First, conduct fire schools for customers in the proper use of extinguishers. Several large corporations have taken time to develop their own on-site training programs which expose employees to the actual "feeling" of fire fighting. Simulated fires for training of employees in the proper use of extinguishers are also an acceptable part of a training program.

In meeting the requirements of this section, the employer may also provide educational materials, without classroom instruction, through the use of employee notice campaigns using instruction sheets or flyers or similar types of informal programs. The employer must make sure that employees are trained and educated to recognize not only what type of fire is being fought and how to fight it, but also when it is time to get away from it and leave fire suppression to more experienced fire fighters.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-59215, filed 12/24/81.]

WAC 296-24-602 Standpipe and hose systems. This section establishes design and installation criteria for standpipe systems.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-602, filed 12/24/81.]

WAC 296-24-60201 Scope and application. (1) Scope. This section applies to all small hose, Class II and Class III standpipe systems installed to meet the requirements of a particular WISHA standard.

(2) Exception. This section does not apply to Class I standpipe systems.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60201, filed 12/24/81.]

WAC 296-24-60203 Protection of standpipes. The employer shall assure that standpipes are located or otherwise protected against mechanical damage. Damaged standpipes shall be repaired promptly.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60203, filed 12/24/81.]

WAC 296-24-60205 Equipment. (1) Reels and cabinets. Where reels or cabinets are provided to contain fire hose, the employer shall assure that they are designed to facilitate prompt use of the hose valves, the hose, and other equipment at the time of a fire or other emergency. The employer shall assure that the reels and cabinets are conspicuously identified and used only for fire equipment.

(2) Hose outlets and connections.

(a) The employer shall assure that hose outlets and connections are located high enough above the floor to avoid being obstructed and to be accessible to employees.

(b) The employer shall standardize screw threads or provide appropriate adapters throughout the system and assure that the hose connections are compatible with those used on the supporting fire equipment.

(3) Hose.

(a) The employer shall assure that every one and one-half inch (3.8 cm) or smaller hose outlet used to meet this standard is equipped with hose connected and ready for use. In extremely cold climates where such installation may result in damaged equipment, the hose may be stored in another location provided it is readily available and can be connected when needed.

(b) Standpipe systems installed after July 1, 1982, for use by employees, shall be equipped with lined hose. Unlined hose may remain in use on existing systems. However, after the effective date of this standard, unlined hose which becomes unserviceable shall be replaced with lined hose.

(c) Beginning July 1, 1982, the employer shall provide hose of such length that friction loss resulting from water flowing through the hose will not decrease the pressure at the nozzle below 30 psi (210 kPa). The dynamic pressure at the nozzle shall be within the range of 30 psi (210 kPa) to 125 psi (860 kPa).

(4) Nozzles. Beginning July 1, 1982, the employer shall assure that standpipe hose is equipped with shut-off type nozzles.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60205, filed 12/24/81.]

WAC 296-24-60207 Water supply. The minimum water supply for standpipe and hose systems, which are provided for the use of employees, shall be sufficient to provide 100 gallons per minute (6.3 l/s) for a period of at least thirty minutes.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60207, filed 12/24/81.]

WAC 296-24-60209 Tests and maintenance. (1) Acceptance tests.

(a) The employer shall assure that the piping of Class II and Class III systems installed after July 1, 1982, including yard piping, is hydrostatically tested for a period of at least two hours at not less than 200 psi (1,380 kPa), or at least 50 psi (340 kPa) in excess of normal pressure when such pressure is greater than 150 psi (1,030 kPa).

(b) The employer shall assure that hose on all standpipe systems installed after July 1, 1982, is

hydrostatically tested with couplings in place, at a pressure of not less than 200 psi (1,380 kPa), before it is placed in service. This pressure shall be maintained for at least fifteen seconds and not more than one minute during which time the hose shall not leak nor shall any jacket thread break during the test.

(2) Maintenance.

(a) The employer shall assure that water supply tanks are kept filled to the proper level except during repairs. When pressure tanks are used, the employer shall assure that proper pressure is maintained at all times except during repairs.

(b) The employer shall assure that valves in the main piping connections to the automatic sources of water supply are kept fully open at all times except during repair.

(c) The employer shall assure that hose systems are inspected at least annually and after each use to assure that all of the equipment and hose are in place, available for use, and in serviceable condition.

(d) When the system or any portion thereof is found not to be serviceable, the employer shall remove it from service immediately and replace it with equivalent protection such as extinguishers and fire watches.

(e) The employer shall assure that hemp or linen hose on existing systems is unracked, physically inspected for deterioration, and reracked using a different fold pattern at least annually. The employer shall assure that defective hose is replaced in accordance with WAC 296-24-60205 (3)(b).

(f) The employer shall designate trained persons to conduct all inspections required under this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60209, filed 12/24/81.]

WAC 296-24-60299 Appendix A--Standpipe and hose systems. (1) Scope and application. This section has been written to provide adequate coverage of those standpipe and hose systems that an employer may install in the workplace to meet the requirements of a particular WISHA standard. For example, WISHA permits the substitution of hose systems for portable fire extinguishers in WAC 296-24-592. If an employer chooses to provide hose systems instead of portable Class A fire extinguishers, then those hose systems used for substitution would have to meet the applicable requirements of WAC 296-24-592. All other standpipe and hose systems not used as a substitute would be exempt from these requirements.

The section specifically exempts Class I large hose systems. By large hose systems, WISHA means those two and one-half inch hose lines that are usually associated with fire departments of the size that provide their own water supply through fire apparatus. When the fire gets to the size that outside protection of that degree is necessary, WISHA believes that in most industries employees will have been evacuated from the fire area and the "professional" fire fighters will take control.

(2) Protection of standpipes. Employers must make sure that standpipes are protected so that they can be relied upon during a fire emergency. This means protecting the pipes from mechanical and physical damage. There are various means for protecting the equipment such as, but not limited to, enclosing the supply piping in the construction of the building, locating the standpipe in an area which is inaccessible to vehicles, or locating the standpipe in a stairwell.

(3) Hose covers and cabinets. The employer should keep fire protection hose equipment in cabinets or inside protective covers which will protect it from the weather elements, dirt or other damaging sources. The use of protective covers must be easily removed or opened to assure that hose and nozzle are accessible. When the employer places hose in a cabinet, the employer must make sure that the hose and nozzle are accessible to employees without subjecting them to injury. In order to make sure that the equipment is readily accessible, the employer must also make sure that the cabinets used to store equipment are kept free of obstructions and other equipment which may interfere with the fast distribution of the fire hose stored in the cabinet.

(4) Hose outlets and connections. The employer must assure that employees who use standpipe and hose systems can reach the hose rack and hose valve without the use of portable equipment such as ladders. Hose reels are encouraged for use because one employee can retrieve the hose, charge it, and place it into service without much difficulty.

(5) Hose. When the employer elects to provide small hose in lieu of portable fire extinguishers, those hose stations being used for the substitution must have hose attached and ready for service. However, if more than the necessary amount of small hose outlets are provided, hose does not have to be attached to those outlets that would provide redundant coverage. Further, where the installation of hose on outlets may expose the hose to extremely cold climates, the employer may store the hose in houses or similar protective areas and connect it to the outlet when needed.

There is approved lined hose available that can be used to replace unlined hose which is stored on racks in cabinets. The lined hose is constructed so that it can be folded and placed in cabinets in the same manner as unlined hose.

Hose is considered to be unserviceable when it deteriorates to the extent that it can no longer carry water at the required pressure and flow rates. Dry rotted linen or hemp hose, cross threaded couplings, and punctured hose are examples of unserviceable hose.

(6) Nozzles. Variable stream nozzles can provide useful variations in water flow and spray patterns during fire fighting operations and they are recommended for employee use. It is recommended that 100 psi nozzle pressure be used to provide good flow patterns for variable stream nozzles. The most desirable attribute for nozzles is the ability of the nozzle person to shut off the water flow at the nozzle when it is necessary. This can be accomplished in many ways. For example, a shut-off nozzle with a lever or rotation of the nozzle to stop flow would be effective, but in other cases a simple globe valve placed between a straight stream nozzle and the

hose could serve the same purpose. For straight stream nozzles, 50 psi nozzle pressure is recommended. The intent of the standard is to protect the employee from "run-away" hoses if it becomes necessary to drop a pressurized hose line and retreat from the fire front and other related hazards.

(7) Design and installation. Standpipe and hose systems designed and installed in accordance with NFPA Standard No. 14-1976, "Standpipe and Hose Systems," are considered to be in compliance with this standard.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60299, filed 12/24/81.]

WAC 296-24-607 Automatic sprinkler systems. The design and installation criteria for automatic sprinkler systems is contained in this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-607, filed 12/24/81.]

WAC 296-24-60701 Scope and application. (1) The requirements of this section apply to all automatic sprinkler systems installed to meet a particular WISHA standard.

(2) For automatic sprinkler systems used to meet WISHA requirements and installed prior to the effective date of this standard, compliance with the National Fire Protection Association (NFPA) or the National Board of Fire Underwriters (NBFU) standard in effect at the time of the system's installation will be acceptable as compliance with this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60701, filed 12/24/81.]

WAC 296-24-60703 Exemptions. Automatic sprinkler systems installed in workplaces, but not required by WISHA are exempt from the requirements of this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60703, filed 12/24/81.]

WAC 296-24-60705 General requirements. (1) Design.

(a) All automatic sprinkler designs used to comply with this standard shall provide the necessary discharge patterns, densities, and water flow characteristics for complete coverage in a particular workplace or zoned subdivision of the workplace.

(b) The employer shall assure that only approved equipment and devices are used in the design and installation of automatic sprinkler systems used to comply with this standard.

(2) Maintenance. The employer shall properly maintain an automatic sprinkler system installed to comply with this section. The employer shall assure that a main drain flow test is performed on each system annually. The inspector's test valve shall be opened at least every two years to assure that the sprinkler system operates properly.

(3) Acceptance tests. The employer shall conduct proper acceptance tests on sprinkler systems installed for employee protection after July 1, 1982, and record the dates of such tests. Proper acceptance tests include the following:

(a) Flushing of underground connections;

(b) Hydrostatic tests of piping in system;

(c) Air tests in dry-pipe systems;

(d) Dry-pipe valve operation; and

(e) Test of drainage facilities.

(4) Water supplies. The employer shall assure that every automatic sprinkler system is provided with at least one automatic water supply capable of providing design water flow for at least thirty minutes. An auxiliary water supply or equivalent protection shall be provided when the automatic water supply is out of service, except for systems of twenty or fewer sprinklers.

(5) Hose connections for fire fighting use. The employer may attach hose connections for fire fighting use to wet pipe sprinkler systems provided that the water supply satisfies the combined design demand for sprinklers and standpipes.

(6) Protection of piping. The employer shall assure that automatic sprinkler system piping is protected against freezing and exterior surface corrosions.

(7) Drainage. The employer shall assure that all dry sprinkler pipes and fittings are installed so that the systems may be totally drained.

(8) Sprinklers.

(a) The employer shall assure that only approved sprinklers are used on systems.

(b) The employer may not use older style sprinklers to replace standard sprinklers without a complete engineering review of the altered part of the system.

(c) The employer shall assure that sprinklers are protected from mechanical damage.

(9) Sprinkler alarms. On all sprinkler systems having more than twenty sprinklers, the employer shall assure that a local water-flow alarm is provided which sounds an audible signal on the premises upon water flow through the system equal to the flow from a single sprinkler.

(10) Sprinkler spacing. The employer shall assure that sprinklers are spaced to provide a maximum protection area per sprinkler, a minimum of interference to the discharge pattern by building or structural members or building contents and suitable sensitivity to possible fire hazards. The minimum vertical clearance between sprinklers and material below shall be eighteen inches.

(11) Hydraulically designed systems. The employer shall assure that hydraulically designed automatic sprinkler systems or portions thereof are identified and that the location, number of sprinklers in the hydraulically designed section, and the basis of the design is indicated. Central records may be used in lieu of signs at sprinkler valves provided the records are available for inspection and copying by the director.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60705, filed 12/24/81.]

WAC 296-24-60799 Appendix A--Automatic sprinkler systems. (1) Scope and application. This section contains the minimum requirements for design, installation and maintenance of sprinkler systems that are

needed for employee safety. The occupational safety and health administration is aware of the fact that the National Board of Fire Underwriters is no longer an active organization, however, sprinkler systems still exist that were designed and installed in accordance with that organization's standards. Therefore, WISHA will recognize sprinkler systems designed to, and maintained in accordance with, NBFU and earlier NFPA standards.

(2) Exemptions. In an effort to assure that employers will continue to use automatic sprinkler systems as the primary fire protection system in workplaces, WISHA is exempting from coverage those systems not required by a particular WISHA standard and which have been installed in workplaces solely for the purpose of protecting property. Many of these types of systems are installed in areas or buildings with little or no employee exposure. An example is those warehouses where employees may enter occasionally to take inventory or move stock. Some employers may choose to shut down those systems which are not specifically required by WISHA rather than upgrade them to comply with the standards. WISHA does not intend to regulate such systems. WISHA only intends to regulate those systems which are installed to comply with a particular WISHA standard.

(3) Design. There are two basic types of sprinkler system design. Pipe schedule designed systems are based on pipe schedule tables developed to protect hazards with standard sized pipe, number of sprinklers, and pipe lengths. Hydraulic designed systems are based on an engineered design of pipe size which will produce a given water density or flow rate at any particular point in the system. Either design can be used to comply with this standard.

The National Fire Protection Association's Standard No. 13, "Automatic Sprinkler Systems," contains the tables needed to design and install either type of system. Minimum water supplies, densities, and pipe sizes are given for all types of occupancies.

The employer may check with a reputable fire protection engineering consultant or sprinkler design company when evaluating existing systems or designing a new installation.

With the advent of new construction materials for the manufacture of sprinkler pipe, materials, other than steel, have been approved for use as sprinkler pipe. Selection of pipe material should be made on the basis of the type of installation and the acceptability of the material to local fire and building officials where such systems may serve more than one purpose.

Before new sprinkler systems are placed into service, an acceptance test is to be conducted. The employer should invite the installer, designer, insurance representative, and a local fire official to witness the test. Problems found during the test are to be corrected before the system is placed into service.

(4) Maintenance. It is important that any sprinkler system maintenance be done only when there is minimal employee exposure to the fire hazard. For example, if repairs or changes to the system are to be made, they should be made during those hours when employees are not working or are not occupying that portion of the workplace protected by the portion of the system which has been shut down.

The procedures for performing a flow test via a main drain test or by the use of an inspector's test valve can be obtained from the employer's fire insurance company or from the National Fire Protection Association's Standard No. 13A, "Sprinkler System, Maintenance."

(5) Water supplies. The water supply to a sprinkler system is one of the most important factors an employer should consider when evaluating a system. Obviously, if there is no water supply, the system is useless. Water supplies can be lost for various reasons such as improperly closed valves, excessive demand, broken water mains, and broken fire pumps. The employer must be able to determine if or when this type of condition exists either by performing a main drain test or visual inspection. Another problem may be an inadequate water supply. For example, a light hazard occupancy may, through rehabilitation or change in tenants, become an ordinary or high hazard occupancy. In such cases, the exiting water supply may not be able to provide the pressure or duration necessary for proper protection. Employers must assure that proper design and tests have been made to assure an adequate water supply. These tests can be arranged through the employer's fire insurance carrier or through a local sprinkler maintenance company or through the local fire prevention organization.

Any time the employer must shut down the primary water supply for a sprinkler system, the standard requires that equivalent protection be provided. Equivalent protection may include a fire watch with extinguishers or hose lines in place and manned, or a secondary water supply such as a tank truck and pump, or a tank or fire pond with fire pumps, to protect the areas where the primary water supply is limited or shut down. The employer may also require evacuation of the workplace and have an emergency action plan which specifies such action.

(6) Protection of piping. Piping which is exposed to corrosive atmospheres, either chemical or natural, can become defective to the extent that it is useless. Employers must assure that piping is protected from corrosion by its material of construction, e.g., stainless steel, or by a protective coating, e.g., paint.

(7) Sprinklers. When an employer finds it necessary to replace sprinkler system components or otherwise change a sprinkler's design, employer should make a complete fire protection engineering survey of that part of the system being changed. This review should assure that the changes to the system will not alter the effectiveness of the system as it is presently designed. Water supplies, densities and flow characteristics should be maintained.

(8) Protection of sprinklers. All components of the system must be protected from mechanical impact damage. This can be achieved with the use of mechanical guards or screens or by locating components in areas where physical contact is impossible or limited.

(9) Sprinkler alarms. The most recognized sprinkler alarm is the water–motor gong or bell that sounds when

water begins to flow through the system. This is not however, the only type of acceptable water flow alarm. Any alarm that gives an indication that water is flowing through the system is acceptable. For example, a siren, a whistle, a flashing light, or similar alerting device which can transmit a signal to the necessary persons would be acceptable. The purpose of the alarm is to alert persons that the system is operating, and that some type of planned action is necessary.

(10) Sprinkler spacing. For a sprinkler system to be effective there must be an adequate discharge of water spray from the sprinkler head. Any obstructions which hinder the designed density or spray pattern of the water may create unprotected areas which can cause fire to spread. There are some sprinklers that, because of the system's design, are deflected to specific areas. This type of obstruction is acceptable if the system's design takes it into consideration in providing adequate coverage.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-60799, filed 12/24/81.]

WAC 296-24-617 Fixed extinguishing systems, general. This section applies to criteria required for fixed extinguisher systems and all sections of this chapter having number WAC 296-24-617 in the section number shall apply.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-617, filed 12/24/81.]

WAC 296-24-61701 Scope and application. (1) This section applies to all fixed extinguishing systems installed to meet a particular WISHA standard except for automatic sprinkler systems which are covered by WAC 296-24-607.

(2) This section also applies to fixed systems not installed to meet a particular WISHA standard, but which, by means of their operation, may expose employees to possible injury, death, or adverse health consequences caused by the extinguishing agent. Such systems are only subject to the requirements of WAC 296-24-61703 (4) through (7) and 296-24-61705.

(3) Systems otherwise covered in subsection (2) of this section which are installed in areas with no employee exposure are exempted from the requirements of this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-61701, filed 12/24/81.]

WAC 296-24-61703 General requirements. (1) Fixed extinguishing system components and agents shall be designed and approved for use on the specific fire hazards they are expected to control or extinguish.

(2) If for any reason a fixed extinguishing system becomes inoperable, the employer shall notify employees and take the necessary temporary precautions to assure their safety until the system is restored to operating order. Any defects or impairments shall be properly corrected by trained personnel.

(3) The employer shall provide a distinctive alarm or signaling system which complies with WAC 296-24-631, and is capable of being perceived above ambient noise or light levels, on all extinguishing systems in those portions of the workplace covered by the extinguishing system to indicate when the extinguishing system is discharging. Discharge alarms are not required on systems where discharge is immediately recognizable.

(4) The employer shall provide effective safeguards to warn employees against entry into discharge areas where the atmosphere remains hazardous to employee safety or health.

(5) The employer shall post hazard warning or caution signs at the entrance to, and inside of, areas protected by fixed extinguishing systems which use agents in concentrations known to be hazardous to employee safety and health.

(6) The employer shall assure that fixed systems are inspected annually by a person knowledgeable in the design and function of the system to assure that the system is maintained in good operating condition.

(7) The employer shall assure that the weight and pressure of refillable containers is checked at least semiannually. If the container shows a loss in net content or weight of more than five percent, or a loss in pressure of more than ten percent, it shall be subjected to maintenance.

(8) The employer shall assure that factory charged nonrefillable containers which have no means of pressure indication are weighed at least semiannually. If a container shows a loss in net weight of more than five percent it shall be replaced.

(9) The employer shall assure that inspection and maintenance dates are recorded on the container, on a tag attached to the container, or in a central location. A record of the last semiannual check shall be maintained until the container is checked again or for the life of the container, whichever is less.

(10) The employer shall train employees designated to inspect, maintain, operate, or repair fixed extinguishing systems and annually review their training to keep them up-to-date in the functions they are to perform.

(11) The employer shall not use chlorobromomethane or carbon tetrachloride as an extinguishing agent where employees may be exposed.

(12) The employer shall assure that systems installed in the presence of corrosive atmospheres are constructed of noncorrosive material or otherwise protected against corrosion.

(13) Automatic detection equipment shall be approved, installed and maintained in accordance with WAC 296-24-629.

(14) The employer shall assure that all systems designed for and installed in areas with climatic extremes shall operate effectively at the expected extreme temperatures.

(15) The employer shall assure that at least one manual station is provided for discharge activation of each fixed extinguishing system.

(16) The employer shall assure that manual operating devices are identified as to the hazard against which they will provide protection.

(17) The employer shall provide and assure the use of the personal protective equipment needed for immediate

rescue of employees trapped in hazardous atmospheres created by an agent discharge.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-61703, filed 12/24/81.]

WAC 296-24-61705 Total flooding systems with potential health and safety hazards to employees. (1) The employer shall provide an emergency action plan in accordance with WAC 296-24-567 for each area within a workplace that is protected by a total flooding system which provides agent concentrations exceeding the maximum safe levels.

(2) Systems installed in areas where employees cannot enter during or after the system's operation are exempt from the requirements of this section.

(3) On all total flooding systems the employer shall provide a predischarge employee alarm which complies with WAC 296-24-631, and is capable of being perceived above ambient light or noise levels before the system discharges, which will give employees time to safely exit from the discharge area prior to system discharge.

(4) The employer shall provide automatic actuation of total flooding systems by means of an approved fire detection device installed and interconnected with a predischarge employee alarm system to give employees time to safely exit from the discharge area prior to system discharge.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-61705, filed 12/24/81.]

WAC 296-24-61799 Appendix A--Fixed extinguishing systems, general. (1) Scope and application. This section contains the general requirements that are applicable to all fixed extinguishing systems installed to meet WISHA standards. It also applies to those fixed extinguishing systems, generally total flooding, which are not required by WISHA, but which, because of the agent's discharge, may expose employees to hazardous concentrations of extinguishing agents or combustion byproducts. Employees who work around fixed extinguishing systems must be warned of the possible hazards associated with the system and its agent. For example, fixed dry chemical extinguishing systems may generate a large enough cloud of dry chemical particles that employees may become visually disoriented. Certain gaseous agents can expose employees to hazardous byproducts of combustion when the agent comes into contact with hot metal or other hot surface. Some gaseous agents may be present in hazardous concentrations when the system has totally discharged because an extra rich concentration is necessary to extinguish deep-seated fires. Certain local application systems may be designed to discharge onto the flaming surface of a liquid, and it is possible that the liquid can splatter when hit with the discharging agent. All of these hazards must be determined before the system is placed into operation, and must be discussed with employees.

Based on the known toxicological effects of agents such as carbon tetrachloride and chlorobromomethane, WISHA is not permitting the use of these agents in areas where employees can be exposed to the agent or its side effects. However, chlorobromomethane has been accepted and may be used as an explosion suppression agent in unoccupied spaces. WISHA is permitting the use of this agent only in areas where employees will not be exposed.

(2) Distinctive alarm signals. A distinctive alarm signal is required to indicate that a fixed system is discharging. Such a signal is necessary on those systems where it is not immediately apparent that the system is discharging. For example, certain gaseous agents make a loud noise when they discharge. In this case, no alarm signal is necessary. However, where systems are located in remote locations or away from the general work area and where it is possible that a system could discharge without anyone knowing that it is doing so, then a distinctive alarm is necessary to warn employees of the hazards that may exist. The alarm can be a bell, gong, whistle, horn, flashing light, or any combination of signals as long as it is identifiable as a discharge alarm.

(3) Maintenance. The employer is responsible for the maintenance of all fixed systems, but this responsibility does not preclude the use of outside contractors to do such work. New systems should be subjected to an acceptance test before placed in service. The employer should invite the installer, designer, insurance representative and others to witness the test. Problems found during the test need to be corrected before the system is considered operational.

(4) Manual discharge stations. There are instances, such as for mechanical reasons and others, where the standards call for a manual backup activation device. While the location of this device is not specified in the standard, the employer should assume that the device should be located where employees can easily reach it. It could, for example, be located along the main means of egress from the protected area so that employees could activate the system as they evacuate the work area.

(5) Personal protective equipment. The employer is required to provide the necessary personal protective equipment to rescue employees who may be trapped in a totally flooded environment which may be hazardous to their health. The equipment would normally include a positive-pressure self-contained breathing apparatus and any necessary first aid equipment. In cases where the employer can assure the prompt arrival of the local fire department or plant emergency personnel which can provide the equipment, this can be considered as complying with the standards.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-61799, filed 12/24/81.]

WAC 296-24-622 Fixed extinguishing systems, dry chemical. The design and installation requirements specifically applicable to fixed extinguishing systems, using dry chemical as the extinguishing agent, are contained in this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-622, filed 12/24/81.]

WAC 296-24-62201 Scope and application. This section applies to all fixed extinguishing systems using

dry chemical as the extinguishing agent, installed to meet a particular WISHA standard. These systems shall also comply with WAC 296-24-617.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62201, filed 12/24/81.]

WAC 296-24-62203 Specific requirements. (1) The employer shall assure that dry chemical agents are compatible with any foams or wetting agents with which they are used.

(2) The employer may not mix together dry chemical extinguishing agents of different compositions. The employer shall assure that dry chemical systems are refilled with the chemical stated on the approval nameplate or an equivalent compatible material.

(3) When dry chemical discharge may obscure vision, the employer shall provide a predischarge employee alarm which complies with WAC 296-24-631, and which will give employees time to safely exit from the discharge area prior to system discharge.

(4) The employer shall sample the dry chemical supply of all but stored pressure systems at least annually to assure that the dry chemical supply is free of moisture which may cause the supply to cake or form lumps.

(5) The employer shall assure that the rate of application of dry chemicals is such that the designed concentration of the system will be reached within thirty seconds of initial discharge.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62203, filed 12/24/81.]

WAC 296-24-62299 Appendix A--Fixed extinguishing systems, dry chemical. (1) Scope and application. The requirements of this section apply only to dry chemical systems. These requirements are to be used in conjunction with the requirements of WAC 296-24-617.

(2) Maintenance. The employer is responsible for assuring that dry chemical systems will operate effectively. To do this, periodic maintenance is necessary. One test that must be conducted during the maintenance check is one which will determine if the agent has remained free of moisture. If an agent absorbs any moisture, it may tend to cake and thereby clog the system. An easy test for acceptable moisture content is to take a lump of dry chemical from the container and drop it from a height of four inches. If the lump crumbles into fine particles, the agent is acceptable.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62299, filed 12/24/81.]

WAC 296-24-623 Fixed extinguishing systems, gaseous agent. This section contains the design and installation requirements for fixed extinguishing systems using gaseous agents.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-623, filed 12/24/81.]

WAC 296-24-62301 Scope and application. (1) Scope. This section applies to all fixed extinguishing systems, using a gas as the extinguishing agent, installed to meet a particular WISHA standard. These systems shall also comply with WAC 296-24-617. In some cases, the gas may be in a liquid state during storage.

(2) Application. The requirements of WAC 296-24-61703 (2) and (4) through (7) shall apply only to total flooding systems.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62301, filed 12/24/81.]

WAC 296-24-62303 Specific requirements. (1) Agents used for initial supply and replenishment shall be of the type approved for the system's application. Carbon dioxide obtained by dry ice conversion to liquid is not acceptable unless it is processed to remove excess water and oil.

(2) Except during overhaul, the employer shall assure that the designed concentration of gaseous agents is maintained until the fire has been extinguished or is under control.

(3) The employer shall assure that employees are not exposed to toxic levels of gaseous agent or its decomposition products.

(4) The employer shall assure that the designed extinguishing concentration is reached within thirty seconds of initial discharge except for Halon systems which must achieve design concentration within ten seconds.

(5) The employer shall provide a distinctive predischarge employee alarm capable of being perceived above ambient light or noise levels when agent design concentrations exceed the maximum safe level for employee exposure. A predischarge employee alarm for alerting employees before system discharge shall be provided on Halon 1211 and carbon dioxide systems with a design concentration of four percent or greater, and for Halon 1301 systems with a design concentration of ten percent or greater. The predischarge employee alarm shall provide employees time to safely exit the discharge area prior to system discharge.

(6)(a) Where egress from an area cannot be accomplished within one minute, the employer shall not use Halon 1301 in concentrations greater than seven percent.

(b) Where egress takes greater than thirty seconds but less than one minute, the employer shall not use Halon 1301 in a concentration greater than ten percent.

(c) Halon 1301 concentrations greater than ten percent are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within thirty seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62303, filed 12/24/81.]

WAC 296-24-62399 Appendix A--Fixed extinguishing systems, gaseous agent. (1) Scope and application. This section applies only to those systems which use gaseous agents. The requirements of WAC 296-24-617 also apply to the gaseous agent systems covered in this section.

(2) Design concentrations. Total flooding gaseous systems are based on the volume of gas which must be discharged in order to produce a certain designed concentration of gas in an enclosed area. The concentration needed to extinguish a fire depends on several factors including the type of fire hazard and the amount of gas expected to leak away from the area during discharge. At times it is necessary to "super-saturate" a work area to provide for expected leakage from the enclosed area. In such cases, employers must assure that the flooded area has been ventilated before employees are permitted to reenter the work area without protective clothing and respirators.

(3) Toxic decomposition. Certain halogenated hydrocarbons will break down or decompose when they are combined with high temperatures found in the fire environment. The products of the decomposition can include toxic elements or compounds. For example, when Halon 1211 is placed into contact with hot metal it will break down and form bromide or fluoride fumes. The employer must find out which toxic products may result from decomposition of a particular agent from the manufacturer, and take the necessary precautions to prevent employee exposure to the hazard.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62399, filed 12/24/81.]

WAC 296-24-627 Fixed extinguishing systems, water spray and foam. This section contains the design and installation requirements for extinguishing systems using water or foam solution as the extinguishing agent.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-627, filed 12/24/81.]

WAC 296-24-62701 Scope and application. This section applies to all fixed extinguishing systems, using water or foam solution as the extinguishing agent, installed to meet a particular WISHA standard. These systems shall also comply with WAC 296-24-617. This section does not apply to automatic sprinkler systems which are covered under WAC 296-24-607.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62701, filed 12/24/81.]

WAC 296-24-62703 Specific requirements. (1) The employer shall assure that foam and water spray systems are designed to be effective in at least controlling fire in the protected area or on protected equipment.

(2) The employer shall assure that drainage of water spray systems is directed away from areas where employees are working and that no emergency egress is permitted through the drainage path.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62703, filed 12/24/81.]

WAC 296-24-62799 Appendix A--Fixed extinguishing systems, water spray and foam. (1) Scope and application. This section applies to those systems that use water spray or foam. The requirements of WAC 296-24-617 also apply to this type of system.

(2) Characteristics of foams. When selecting the type of foam for a specific hazard, the employer should consider the following limitations of some foams.

(a) Some foams are not acceptable for use on fires involving flammable gases and liquefied gases with boiling points below ambient workplace temperatures. Other foams are not effective when used on fires involving polar solvent liquids.

(b) Any agent using water as part of the mixture should not be used on fire involving combustible metals unless it is applied under proper conditions to reduce the temperature of burning metal below the ignition temperature. The employer should use only those foams that have been tested and accepted for this application by a recognized independent testing laboratory.

(c) Certain types of foams may be incompatible and break down when they are mixed together.

(d) For fires involving water miscible solvents, employers should use only those foams tested and approved for such use. Regular protein foams may not be effective on such solvents.

Whenever employers provide a foam or water spray system, drainage facilities must be provided to carry contaminated water or foam overflow away from the employee work area and egress routes. This drainage system should drain to a central impounding area where it can be collected and disposed of properly. Other government agencies may have regulations concerning environmental considerations.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62799, filed 12/24/81.]

WAC 296-24-629 Fire detection systems. The requirements for installation, restoration, maintenance, testing and protection of fire detection systems and the criteria for response time can be found in this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-629, filed 12/24/81.]

WAC 296-24-62901 Scope and application. This section applies to all automatic fire detection systems installed to meet the requirements of a particular WISHA standard.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62901, filed 12/24/81.]

WAC 296-24-62903 Installation and restoration. (1) The employer shall assure that all devices and equipment constructed and installed to comply with this standard are approved for the purpose for which they are intended.

(2) The employer shall restore all fire detection systems and components to normal operating condition as promptly as possible after each test or alarm. Spare detection devices and components which are normally destroyed in the process of detecting fires shall be available on the premises or from a local supplier in sufficient quantities and locations for prompt restoration of the system.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62903, filed 12/24/81.]

WAC 296-24-62905 Maintenance and testing. (1) The employer shall maintain all systems in an operable condition except during repairs or maintenance.

(2) The employer shall assure that fire detectors and fire detection systems are tested and adjusted as often as needed to maintain proper reliability and operating condition except that factory calibrated detectors need not be adjusted after installation.

(3) The employer shall assure that pneumatic and hydraulic operated detection systems installed after July 1, 1982, are equipped with supervised systems.

(4) The employer shall assure that the servicing, maintenance and testing of fire detection systems, including cleaning and necessary sensitivity adjustments are performed by a trained person knowledgeable in the operations and functions of the system.

(5) The employer shall also assure that fire detectors that need to be cleaned of dirt, dust, or other particulates in order to be fully operational are cleaned at regular periodic intervals.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62905, filed 12/24/81.]

WAC 296-24-62907 Protection of fire detectors. (1) The employer shall assure that fire detection equipment installed outdoors or in the presence of corrosive atmospheres be protected from corrosion. The employer shall provide a canopy, hood, or other suitable protection for detection equipment requiring protection from the weather.

(2) The employer shall locate or otherwise protect detection equipment so that it is protected from mechanical or physical impact which might render it inoperable.

(3) The employer shall assure that detectors are supported independently of their attachment to wires or tubing.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62907, filed 12/24/81.]

WAC 296-24-62909 Response time. (1) The employer shall assure that fire detection systems installed for the purpose of actuating fire extinguishment or suppression systems shall be designed to operate in time to control or extinguish a fire.

(2) The employer shall assure that fire detection systems installed for the purpose of employee alarm and evacuation be designed and installed to provide a warning for emergency action and safe escape of employees.

(3) The employer shall not delay alarms or devices initiated by fire detector actuation for more than thirty seconds unless such delay is necessary for the immediate safety of employees. When such delay is necessary, it shall be addressed in an emergency action plan meeting the requirements of WAC 296-24-567.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62909, filed 12/24/81.]

WAC 296-24-62911 Number, location and spacing of detecting devices. The employer shall assure that the number, spacing and location of fire detectors is based upon design data obtained from field experience, or tests, engineering surveys, the manufacturer's recommendations, or a recognized testing laboratory listing.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62911, filed 12/24/81.]

WAC 296-24-62999 Appendix A--Fire detection systems. (1) Installation and restoration. Fire detection systems must be designed by knowledgeable engineers or other professionals, with expertise in fire detection systems and when the systems are installed, there should be an acceptance test performed on the system to insure it operates properly. The manufacturer's recommendations for system design should be consulted. While entire systems may not be approved, each component used in the system is required to be approved. Custom fire detection systems should be designed by knowledgeable fire protection or electrical engineers who are familiar with the workplace hazards and conditions. Some systems may only have one or two individual detectors for a small workplace, but good design and installation is still important. An acceptance test should be performed on all systems, including these smaller systems.

WISHA has a requirement that spare components used to replace those which may be destroyed during an alarm situation be available in sufficient quantities and locations for prompt restoration of the system. This does not mean that the parts or components have to be stored at the workplace. If the employer can assure that the supply of parts is available in the local community or the general metropolitan area of the workplace, then the requirements for storage and availability have been met. The intent is to make sure that the alarm system is fully operational when employees are occupying the workplace, and that when the system operates it can be returned to full service the next day or sooner.

(2) Supervision. Fire detection systems should be supervised. The object of supervision is detection of any failure of the circuitry, and the employer should use any method that will assure that the system's circuits are operational. Electrically operated sensors for air pressure, fluid pressure, or electrical circuits, can provide effective monitoring and are the typical types of supervision.

(3) Protection of fire detectors. Fire detectors must be protected from corrosion either by protective coating, by being manufactured from noncorrosive materials or by location. Detectors must also be protected from mechanical impact damage, either by suitable cages or metal guards where such hazards are present, or by locating them above or out of contact with materials or equipment which may cause damage.

(4) Number, location, and spacing of detectors. This information can be obtained from the approval listing for detectors or NFPA standards. It can also be obtained from fire protection engineers or consultants or manufacturers of equipment who have access to approval listing and design methods.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-62999, filed 12/24/81.]

WAC 296-24-631 Employee alarm systems. This section contains requirements for the design, installation, restoration and manual actuation of all types of emergency employee alarm systems.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-631, filed 12/24/81.]

WAC 296-24-63101 Scope and application. (1) This section applies to all emergency employee alarms installed to meet a particular WISHA standard. This section does not apply to those discharge or supervisory alarms required on various fixed extinguishing systems or to supervisory alarms on fire suppression, alarm or detection systems unless they are intended to be employee alarm systems.

(2) The requirements in this section that pertain to maintenance, testing and inspection shall apply to all local fire alarm signaling systems used for alerting employees regardless of the other functions of the system.

(3) All predischarge employee alarms installed to meet a particular WISHA standard shall meet the requirements of WAC 296-24-63103 (1) through (4) and 296-24-63107(1).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63101, filed 12/24/81.]

WAC 296-24-63103 General requirements. (1) The employee alarm system shall provide warning for necessary emergency action as called for in the emergency action plan, or for reaction time for safe escape of employees from the workplace or the immediate work area, or both.

(2) The employee alarm shall be capable of being perceived above ambient noise or light levels by all employees in the affected portions of the workplace. Tactile devices may be used to alert those employees who would not otherwise be able to recognize the audible or visual alarm.

(3) The employee alarm shall be distinctive and recognizable as a signal to evacuate the work area or to perform actions designated under the emergency action plan.

(4) The employer shall explain to each employee the preferred means of reporting emergencies, such as manual pull box alarms, public address systems, radio or telephones. The employer shall post emergency telephone numbers near telephones, or employee notice boards, and other conspicuous locations when telephones serve as a means of reporting emergencies. Where a communication system also serves as the employee alarm system, all emergency messages shall have priority over all nonemergency messages.

(5) The employer shall establish procedures for sounding emergency alarms in the workplace. For those employers with ten or fewer employees in a particular workplace, direct voice communication is an acceptable procedure for sounding the alarm provided all employees can hear the alarm. Such workplaces need not have a back-up system.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63103, filed 12/24/81.]

WAC 296-24-63105 Installation and restoration. (1) The employer shall assure that all devices, components, combinations of devices or systems constructed and installed to comply with this standard are approved. Steam whistles, air horns, strobe lights or similar lighting devices, or tactile devices meeting the requirements of this section are considered to meet this requirement for approval.

(2) The employer shall assure that all employee alarm systems are restored to normal operating condition as promptly as possible after each test or alarm. Spare alarm devices and components subject to wear or destruction shall be available in sufficient quantities and locations for prompt restoration of the system.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63105, filed 12/24/81.]

WAC 296-24-63107 Maintenance and testing. (1) The employer shall assure that all employee alarm systems are maintained in operating condition except when undergoing repairs or maintenance.

(2) The employer shall assure that a test of the reliability and adequacy of nonsupervised employee alarm systems is made every two months. A different actuation device shall be used in each test of a multi-actuation device system so that no individual device is used for two consecutive tests.

(3) The employer shall maintain or replace power supplies as often as is necessary to assure a fully operational condition. Back-up means of alarm, such as employee runners or telephones, shall be provided when systems are out of service.

(4) The employer shall assure that employee alarm circuitry installed after July 1, 1982, which is capable of being supervised is supervised and that it will provide positive notification to assigned personnel whenever a deficiency exists in the system. The employer shall assure that all supervised employee alarm systems are tested at least annually for reliability and adequacy.

(5) The employer shall assure that the servicing, maintenance and testing of employee alarms are done by persons trained in the designed operation and functions necessary for reliable and safe operation of the system.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63107, filed 12/24/81.]

WAC 296-24-63109 Manual operation. The employer shall assure that manually operated actuation devices for use in conjunction with employee alarms are unobstructed, conspicuous and readily accessible.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63109, filed 12/24/81.]

WAC 296-24-63199 Appendix A--Employee alarm systems. (1) Scope and application. This section is intended to apply to employee alarm systems used for all types of employee emergencies except those which occur so quickly and at such a rapid rate (e.g., explosions) that any action by the employee is extremely limited following detection.

In small workplaces with ten or less employees the alarm system can be by direct voice communication (shouting) where any one individual can quickly alert all other employees. Radio may be used to transmit alarms from remote workplaces where telephone service is not available, provided that radio messages will be monitored by emergency services, such as fire, police or others, to insure alarms are transmitted and received.

(2) Alarm signal alternatives. In recognition of physically impaired individuals, WISHA is accepting various methods of giving alarm signals. For example, visual, tactile or audible alarm signals are acceptable methods for giving alarms to employees. Flashing lights or vibrating devices can be used in areas where the employer has hired employees with hearing or vision impairments. Vibrating devices, air fans, or other tactile devices can be used where visually and hearing impaired employees work. Employers are cautioned that certain frequencies of flashing lights have been claimed to initiate epileptic seizures in some employees and that this fact should be considered when selecting an alarm device. Two-way radio communications would be most appropriate for transmitting emergency alarms in such workplaces which may be remote or where telephones may not be available.

(3) Reporting alarms. Employee alarms may require different means of reporting, depending on the workplace involved. For example, in small workplaces, a simple shout throughout the workplace may be sufficient to warn employees of a fire or other emergency. In larger workplaces, more sophisticated equipment is necessary so that entire plants or high-rise buildings are not evacuated for one small emergency. In remote areas, such as pumping plants, radio communication with a central base station may be necessary. The goal of this standard is to assure that all employees who need to know that an emergency exists can be notified of the emergency. The method of transmitting the alarm should reflect the situation found at the workplace.

Personal radio transmitters, worn by an individual, can be used where the individual may be working, such as in a remote location. Such personal radio transmitters shall send a distinct signal and should clearly indicate who is having an emergency, the location, and the nature of the emergency. All radio transmitters need a feedback system to assure that the emergency alarm is sent to the people who can provide assistance.

For multistory buildings or single-story buildings with interior walls for subdivisions, the more traditional alarm systems are recommended for these types of workplaces. Supervised telephone or manual fire alarm or pull box stations with paging systems to transmit messages throughout the building is the recommended alarm system. The alarm box stations should be available within a travel distance of 200 feet. Water flow detection on a sprinkler system, fire detection systems (guard's supervisory station) or tour signal (watchman's service), or other related systems may be part of the overall system. The paging system may be used for nonemergency operations provided the emergency messages and uses will have precedence over all other uses of the system.

(4) Supervision. The requirements for supervising the employee alarm system circuitry and power supply may be accomplished in a variety of ways. Typically, electrically operated sensors for air pressure, fluid pressure, steam pressure, or electrical continuity of circuitry may be used to continuously monitor the system to assure it is operational and to identify trouble in the system and give a warning signal.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63199, filed 12/24/81.]

WAC 296-24-63299 Appendix B--National consensus standards. The following table contains a cross-reference listing of those current national consensus standards which contains information and guidelines that would be considered acceptable in complying with requirements in the specific sections.

Section	National Consensus Standard
WAC 296-24-58505 .	ANSI/NFPA No. 1972, Structural Fire Fighter's Helmets. ANSI Z88.5 American National Standard, Practice for Respirator Protection for the Fire Service. ANSI/NFPA No. 1971, Protective Clothing for Structural Fire Fighters. NFPA No. 1041, Fire Service Instructor Professional Qualifications.
WAC 296-24-592 ...	ANSI/NFPA No. 10, Portable Fire Extinguishers.
WAC 296-24-602 ...	ANSI/NFPA No. 18, Wetting Agents. ANSI/NFPA No. 20, Centrifugal Fire Pumps. NFPA No. 21, Steam Fire Pumps. ANSI/NFPA No. 22, Water Tanks. NFPA No. 24, Outside Protection. NFPA No. 26, Supervision of Valves. NFPA No. 13E, Fire Department Operations in Properties Protected by Sprinkler, Standpipe Systems. ANSI/NFPA No. 194, Fire Hose Connections. NFPA No. 197, Initial Fire Attack, Training for. NFPA No. 1231, Water Supplies for Suburban and Rural Fire Fighting.
WAC 296-24-607 ...	ANSI/NFPA No. 13, Sprinkler Systems. NFPA No. 13A, Sprinkler Systems, Maintenance. ANSI/NFPA No. 18, Wetting Agents. ANSI/NFPA No. 20, Centrifugal Fire Pumps. ANSI/NFPA No. 22, Water Tanks. NFPA No. 24, Outside Protection. NFPA No. 26, Supervision of Valves. ANSI/NFPA No. 72B, Auxiliary Signaling Systems. NFPA No. 1231, Water Supplies for Suburban and Rural Fire Fighting.
WAC 296-24-617 ...	ANSI/NFPA No. 11, Foam Systems. ANSI/NFPA No. 11A, High Expansion Foam Extinguishing Systems. ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems. ANSI/NFPA No. 12, Carbon Dioxide Systems. ANSI/NFPA No. 12A, Halon 1301 Systems. ANSI/NFPA No. 12B, Halon 1211 Systems. ANSI/NFPA No. 15, Water Spray Systems. ANSI/NFPA No. 16, Foam-Water Spray Systems. ANSI/NFPA No. 17, Dry Chemical Systems. ANSI/NFPA No. 69, Explosion Suppression Systems.

Section	National Consensus Standard
WAC 296-24-622 ...	ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems. ANSI/NFPA No. 17, Dry Chemical Systems.
WAC 296-24-623 ...	ANSI/NFPA No. 12, Carbon Dioxide Systems. ANSI/NFPA No. 12A, Halon 1211 Systems. ANSI/NFPA No. 12B, Halon 1301 Systems. ANSI/NFPA No. 69, Explosion Suppression Systems.
WAC 296-24-627 ...	ANSI/NFPA No. 11, Foam Extinguishing Systems. ANSI/NFPA No. 11A, High Expansion Foam Extinguishing Systems. ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems. ANSI/NFPA No. 15, Water Spray Fixed Systems. ANSI/NFPA No. 16, Foam-Water Spray Systems. ANSI/NFPA No. 18, Wetting Agents. NFPA No. 26, Supervision of Valves.
WAC 296-24-629 ...	ANSI/NFPA No. 71, Central Station Signaling Systems. ANSI/NFPA No. 72A, Local Protective Signaling Systems. ANSI/NFPA No. 72B, Auxiliary Signaling Systems. ANSI/NFPA No. 72D, Proprietary Protective Signaling Systems. ANSI/NFPA No. 72E, Automatic Fire Detectors. ANSI/NFPA No. 101, Life Safety Code.
WAC 296-24-631 ...	ANSI/NFPA No. 71, Central Station Signaling Systems. ANSI/NFPA No. 72A, Local Protective Signaling Systems. ANSI/NFPA No. 72B, Auxiliary Protective Signaling Systems. ANSI/NFPA No. 72C, Remote Station Protective Signaling Systems. ANSI/NFPA No. 72D, Proprietary Protective Signaling Systems. ANSI/NFPA No. 101, Life Safety Code.
Metric Conversion....	ANSI/ASTM NSo. E380, American National Standard for Metric Practice.

NFPA standards are available from the National Fire Protection Association; 470 Atlantic Avenue; Boston, MA 02210.

ANSI Standards are available from the American National Standards Institute; 1430 Broadway; New York, NY 10018.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63299, filed 12/24/81.]

WAC 296-24-63399 Appendix C--Fire protection references for further information. (1) Appendix general references. The following references provide information which can be helpful in understanding the requirements contained in all of the sections of Part G:

(a) Fire Protection Handbook, National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(b) Accident Prevention Manual for Industrial Operations, National Safety Council, 425 North Michigan Avenue, Chicago, IL 60611.

(c) Various associations also publish information which may be useful in understanding these standards. Examples of these associations are: Fire Equipment Manufacturers Association (FEMA) of Arlington, VA 22204, and the National Association of Fire Equipment Distributors (NAFED) of Chicago, IL 60601.

(2) Appendix references applicable to individual sections. The following references are grouped according to individual sections contained in Part G. These references provide information which may be helpful in understanding and implementing the standards of each section of Part G.

(a) WAC 296-24-58505 - Fire brigades:

(i) Private Fire Brigades, NFPA 27; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Initial Fire Attack, Training Standard On, NFPA 197; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Fire Fighter Professional Qualifications, NFPA 1001; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iv) Organization for Fire Services, NFPA 1201; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(v) Organization of a Fire Department, NFPA 1202; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vi) Protective Clothing for Structural Fire Fighting, ANSI/NFPA 1971; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vii) American National Standard for Men's Safety-Toe Footwear, ANSI Z41.1; American National Standards Institute, New York, NY 10018.

(viii) American National Standard for Occupational and Educational Eye and Face Protection, ANSI Z87.1; American National Standards Institute, New York, NY 10018.

(ix) American National Standard, Safety Requirements for Industrial Head Protection, ANSI Z89.1; American National Standards Institute, New York, NY 10018.

(x) Specifications for Protective Headgear for Vehicular Users, ANSI Z90.1; American National Standards Institute, New York, NY 10018.

(xi) Testing Physical Fitness; Davis and Santa Maria, Fire Command, April 1975.

(xii) Development of a Job-Related Physical Performance Examination for Fire Fighters; Dotson and Others. A summary report for the National Fire Prevention and Control Administration, Washington, D.C., March 1977.

(xiii) Proposed Sample Standards for Fire Fighters' Protective Clothing and Equipment; International Association of Fire Fighters, Washington, D.C.

(xiv) A Study of Facepiece Leakage of Self-Contained Breathing Apparatus by DOP Man Tests; Los Alamos Scientific Laboratory, Los Alamos, N.M.

(xv) The Development of Criteria for Fire Fighters' Gloves; Vol. II: Glove Criteria and Test Methods; National Institute for Occupational Safety and Health, Cincinnati, Ohio, 1976.

(xvi) Model Performance Criteria for Structural Fire Fighters' Helmets; National Fire Prevention and Control Administration, Washington, D.C., 1977.

(xvii) Firefighters; Job Safety and Health Magazine, Occupational Safety and Health Administration, Washington, D.C., June 1978.

(xviii) Eating Smoke—The Dispensable Diet; Utech, H.P. The Fire Independent, 1975.

(xix) Project Monoxide—A Medical Study of an Occupational Hazard of Fire Fighters; International Association of Fire Fighters, Washington, D.C.

(xx) Occupational Exposures to Carbon Monoxide in Baltimore Firefighters; Radford Baltimore, MD. Journal of Occupational Medicine, September, 1976.

(xxi) Fire Brigades; National Safety Council, Chicago, IL, 1966.

(xxii) American National Standard, Practice for Respiratory Protection for the Fire Service, ANSI Z88.5; American National Standards Institute, New York, NY 10018.

(xxiii) Respirator Studies for the Nuclear Regulatory Commission; October 1, 1977—September 30, 1978. Evaluation and Performance of Open-Circuit Breathing Apparatus. NUREG/CR-1235. Los Alamos Scientific Laboratory; Los Alamos, NM 87545, January, 1980.

(b) WAC 296-24-592 - Portable fire extinguishers:

(i) Standard for Portable Fire Extinguishers, ANSI/NFPA 10; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Methods for Hydrostatic Testing of Compressed-Gas Cylinders, C-1; Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.

(iii) Recommendations for the Disposition of Unserviceable Compressed-Gas Cylinders, C-2; Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.

(iv) Standard for Visual Inspection of Compressed-Gas Cylinders, C-6; Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.

(v) Portable Fire Extinguisher Selection Guide, National Association of Fire Equipment Distributors; 111 East Wacker Drive, Chicago, IL 60601.

(c) WAC 296-24-602 - Standpipe and hose systems:

(i) Standard for the Installation of Sprinkler Systems, ANSI/NFPA 13; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Standard of the Installation of Standpipe and Hose Systems, ANSI/NFPA 14; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard for the Installation of Centrifugal Fire Pumps, ANSI/NFPA 20; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iv) Standard for Water Tanks for Private Fire Protection, ANSI/NFPA 22; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(v) Standard for Screw Threads and Gaskets for Fire Hose Connections, ANSI/NFPA 194; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vi) Standard for Fire Hose, NFPA 196; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vii) Standard for the Care of Fire Hose, NFPA 198; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(d) WAC 296-24-607 - Automatic sprinkler systems:

(i) Standard of the Installation of Sprinkler Systems, ANSI/NFPA 13; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Standard for the Care and Maintenance of Sprinkler Systems, ANSI/NFPA 13A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard for the Installation of Standpipe and Hose Systems, ANSI/NFPA 14; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iv) Standard for the Installation of Centrifugal Fire Pumps, ANSI/NFPA 20; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(v) Standard for Water Tanks for Private Fire Protection, ANSI/NFPA 22; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vi) Standard for Indoor General Storage, ANSI/NFPA 231; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vii) Standard for Rack Storage of Materials, ANSI/NFPA 231C; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(e) WAC 296-24-617 - Fixed extinguishing systems, general information:

(i) Standard for Foam Extinguishing Systems, ANSI/NFPA 11; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Standard for Hi-Expansion Foam Systems, ANSI/NFPA 11A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard on Synthetic Foam and Combined Agent Systems, ANSI/NFPA 11B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iv) Standard on Carbon Dioxide Extinguishing Systems, ANSI/NFPA 12; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(v) Standard on Halon 1301, ANSI/NFPA 12A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vi) Standard on Halon 1211, ANSI/NFPA 12B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vii) Standard for Water Spray Systems, ANSI/NFPA 15; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(viii) Standard for Foam-Water Sprinkler Systems and Foam-Water Spray Systems, ANSI/NFPA 16; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ix) Standard for Dry Chemical Extinguishing Systems, ANSI/NFPA 17; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(f) WAC 296-24-622 - Fixed extinguishing systems, dry chemical:

(i) Standard for Dry Chemical Extinguishing Systems, ANSI/NFPA 17; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) National Electrical Code, ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapor from Commercial Cooling Equipment, NFPA 96; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(g) WAC 296-24-623 - Fixed extinguishing systems, gaseous agents:

(i) Standard on Carbon Dioxide Extinguishing Systems, ANSI/NFPA 12; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Standard on Halon 1301, ANSI/NFPA 12B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard on Halon 1211, ANSI/NFPA 12; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iv) Standard on Explosion Prevention Systems, ANSI/NFPA 69; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(v) National Electrical Code, ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vi) Standard on Automatic Fire Detectors, ANSI/NFPA 72E; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vii) Determination of Halon 1301/1211 Threshold Extinguishing Concentrations Using the Cup Burner Method, Riley and Olson, Ansul Report AL-530-A.

(h) WAC 296-24-627 - Fixed extinguishing systems, water spray and foam agents:

(i) Standard for Foam Extinguisher Systems, ANSI/NFPA 11; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Standard for High-Expansion Foam Systems, ANSI/NFPA 11A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard for Water Spray Fixed Systems for Fire Protection, ANSI/NFPA 15; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iv) Standard for the Installation of Foam-Water Sprinkler Systems and Foam-Water Spray Systems, ANSI/NFPA 16; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(i) WAC 296-24-629 - Fire detection systems:

(i) National Electrical Code, ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Standard for Central Station Signaling Systems, ANSI/NFPA 71; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard on Automatic Fire Detectors, ANSI/NFPA 72E; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(j) WAC 296-24-631 - Employee alarm systems:

(i) National Electrical Code, ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(ii) Standard for Central Station Signaling Systems, ANSI/NFPA 71; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iii) Standard for Local Protective Signaling Systems, ANSI/NFPA 72A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(iv) Standard for Auxiliary Protective Signaling Systems, ANSI/NFPA 72B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(v) Standard for Remote Station Protective Signaling Systems, ANSI/NFPA 72C; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vi) Standard for Proprietary Protective Signaling Systems, ANSI/NFPA 72D; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(vii) Vocal Emergency Alarms in Hospitals and Nursing Facilities: Practice and Potential, National Bureau of Standards, Washington, D.C., July, 1977.

(viii) Fire Alarm and Communication Systems, National Bureau of Standards, Washington, D.C., April, 1976.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-24-63399, filed 7/6/88; 87-24-051 (Order 87-24), § 296-24-63399, filed 11/30/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63399, filed 12/24/81.]

WAC 296-24-63499 Appendix D--Availability of publications incorporated by references in WAC 296-24-58505--Fire brigades. The final standard for fire brigades, WAC 296-24-58505, contains provisions which incorporate certain publications by reference. The publications provide criteria and test methods for protective clothing worn by those fire brigade members who are expected to perform interior structural fire fighting. The standard references the publications as the chief sources of information for determining if the protective clothing affords the required level of protection.

It is appropriate to note that the final standard does not require employers to purchase a copy of the referenced publications. Instead, employers can specify (in purchase orders to the manufacturers) that the protective clothing meet the criteria and test methods contained in the referenced publications and can rely on the manufacturers assurances of compliance. Employers, however, may desire to obtain a copy of the referenced publications for their own information.

The paragraph designation of the standard where the referenced publications appear, the title of the publications, and the availability of the publications are as follows:

Paragraph Designation	Referenced Publication	Available From
WAC 296-24-58513 (3)(b)	"Protective Clothing for Structural Fire Fighting." NFPA No. 1971 (1975).	National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

Paragraph Designation	Referenced Publication	Available From
WAC 296-24-58513 (4)(a)	"Development of Criteria for Fire Fighter's Gloves; Vol. II, Part II: Test Methods" (1976)	U.S. Government Printing Office, Washington, D.C. 20402. Stock No. for Vol. II is: 071-033-021-1.
WAC 296-24-58513 (5)(a)	"Model Performance Criteria for Structural Firefighter's Helmets" (1977)	U.S. Fire Administration, National Fire Safety and Research Office, Washington, D.C. 20230.

The referenced publications (or a microfiche of the publications) are available for review at many universities and public libraries throughout the country. These publications may also be examined at the OSHA Technical Data Center, Room N2439-Rear, United States Department of Labor, 200 Constitution Avenue Northwest, Washington, D.C. 20210 (202-523-9700), or at any OSHA Regional Office (see telephone directories under United States Government-Labor Department).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-24-63499, filed 12/24/81.]

WAC 296-24-63599 Appendix E--Test methods for protective clothing. This appendix contains test methods which must be used to determine if protective clothing affords the required level of protection as specified in WAC 296-24-58505 - fire brigades.

(1) Puncture resistance test method for foot protection.

(a) Apparatus. The puncture resistance test shall be performed on a testing machine having a movable platform adjusted to travel at one-quarter-inch per minute (0.1 cm/sec). Two blocks of hardwood, metal, or plastic shall be prepared as follows: The blocks shall be of such size and thickness as to insure a suitable rigid test ensemble and allow for at least one-inch of the pointed end of an 8D nail to be exposed for the penetration. One block shall have a hole drilled to hold an 8D common nail firmly at an angle of 98°. The second block shall have a maximum one-half inch (1.3 cm) diameter hole drilled through it so that the hole will allow free passage of the nail after it penetrates the insole during the test.

(b) Procedure. The test ensemble consisting of the sample unit, the two prepared blocks, a piece of leather outsole ten to eleven irons thick and a new 8D nail, shall be placed as follows: The 8D nail in the hole, the sample of outsole stock superimposed above the nail, the area of the sole plate to be tested placed on the outsole, and the second block with hole so placed as to allow for free passage of the nail after it passes through the outsole stock and sole plate in that order. The machine shall be started and the pressure, in pounds required for the nail to completely penetrate the outsole and sole plate, recorded to the nearest five pounds. Two determinations shall be made on each sole plate and the results averaged. A new nail shall be used for each determination.

(c) Source. These test requirements are contained in "Military Specification For Fireman's Boots," MIL-B-2885D (1973 and amendment dated 1975) and are reproduced for your convenience.

(2) Test method for determining the strength of cloth by tearing: Trapezoid method.

(a) Test specimen. The specimen shall be a rectangle of cloth three-inches by six-inches (7.6 cm by 15.2 cm). The long dimension shall be parallel to the warp for warp tests and parallel to the filling for filling tests. No two specimens for warp tests shall contain the same warp yarns, nor shall any two specimens for filling tests contain the same filling yarns. The specimen shall be taken no nearer the selvage than 1/10 the width of the cloth. An isosceles trapezoid having an altitude of three inches (7.6 cm) and bases of one inch (2.5 cm) and four inches (10.2 cm) in length, respectively, shall be marked on each specimen, preferably with the aid of a template. A cut approximately three-eighths inch (1 cm) in length shall then be made in the center of a perpendicular to the one inch (2.5 cm) edge.

(b) Apparatus.

(i) Six-ounce (.17 kg) weight tension clamps shall be used so designed that the six ounces (.17 kg) of weight are distributed evenly across the complete width of the sample.

(ii) The machine shall consist of three main parts: Straining mechanism, clamps for holding specimen, and load and elongation recording mechanisms.

(iii) A machine wherein the specimen is held between two clamps and strained by a uniform movement of the pulling clamp shall be used.

(iv) The machine shall be adjusted so that the pulling clamp shall have a uniform speed of 12 ± 10.5 inches per minute (0.5 ± .02 cm/sec).

(v) The machine shall have two clamps with two jaws on each clamp. The design of the two clamps shall be such that one gripping surface or jaw may be an integral part of the rigid frame of the clamp or be fastened to allow a slight vertical movement, while the other gripping surface or jaw shall be completely moveable. The dimension of the immovable jaw of each clamp parallel to the application of the load shall measure one inch, and the dimension of the jaw perpendicular to this direction shall measure three inches or more. The face of the moveable jaw of each clamp shall measure one inch by three inches.

Each jaw face shall have a flat, smooth, gripping surface. All edges which might cause a cutting action shall be rounded to a radius of not over 1/64 inch (.04 cm). In cases where a cloth tends to slip when being tested, the jaws may be faced with rubber or other material to prevent slippage. The distance between the jaws (gage length) shall be one inch at the start of the test.

(vi) Calibrated dial; scale or chart shall be used to indicate applied load and elongation. The machine shall be adjusted or set, so that the maximum load required to break the specimen will remain indicated on the calibrated dial or scale after the test specimen has ruptured.

(vii) The machine shall be of such capacity that the maximum load required to break the specimen shall be not greater than eighty-five percent or less than fifteen percent of the rated capacity.

(viii) The error of the machine shall not exceed two percent up to and including a fifty–pound load (22.6 kg) and one percent over a fifty–pound load (22.6 kg) at any reading within its loading range.

(ix) All machine attachments for determining maximum loads shall be disengaged during this test.

(c) Procedure.

(i) The specimen shall be clamped in the machine along the nonparallel sides of the trapezoid so that these sides lie along the lower edge of the upper clamp and the upper edge of the lower clamp with the cut halfway between the clamps. The short trapezoid base shall be held taut and the long trapezoid base shall lie in the folds.

(ii) The machine shall be started and the force necessary to tear the cloth shall be observed by means of an autographic recording device. The speed of the pulling clamp shall be 12 inches ± 0.5–inch per minute (0.5 ± .02 cm/sec).

(iii) If a specimen slips between the jaws, breaks in or at the edges of the jaws, or if for any reason attributable to faulty technique, an individual measurement falls markedly below the average test results for the sample unit, such result shall be discarded and another specimen shall be tested.

(iv) The tearing strength of the specimen shall be the average of the five highest peak loads of resistance registered for three inches (7.6 cm) of separation of the tear.

(d) Report.

(i) Five specimens in each of the warp and filling direction shall be tested from each sample unit.

(ii) The tearing strength of the sample unit shall be the average of the result obtained from the specimens tested in each of the warp and filling directions and shall be reported separately to the nearest 0.1 pound (.05 kg).

(e) Source. These test requirements are contained in "Federal Test Method Standard 191, Method 5136," and are reproduced for your convenience.

(3) Test method for determining flame resistance of cloth; vertical.

(a) Test specimen. The specimen shall be a rectangle of cloth two and three–quarter inches (7.0 cm) by twelve inches (30.5 cm) with the long dimension parallel to either the warp or filling direction of the cloth. No two warp specimens shall contain the same warp yarns, and no two filling specimens shall contain the same filling yarn.

(b) Number of determinations. Five specimens from each of the warp and filling directions shall be tested from each sample unit.

(c) Apparatus.

(i) Cabinet. A cabinet and accessories shall be fabricated in accordance with the requirements specified in Figures L–1, L–2, and L–3. Galvanized sheet metal or other suitable metal shall be used. The entire inside back wall of the cabinet shall be painted black to facilitate the viewing of the test specimen and pilot flame.

(ii) Burner. The burner shall be equipped with a variable orifice to adjust the flame height, a barrel having a three–eighth inch (9.5 mm) inside diameter and a pilot light.

(A) The burner may be constructed by combining a three–eighth inch (1 cm) inside diameter barrel 3 ± 1/4–inches (7.6 ± .6 cm) long from a fixed orifice burner with a base from a variable orifice burner.

(B) The pilot light tube shall have a diameter of approximately one–sixteenth inch (.2 cm) and shall be spaced one–eighth inch (.3 cm) away from the burner edge with a pilot flame one–eighth inch (.3 cm) long.

(C) The necessary gas connections and the applicable plumbing shall be as specified in Figure L–4 except that a solenoid valve may be used in lieu of the stopcock valve to which the burner is attached. The stopcock valve or solenoid valve, whichever is used, shall be capable of being fully opened or fully closed in 0.1 second.

(D) On the side of the barrel of the burner, opposite the pilot light there shall be a metal rod of approximately one–eighth inch (.3 cm) diameter spaced one–half inch (1.3 cm) from the barrel and extending above the burner. The rod shall have two five–sixteenth inch (.8 cm) prongs marking the distances of three–quarters inch (1.9 cm), and one and one–half inches (3.8 cm) above the top of the burner.

(E) The burner shall be fixed in a position so that the center of the barrel of the burner is directly below the center of the specimen.

(iii) There shall be a control valve system with a delivery rate designed to furnish gas to the burner under a pressure of 2–1/2 ± 1/4 (psi) (17.5 ± 1.8 kPa) per square inch at the burner inlet. The manufacturer's recommended delivery rate for the valve system shall be included in the required pressure.

(iv) A synthetic gas mixture shall be of the following composition within the following limits (analyzed at standard conditions): 55 ± 3 percent hydrogen, 24 ± 1 percent methane, 3 ± 1 percent ethane, and 18 ± 1 percent carbon monoxide which will give a specific gravity of 0.365 ± 0.018 (air = 1) and a B.T.U. content of 540 ± 20 per cubic foot (20.1 ± 3.7 kJL) (dry basis) at 69.8 F (21 C).

(v) There shall be metal hooks and weights to produce a series of total loads to determine length of char. The metal hooks shall consist of No. 19 gage steel wire or equivalent and shall be made from three inch (7.6 cm) lengths of wire and bent one–half inch (1.3 cm) from one end to a 45–degree hook. One end of the hook shall be fastened around the neck of the weight to be used.

(vi) There shall be a stop watch or other device to measure the burning time 0.2 second.

(vii) There shall be a scale, graduated in 0.1 inch (.3 cm) to measure the length of char.

(d) Procedure.

(i) The material undergoing test shall be evaluated for the characteristics of after–flame time and char length on each specimen.

(ii) All specimens to be tested shall be at moisture equilibrium under standard atmospheric conditions in accordance with subsection (3)(c) of this appendix. Each specimen to be tested shall be exposed to the test flame within twenty seconds after removal from the standard

atmosphere. In case of dispute, all testing will be conducted under standard atmospheric conditions in accordance with subsection (3)(c) of this appendix.

(iii) The specimen in its holder shall be suspended vertically in the cabinet in such a manner that the entire length of the specimen is exposed and the lower end is three–quarters inch (1.9 cm) above the top of the gas burner. The apparatus shall be set up in a draft–free area.

(iv) Prior to inserting the specimen, the pilot flame shall be adjusted to approximately one–eighth inch (.3 cm) in height measured from its lowest point to the tip.

The burner flame shall be adjusted by means of the needle valve in the base of the burner to give a flame height of one and one–half inches (3.8 cm) with the stopcock fully open and the air supply to burner shut off and taped. The one and one–half inch (3.8 cm) flame height is obtained by adjusting the valve so that the uppermost portion (tip) of the flame is level with the tip of the metal prong (see Fig. L–2) specified for adjustment of flame height. It is an important aspect of the evaluation that the flame height to be adjusted with the tip of the flame level with the tip of the metal prong. After inserting the specimen, the stopcock shall be fully opened, and the burner flame applied vertically at the middle of the lower edge of the specimen for twelve seconds and the burner turned off. The cabinet door shall remain shut during testing.

(v) The after–flame shall be the time the specimen continues to flame after the burner flame is shut off.

(vi) After each specimen is removed, the test cabinet shall be cleared of fumes and smoke prior to testing the next specimen.

(vii) After both flaming and glowing have ceased, the char length shall be measured. The char length shall be the distance from the end of the specimen, which was exposed to the flame, to the end of a tear (made lengthwise) of the specimen through the center of the charred area as follows: The specimen shall be folded lengthwise and creased by hand along a line through the highest peak of the charred area. The hook shall be inserted in the specimen (or a hole, one–quarter inch (.6 cm) diameter or less, punched out for the hook) at one side of the charred area one–quarter inch (.6 cm) from the adjacent outside edge and one–quarter inch (.6 cm) in from the lower end. A weight of sufficient size such that the weight and hook together shall equal the total tearing load required in Table L–2 of this section shall be attached to the hook.

(viii) A tearing force shall be applied gently to the specimen by grasping the corner of the cloth at the opposite edge of the char from the load and raising the specimen and weight clear of the supporting surface. The end of the tear shall be marked off on the edge and the char length measurement made along the undamaged edge.

Loads for determining char length applicable to the weight of the test cloth shall be as shown in Table L–2.

TABLE L–2

Specified weight per square yard of cloth before any fire retardant treatment or coating – ounces	Total learning weight for determining the charred length – pound
2.0 to 6.0	0.25
Over 6.0 to 15.0	0.50
Over 15.0 to 23.0	0.75
Over 23.0	1.0

To change into S.I. (System International) units, 1 ounce = 28.35 grams, 1 pound = 453 grams, 1 yard = .91 metre.

(ix) The after–flame time of the specimen shall be recorded to the nearest 0.2 second and the car length to the nearest 0.1 inch (.3 cm).

(e) Report.

(i) The after–flame time and char length of the sample unit shall be the average of the results obtained from the individual specimens tested. All values obtained from the individual specimens shall be recorded.

(ii) The after–flame time shall be reported in the nearest 0.2 second and the char length to the nearest 0.1 inch (.3 cm).

(f) Source. These test requirements are contained in "Federal Test Method Standard 191, Method 5903 (1971)," and are reproduced for your convenience.

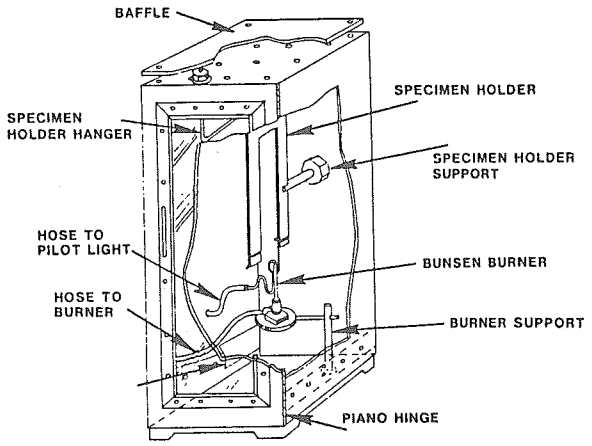


Figure L–1 – Vertical flame resistance textile apparatus. All given dimensions are in inches. System International (S.I.) unit: 1 inch = 2.54 cm.

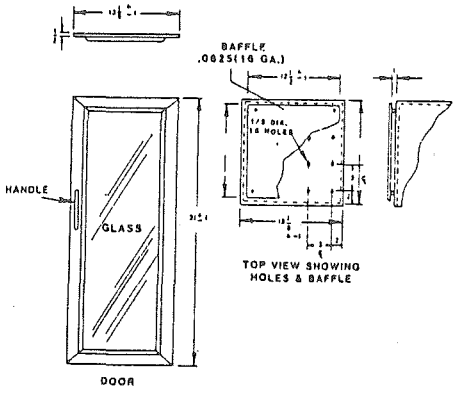


Figure L–2 – Vertical flame resistance textile apparatus, door and top view w/baffle. All given dimensions are in inches. System International (S.I.) unit: 1 inch = 2.54 cm.

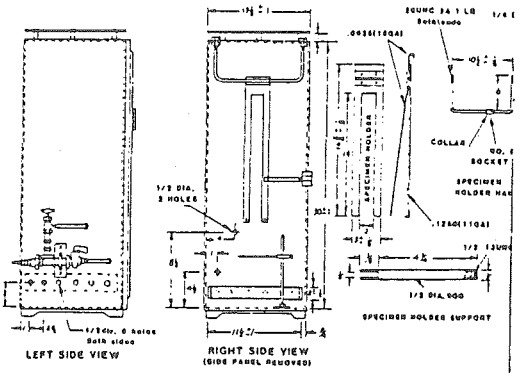


Figure L–3 – Vertical flame resistance textile apparatus, views and details. All given dimensions are in inches. System International (S.I.) unit: 1 inch = 2.54 cm.

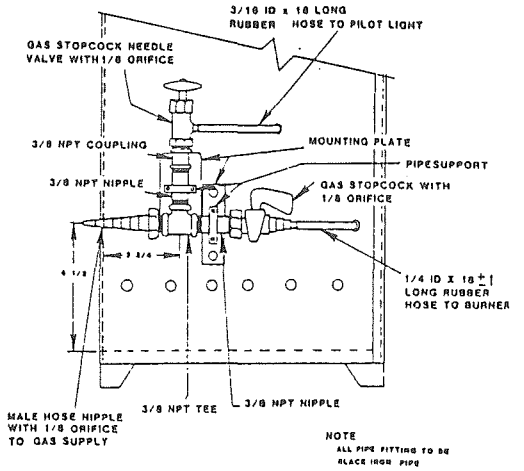


Figure L–4 – Vertical flame resistance textile apparatus. All given dimensions are in inches. System International (S.I.) unit: 1 inch = 2.54 cm.

[Statutory Authority: Chapter 49.17 RCW. 87–24–051 (Order 87–24), § 296–24–63599, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82–02–003 (Order 81–32), § 296–24–63599, filed 12/24/81.]

Part H–1
HAND AND PORTABLE POWERED TOOLS AND OTHER HAND–HELD EQUIPMENT

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS SUBCHAPTER

296-24-662 Safety requirements for explosive-actuated fastening tools. [Order 73-5, § 296-24-662, filed 5/9/73 and Order 73-4, § 296-24-662, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

296-24-66201 Scope. [Order 73-5, § 296-24-66201, filed 5/9/73 and Order 73-4, § 296-24-66201, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

296-24-66203 Purpose. [Order 73-5, § 296-24-66203, filed 5/9/73 and Order 73-4, § 296-24-66203, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

296-24-66205 Definitions. [Order 73-5, § 296-24-66205, filed 5/9/73 and Order 73-4, § 296-24-66205, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49-.17.150, and 49.17.240.

296-24-66207 Design requirements—High velocity tools. [Order 73-5, § 296-24-66207, filed 5/9/73 and Order 73-4, § 296-24-66207, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

296-24-66209 Low velocity piston tools. [Order 73-5, § 296-24-66209, filed 5/9/73 and Order 73-4, § 296-24-66209, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49-.17.040, 49.17.150, and 49.17.240.

296-24-66211 Hammer-operated piston tools—Low velocity type. [Order 73-5, § 296-24-66211, filed 5/9/73 and Order 73-4, § 296-24-66211, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

296-24-66213 Requirements for loads and fasteners. [Order 73-5, § 296-24-66213, filed 5/9/73 and Order 73-4, § 296-24-66213, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

296-24-66215 Approvals. [Order 73-5, § 296-24-66215, filed 5/9/73 and Order 73-4, § 296-24-66215, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49-.17.150, and 49.17.240.

296-24-66217 Operation. [Order 73-5, § 296-24-66217, filed 5/9/73 and Order 73-4, § 296-24-66217, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49-.17.150, and 49.17.240.

296-24-66219 Servicing. [Order 73-5, § 296-24-66219, filed 5/9/73 and Order 73-4, § 296-24-66219, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49-.17.150, and 49.17.240.

296-24-66221 Qualification and certification of operators. [Order 73-5, § 296-24-66221, filed 5/9/73 and Order 73-4, § 296-24-66221, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

296-24-66223 Storage of explosive-actuated tools, instruction books, cleaning kits, and tools. [Order 73-5, § 296-24-66223, filed 5/9/73 and Order 73-4, § 296-24-66223, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49-.17.040, 49.17.150, and 49.17.240.

296-24-66225 Use low velocity tools when possible. [Order 73-5, § 296-24-66225, filed 5/9/73 and Order 73-4, § 296-24-66225, filed 5/7/73.] Repealed by 79-08-115 (Order 79-9), filed 7/31/79. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240.

WAC 296-24-650 Hand and portable powered tools and equipment—General.

[Order 73-5, § 296-24-650, filed 5/9/73 and Order 73-4, § 296-24-650, filed 5/7/73.]

WAC 296-24-65001 General requirements. Each employer shall be responsible for the safe condition of tools and equipment used by employees, including tools and equipment which may be furnished by employees.

[Order 73-5, § 296-24-65001, filed 5/9/73 and Order 73-4, § 296-24-65001, filed 5/7/73.]

WAC 296-24-65003 Compressed air used for cleaning. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 p.s.i. and then only with effective chip guarding and personal protective equipment.

[Order 73-5, § 296-24-65003, filed 5/9/73 and Order 73-4, § 296-24-65003, filed 5/7/73.]

WAC 296-24-65005 Compressed air tools. (1) In the use of compressed air tools, care should be used to prevent the tool from being shot from the gun.

(2) When momentarily out of use the gun should be laid in such position that the tool cannot fly out if the pressure is accidentally released. When not in use, all tools should be removed from the gun.

(3) In disconnecting a compressed air tool from the air line, care should be exercised first to shut off the pressure and then to operate the tool to exhaust the pressure remaining in the hose.

(4) Compressed air hose or guns shall not be pointed at or brought into contact with the body of any person.

[Order 73-5, § 296-24-65005, filed 5/9/73 and Order 73-4, § 296-24-65005, filed 5/7/73.]

WAC 296-24-65007 Air hammer. (1) Before laying down an air hammer remove tool from hammer unless it is held in place by safety catch.

[Order 73-5, § 296-24-65007, filed 5/9/73 and Order 73-4, § 296-24-65007, filed 5/7/73.]

WAC 296-24-655 Guarding of portable powered tools.

[Order 73-5, § 296-24-655, filed 5/9/73 and Order 73-4, § 296-24-655, filed 5/7/73.]

WAC 296-24-65501 Portable powered tools. (1) Portable circular saws.

(a) All portable, power-driven circular saws having a blade diameter greater than 2 in. shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required 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 required 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 covering position.

(b) (1)(a) of this section does not apply to circular saws used in the meat industry for meat cutting purposes.

(2) Switches and controls.

(a) All hand-held powered circular saws having a blade diameter-greater than 2 inches, electric, hydraulic or pneumatic chain saws, and percussion tools without positive accessory holding means shall be equipped with a constant pressure switch or control that will shut off the power when the pressure is released. All hand-held gasoline powered chain saws shall be equipped with a constant pressure throttle control that will shut off the power to the saw chain when the pressure is released.

(b) All hand-held powered drills, tappers, fastener drivers, horizontal, vertical, and angle grinders with wheels greater than 2 inches in diameter, disc sanders with discs greater than 2 inches in diameter, belt sanders, reciprocating saws, saber, scroll, and jig saws with blade shanks greater than a nominal one-fourth inch, and other similarly operating powered tools shall be equipped with a constant pressure switch or control and may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

(c) All other hand-held powered tools, such as, but not limited to, platen sanders, grinders with wheels 2 inches in diameter or less, disc sanders with discs 2 inches in diameter or less, routers, planers, laminate trimmers, nibblers, shears, saber, scroll, and jig saws with blade shanks a nominal one-fourth of an inch wide or less, may be equipped with either a positive "on-off" control, or other controls as described by (2)(a) and (b) of this section.

(i) Saber, scroll, and jig saws with nonstandard blade holders may use blades with shanks which are nonuniform in width, provided the narrowest portion of the blade shank is an integral part in mounting the blade.

(ii) Blade shank width shall be measured at the narrowest portion of the blade shank when saber, scroll, and jig saws have nonstandard blade holders.

(iii) "Nominal" in this section means +0.05 inch.

(d) The operating control on hand-held power tools shall be so located as to minimize the possibility of its accidental operation, if such accidental operation would constitute a hazard to employees.

(e) This paragraph does not apply to concrete vibrators, concrete breakers, powered tampers, jack hammers, rock drills, garden appliances, household and kitchen appliances, personal care appliances, medical or dental equipment, or to fixed machinery.

(3) Portable belt sanding machines. Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs onto a pulley. These guards shall effectively prevent the hands or fingers of the operator from coming in contact with the nip points. The unused run of the sanding belt shall be guarded against accidental contact.

(4) Cracked saws. All cracked saws shall be removed from service.

(5) Grounding. Portable electric powered tools shall meet the electrical requirements of WAC 296-24-950 and 296-24-955.

[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), § 296-24-65501, filed 11/13/80; Order 74-27, § 296-24-65501, filed 5/7/74; Order 73-5, § 296-24-65501, filed 5/9/73 and Order 73-4, § 296-24-65501, filed 5/7/73.]

WAC 296-24-657 Pneumatic powered tools and hose.

[Order 73-5, § 296-24-657, filed 5/9/73 and Order 73-4, § 296-24-657, filed 5/7/73.]

WAC 296-24-65701 Portable tools. (1) The operating trigger on portable hand-operated utilization equipment shall be so located as to minimize the possibility of its accidental operation and shall be arranged to close the air inlet valve automatically when the pressure of the operator's hand is removed.

(2) A tool retainer shall be installed on each piece of utilization equipment which, without such a retainer, may eject the tool.

[Order 73-5, § 296-24-65701, filed 5/9/73 and Order 73-4, § 296-24-65701, filed 5/7/73.]

WAC 296-24-65703 Airhose. Hose and hose connections used for conducting compressed air to utilization equipment shall be designed for the pressure and service to which they are subjected.

[Order 73-5, § 296-24-65703, filed 5/9/73 and Order 73-4, § 296-24-65703, filed 5/7/73.]

WAC 296-24-660 Portable abrasive wheels.

[Order 73-5, § 296-24-660, filed 5/9/73 and Order 73-4, § 296-24-660, filed 5/7/73.]

WAC 296-24-66001 Abrasive wheel terms. (1) Mounted wheels. Mounted wheels, usually 2-inch diameter or smaller, and of various shapes, may be either organic or inorganic bonded abrasive wheels. They are secured to plain or threaded steel mandrels.

(2) Tuck pointing. Removal, by grinding, of cement, mortar, or other nonmetallic jointing material.

(3) Tuck pointing wheels. Tuck pointing wheels, usually Type 1, reinforced organic bonded wheels have diameter, thickness and hole size dimension. They are subject to the same limitations of use and mounting as Type 1 wheels defined in WAC 296-24-66001(10).

LIMITATION: Wheels used for tuck pointing should be reinforced, organic bonded.

(4) Portable grinding. A grinding operation where the grinding machine is designed to be hand held and may be easily moved from one location to another.

(5) Organic bonded wheels. Organic wheels are wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent.

(6) Safety guard. A safety guard is an enclosure designed to restrain the pieces of the grinding wheel and furnish all possible protection in the event that the wheel is broken in operation.

(7) Reinforced wheels. The term "reinforced" as applied to grinding wheels shall define a class of organic wheels which contain strengthening fabric or filament. The term "reinforced" does not cover wheels using such mechanical additions as steel rings, steel cup backs or wire or tape winding.

(8) Type 11 flaring cup wheels. Type 11 flaring cup wheels have double diameter dimensions D and J, and in addition have thickness, hole size, rim and back thickness dimensions. Grinding is always performed on rim face, W dimension. Type 11 wheels are subject to all limitations of use and mounting listed for Type 6 straight sided cup wheels definition in WAC 296-24-66001(9).

LIMITATION: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition when unthreaded hole wheels are specified the inside flat, K dimension, shall be large enough to accommodate a suitable flange.

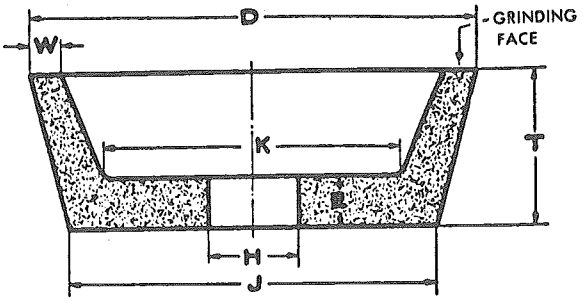


Figure P-1

Type 11—Flaring-cup wheel side grinding wheel having a wall flared or tapered outward from the back. Wall thickness at the back is normally greater than at the grinding face (W).

(9) Type 6 straight cup wheels. Type 6 cup wheels have diameter, thickness, hole size, rim thickness, and back thickness dimensions. Grinding is always performed on rim face, W dimension.

LIMITATION: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition, when unthreaded hole wheels are specified, the inside flat, K dimension, must be large enough to accommodate a suitable flange.

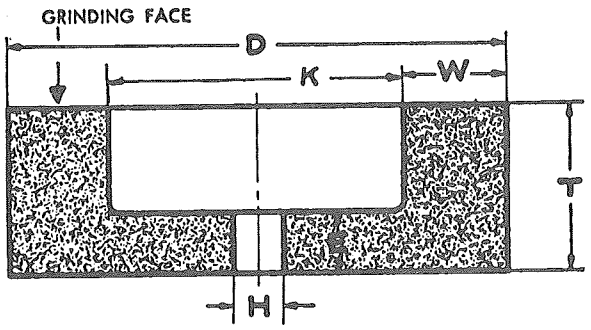


Figure P-2

Type 6—Straight-cup wheel

Side grinding wheel having a diameter, thickness and hole with one side straight or flat and the opposite side recessed. This type, however, differs from Type 5 in that the grinding is performed on the wall of the abrasive created by difference between the diameter of the recess and the outside diameter of the wheel. Therefore, the wall dimension "W" takes precedence over the diameter of the recess as an essential intermediate dimension to describe this shape type.

(10) Type 1 straight wheels. Type 1 straight wheels have a diameter, thickness, and hole size dimensions and should be used only on the periphery. Type 1 wheels shall be mounted between flanges.

LIMITATION: Hole dimension (H) should not be greater than two-thirds of wheel diameter dimension (D) for precision, cylindrical, centerless, or surface grinding applications. Maximum hole size for all other application should not exceed one-half wheel diameter.

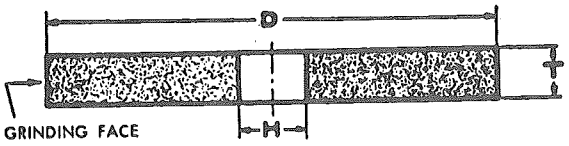


Figure P-3

Type 1—Straight wheel

Peripheral grinding wheel having a diameter, thickness and hole.

[Order 73-5, § 296-24-66001, filed 5/9/73 and Order 73-4, § 296-24-66001, filed 5/7/73.]

WAC 296-24-66003 General requirements. (1) All abrasive wheels shall be used only on machines provided with safety guards as defined in the following sections through WAC 296-24-66011.

EXCEPTIONS: This requirement shall not apply to the following classes of wheels and conditions.

(a) Wheels used for internal work while within the work being ground.

(b) Mounted wheels used in portable operations 2 inches and smaller in diameter.

(c) Types 16, 17, 18, 18R, and 19 cones and plugs and threaded hole pot balls as illustrated and described by 1.4.11 of ANSI B 7.1–1970 Safety Code for the Use, Care and Protection of Abrasive Wheels, where the work offers protection.

(2) The safety guard shall cover the spindle end, nut, and flange projections. The safety guard shall be mounted so as to maintain proper alignment with the wheel, and the strength of the fastenings shall exceed the strength of the guard.

(a) Exception: Safety guards on all operations where the work provides a suitable measure of protection to the operator, may be so constructed that the spindle end, nut, and outer flange are exposed; and where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted.

(b) Exception: The spindle end, nut, and outer flange may be exposed on portable machines designed for, and used with, type 6, 11, 27, and 28 abrasive wheels, cutting off wheels, and tuck pointing wheels.

(c) Exception: The spindle end, nut, and outer flange may be exposed on machines designed as portable saws.

[Order 74–27, § 296–24–66003, filed 5/7/74; Order 73–5, § 296–24–66003, filed 5/9/73 and Order 73–4, § 296–24–66003, filed 5/7/73.]

WAC 296–24–66005 Cup wheels. Cup wheels (Types 6 and 11) shall be guarded by:

(1) Safety guards as specified in WAC 296–24–66003; or,

(2) Special "revolving cup guards" which mount behind the wheel and turn with it. They shall be made of steel or other material with adequate strength and shall enclose the wheel sides upward from the back for one–third of the wheel thickness. The mounting features shall conform with all regulations. (See WAC 296–24–66011.) It is necessary to maintain clearance between the wheel side and the guard. The clearance shall not exceed one–sixteenth inch; or,

(3) Some other form of guard that will insure as good protection as that which would be provided by the guards specified in WAC 296–24–66005 (1) or (2).

[Order 73–5, § 296–24–66005, filed 5/9/73 and Order 73–4, § 296–24–66005, filed 5/7/73.]

WAC 296–24–66007 Vertical portable grinders. Safety guards used on machines known as right angle head or vertical portable grinders shall have a maximum exposure angle of 180°, and the guard shall be located so as to be between the operator and the wheel during use. Adjustment of guard shall be such that pieces of an accidentally broken wheel will be deflected away from the operator. (See Figure P–4.)

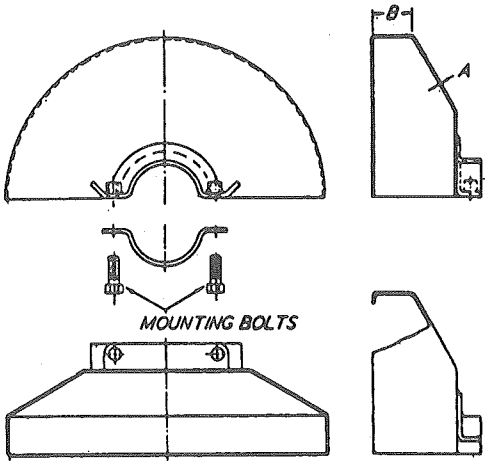


Figure No. P–4

[Order 73–5, § 296–24–66007, filed 5/9/73 and Order 73–4, § 296–24–66007, filed 5/7/73.]

WAC 296–24–66009 Other portable grinders. The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on other portable grinding machines shall not exceed 180° and the top half of the wheel shall be enclosed at all times. (See Figures P–5 and P–6.)

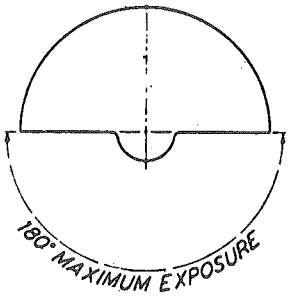


Figure No. P–5

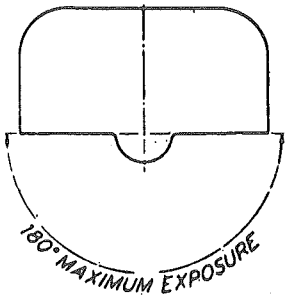


Figure No. P–6

[Order 73–5, § 296–24–66009, filed 5/9/73 and Order 73–4, § 296–24–66009, filed 5/7/73.]

WAC 296–24–66011 Mounting and inspection of abrasive wheels. (1) Immediately before mounting, all wheels shall be closely inspected and sounded by the user (ring test) to make sure they have not been damaged in transit, storage, or otherwise. The spindle speed of the machine shall be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel. Wheels should be tapped gently; if they sound cracked (dead), they shall not be used.

Note: Wheels should be tapped gently with a light nonmetallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels. This is known as the "ring test."

(2) Grinding wheels shall fit freely on the spindle and remain free under all grinding conditions. The machine spindle shall be made to nominal (standard) size plus zero minus .002 inch, and the wheel hole shall be made suitably oversize to assure safety clearance under the conditions of operating heat and pressure.

Note: A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion.

(3) All contact surfaces of wheels, blotters, and flanges shall be flat and free of foreign matter.

(4) When a bushing is used in the wheel hole it shall not exceed the width of the wheel and shall not contact the flanges.

(5) For requirements for the use of flanges and blotters see WAC 296-24-18007.

Note: Excluded machinery. Natural sandstone wheels and metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface are not covered by this section.

[Order 74-27, § 296-24-66011, filed 5/7/74; Order 73-5, § 296-24-66011, filed 5/9/73 and Order 73-4, § 296-24-66011, filed 5/7/73.]

WAC 296-24-663 Safety requirements for powder actuated fastening systems.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-663, filed 7/31/79.]

WAC 296-24-66301 Scope. This standard provides safety requirements for a powder actuated fastening tool or machine which propels a stud, pin, fastener, or other object for the purpose of affixing it by penetration to another object.

This standard does not apply to devices designed for attaching objects to soft construction materials, such as wood, plaster, tar, dry wallboard, and the like, or to stud welding equipment.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66301, filed 7/31/79.]

WAC 296-24-66303 Purpose. The purpose of this standard is to provide reasonable safety for life, limb, and property, by establishing requirements for design, construction, operation, service, and storage of powder actuated fastening tools, fasteners, and power loads.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66303, filed 7/31/79.]

WAC 296-24-66305 Definitions applicable to this section. (1) Angle control – a safety feature designed to prevent a tool from operating when tilted beyond a predetermined angle.

(2) Approved – meeting the requirements of this standard and acceptable to the department of labor and industries, division of industrial safety and health.

(3) Cased power load – a power load with the propellant contained in a closed case.

(4) Caseless power load – a power load with the propellant in solid form not requiring containment.

(5) Chamber (noun) – the location in the tool into which the power load is placed and in which it is actuated.

(6) Chamber (verb) – to fit the chamber according to manufacturer's specifications.

(7) Fasteners – any pins (unthreaded heads) or studs (threaded heads) driven by powder actuated tools.

(8) Fixture – a special shield that provides equivalent protection where the standard shield cannot be used.

(9) Head – that portion of a fastener that extends above the work surface after being properly driven.

(10) Misfire – a condition in which the power load fails to ignite after the tool has been operated.

(11) Powder actuated fastening system – a method comprising the use of a powder actuated tool, a power load, and a fastener.

(12) Powder actuated tool (also known as tool) – a tool that utilizes the expanding gases from a power load to drive a fastener.

(13) Power load – the energy source used in powder actuated tools.

(14) Qualified operator – a person who meets the requirements of WAC 296-24-66321 (1) and (2).

(15) Shield – a device, attached to the muzzle end of a tool, which is designed to confine flying particles.

(16) Spalled area – a damaged and nonuniform concrete or masonry surface.

(17) Test velocity – the measurement of fastener velocity performed in accordance with WAC 296-24-66307 (1)(m).

(18) Tools – tools can be divided into two types: Direct acting and indirect acting; and three classes: Low velocity, medium velocity, and high velocity.

(a) Direct-acting tool – a tool in which the expanding gas of the power load acts directly on the fastener to be driven.

(b) Indirect-acting tool – a tool in which the expanding gas of the power load acts on a captive piston, which in turn drives the fastener.

(c) Low-velocity tool – a tool whose test velocity has been measured ten times while utilizing the highest velocity combination of:

(i) The lightest commercially available fastener designed for that specific tool;

(ii) The strongest commercially available power load that will properly chamber in the tool;

(iii) The piston designed for that tool and appropriate for that fastener; that will produce an average test velocity from the ten tests not in excess of 100 meters per second (328 feet per second) with no single test having a velocity of over 108 m/s (354 ft/s).

(d) Medium-velocity tool – a tool whose test velocity has been measured ten times while utilizing the highest velocity combination of:

(i) The lightest commercially available fastener designed for the tool;

(ii) The strongest commercially available power load that will properly chamber in the tool;

(iii) The piston designed for that tool and appropriate for that fastener; that will produce an average test velocity from ten tests in excess of 100 m/s (328 ft/s) but not in excess of 150 m/s (492 ft/s) with no single test having a velocity of 160 m/s (525 ft/s).

(e) High-velocity tool – a tool whose test velocity has been measured ten times while utilizing the combination of:

(i) The lightest commercially available fastener designed for the tool;

(ii) The strongest commercially available power load which will properly chamber in the tool; that will produce an average velocity from the ten tests in excess of 150 m/s (492 ft/s).

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66305, filed 7/31/79.]

WAC 296-24-66307 Requirements. (1) General.

(a) The tool shall be designed to prevent inadvertent actuation.

(b) The tool shall be designed to prevent actuation when dropped in any attitude from a height of 3 meters (10 ft) onto a smooth, hard surface such as concrete or steel, if such actuation can propel a fastener or any part thereof in free flight.

(c) Actuation of the tool shall be dependent upon at least two separate and distinct operations by the operator, with at least one operation being separate from the operation of holding the tool against the work surface.

(d) The tool shall be designed not to be operable other than against a work surface with a force on the work surface equal to 22 newtons (5 lb.) greater than the weight of the tool or a minimum impact energy of 4 joules (3 ft-lb).

(e) All tools shall be designed so that compatible protective shields or fixtures, designed, built, and supplied by the manufacturer of the tool, can be used (see WAC 296-24-66307 (2)(b), (3)(b), (4)(b) and 296-24-66313(8)).

(f) The tool shall be designed so that a determinable means of varying the power levels is available for selecting a power level adequate to perform the desired work (see WAC 296-24-66309(5)).

(g) The tool shall be designed so that all principal functional parts can be checked for foreign matter that may affect operation.

(h) The tool shall be designed so that all parts will be of adequate strength to resist maximum stresses imposed upon actuation when the tool is used in accordance with the manufacturer's instructions and is powered by any commercially available power load which will properly chamber in the tool.

(i) Each tool shall bear a legible permanent model designation, which shall serve as a means of identification. Each tool shall also bear a legible, permanent manufacturer's unique serial number.

(j) A lockable container shall be provided for each tool. The words "POWDER ACTUATED TOOL" shall appear in plain sight on the outside of the container. The following notice shall be attached on the inside cover of the container:

"WARNING – POWDER ACTUATED TOOL. TO BE USED ONLY BY A QUALIFIED OPERATOR AND KEPT UNDER LOCK AND KEY WHEN NOT IN USE."

(k) Each tool shall bear a durable warning label with the following statement, or the equivalent:

"WARNING – FOR USE ONLY BY QUALIFIED OPERATORS ACCORDING TO MANUFACTURER'S INSTRUCTION MANUAL."

(l) Each tool shall be supplied with the following:

(i) Operator's instruction and service manual.

(ii) Power load chart.

(iii) Tool inspection record.

(iv) Service tools and accessories.

(m) In determining tool test velocities, the velocity of the fastener shall be measured in free flight at a distance of 2 meters (6-1/2 ft) from the muzzle end of the tool, using accepted ballistic test methods.

(2) Design requirements – low-velocity class.

(a) Low-velocity tools, indirect-acting (piston) type, as defined in WAC 296-24-66305, shall meet the requirements of WAC 296-24-66307(1).

(b) A shield shall be supplied with each tool.

(3) Design requirements – medium-velocity class.

(a) Medium-velocity tools, indirect-acting (piston) type, as defined in WAC 296-24-66305, shall meet the requirements of WAC 296-24-66307(1).

(b) The tool shall have a shield at least 63 mm (2-1/2 in) in diameter mounted perpendicular to, and concentric with, the muzzle end, when it is indexed to the center position. A special shield or fixture may be used when it provides equivalent protection.

(c) The tool shall be designed so that it cannot be actuated unless it is equipped with a shield or fixture.

(d) The tool shall be designed with angle control so that it will not actuate when equipped with the standard shield indexed to the center position if the bearing surface of the shield is tilted more than 12 degrees from a flat surface.

(4) Design requirements – high-velocity class.

(a) High-velocity tools, direct-acting or indirect-acting type, as defined in WAC 296-24-66305, shall meet the requirements of WAC 296-24-66307(1).

(b) The tool shall have a shield at least 88 mm (3-1/2 in) in diameter mounted perpendicular to, and concentric with, the muzzle end, when it is indexed to the center position. A special shield or fixture may be used when it provides equivalent protection.

(c) The tool shall be designed so that it cannot be actuated unless it is equipped with a shield or fixture.

(d) The tool shall be designed with angle control so that it will not actuate when equipped with the standard shield indexed to the center position, if the bearing surface of the shield is tilted more than eight degrees from a flat surface.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66307, filed 7/31/79.]

WAC 296-24-66309 Power loads. (1) Identification of cased power loads. Cased power loads shall be coded

to identify power load levels by case color and power load color as specified in Table P–1.

(2) Identification of caseless power loads. Caseless power loads shall be coded to identify power load levels by power load color as specified in Table P–1 and by configuration.

(3) Power load use limitation. No power load (cased or caseless) shall be used if it will properly chamber in any existing commercially available tool and will cause a fastener to have a test velocity in excess of the maximum test velocities specified for the said tool.

(4) Identification of power load packages. Power load packages shall provide a visual number–color indication of the power level of the power load as specified in Table P–1.

(5) Optional power load variation. Where means other than power loads of varying power levels are to be used to control penetration, such means shall provide an equivalent power level variation.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79–08–115 (Order 79–9), § 296–24–66309, filed 7/31/79.]

WAC 296-24-66311 Fasteners. Fasteners for use in powder actuated tools shall be designed and manufactured to function compatibly with these tools and, when used in masonry, concrete, or steel, to effect properly the application for which they are recommended.

TABLE P-1

Power Load Identification

Power Level	Color Identification		Nominal velocity	
	Case Color	Load Color	Meters per Second (± 13.5)	Feet per Second (± 45)
1	Brass	Gray	91	300
2	Brass	Brown	119	390
3	Brass	Green	146	480
4	Brass	Yellow	174	570
5	Brass	Red	201	660
6	Brass	Purple	229	750
7	Nickel	Gray	256	840
8	Nickel	Brown	283	930
9	Nickel	Green	311	1020
10	Nickel	Yellow	338	1110
11	Nickel	Red	366	1200
12	Nickel	Purple	393	1290

Note: The nominal velocity applies to a 9.53 mm (3/8–in) diameter 22.7–gram (350–grain) ballistic slug fired in a test device and has no reference to actual fastener velocity developed in any specific tool.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79–08–115 (Order 79–9), § 296–24–66311, filed 7/31/79.]

WAC 296-24-66313 Operation. (1) Only tools meeting the requirements of this standard shall be used.

(2) Only qualified operators shall operate tools.

(3) The lowest velocity class of tool that will properly set the fastener shall be used.

(4) Tools shall be operated in strict accordance with the manufacturer's instructions.

(5) Eye or face protection, or both, shall be worn by operators, assistants, and adjacent personnel when tool is in use. Hearing protection shall be used when making fastenings in confined areas.

(6) Each day, prior to use, the operator shall inspect the tool to determine that it is in proper working condition in accordance with the testing methods recommended by the manufacturer of the tool.

(7) Any tool found not to be in proper working condition shall be immediately removed from service and tagged "DEFECTIVE"; it shall not be used until it has been properly repaired in accordance with the manufacturer's instructions.

(8) The proper shield, fixture, adapter, or accessory, suited for the application, as recommended and supplied by the manufacturer, shall be used.

(9) Only those types of fasteners and power loads recommended by the tool manufacturer shall be used.

(10) Before fastening into any questionable material, the operator shall determine its suitability by using a fastener as a center punch. If the fastener point does not easily penetrate, is not blunted, and does not fracture the material, initial test fastenings shall then be made in accordance with the tool manufacturer's recommendations. (See WAC 296–24–66315(3).)

(11) No tool shall be loaded unless it is being prepared for immediate use. If the work is interrupted after loading, the tool shall be unloaded at once.

(12) Powder actuated magazine or clip–fed tools are not considered loaded unless a power load is actually in the ram (firing chamber), even though the magazine or clip is inserted in the tool. If work is interrupted, the firing chamber shall be cleared and the magazine or clip removed.

(13) Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any person; hands shall be kept clear of the open barrel end.

(14) The tool shall always be held perpendicular to the work surface when fastening into any material, except for specific applications recommended by the tool manufacturer.

(15) In the event of a misfire, the operator shall hold the tool firmly against the work surface for a period of thirty seconds and then follow the explicit instructions set forth in the manufacturer's instructions.

(16) Power loads of different power levels and types shall be kept in separate compartments or containers.

(17) A sign, at least 20 x 25 cm (8 x 10 in), using boldface type no less than 2.5 cm (1 in) in height, shall be posted in plain sight on all construction projects where tools are used. The sign shall bear wording similar to the following: "POWDER ACTUATED TOOL IN USE."

[Statutory Authority: Chapter 49.17 RCW. 89–11–035 (Order 89–03), § 296–24–66313, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79–08–115 (Order 79–9), § 296–24–66313, filed 7/31/79.]

WAC 296-24-66315 Limitations of use. (1) The tool shall not be used in an explosive or flammable atmosphere.

(2) A tool shall never be left unattended in a place where it would be available to unauthorized persons.

(3) Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, hardened steel, glass block, natural rock, hollow tile, or most brick. (See WAC 296-24-66313(10).)

(4) Fasteners shall not be driven into easily penetrated or thin materials, or materials of questionable resistance, unless backed by a material that will prevent the fastener from passing completely through the other side.

(5) Fasteners shall not be driven closer than 13 mm (1/2 in) from the edge of steel except for specific applications recommended by the tool manufacturer.

(6) Fasteners shall not be driven closer than 7.5 cm (3 in) from the unsupported edge of masonry materials except for specific applications recommended by the tool manufacturer.

(7) Fasteners shall not be driven into concrete unless material thickness is at least three times the fastener shank penetration.

(8) Fasteners shall not be driven into any spalled area.

(9) Fasteners shall not be driven through existing holes unless a specific guide means, as recommended and supplied by the tool manufacturer, is used to ensure positive alignment.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66315, filed 7/31/79.]

WAC 296-24-66317 Maintenance and storage. (1) The tool shall be serviced and inspected for worn or damaged parts at regular intervals as recommended by the tool manufacturer. Prior to the tool being put back into use, all worn or damaged parts shall be replaced by a qualified person using only parts supplied by the tool manufacturer. A record of this inspection shall be noted and dated on the tool inspection record.

(2) Instruction manuals, maintenance tools, and accessories supplied with the tool shall be stored in the tool container when not in use.

(3) Powder actuated tools and power loads shall be locked in a container and stored in a safe place when not in use and shall be accessible only to authorized personnel.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66317, filed 7/31/79.]

WAC 296-24-66319 Authorized instructor. (1) Only persons trained and authorized by the tool manufacturer or by an authorized representative of the tool manufacturer shall be qualified to instruct and qualify operators for the manufacturer's powder actuated tools.

(2) All authorized instructors shall have read and be familiar with this standard, and shall be capable of:

(a) Disassembling, servicing, and reassembling the tool.

(b) Recognizing any worn or damaged parts or defective operation.

(c) Recognizing and clearly identifying the colors used to identify power load levels.

(d) Using the tool correctly within the limitations of its use.

(e) Training and testing operators prior to issuing a qualified operator's card.

(3) All authorized instructors shall have in their possession a valid authorized instructor's card issued and signed by an authorized representative of the manufacturer. The card shall be wallet size of approximately 6 x 9 cm (2-1/2 x 3-1/2 in), and the face of the card shall bear text similar to that shown in Figure P-1.

(4) A list of all instructors authorized by the manufacturer to instruct and qualify operators shall be maintained by the tool manufacturer and be made available to the department of labor and industries, division of industrial safety and health, upon request.

(5) An instructor's card may be revoked by the authorizing agent or the department of labor and industries, division of industrial safety and health, if he is known to have issued a qualified operator's card in violation of any regulation contained in this standard. When an instructor is no longer authorized to issue qualified operator's cards, he shall surrender his card to the authorizing agent or the department of labor and industries, division of industrial safety and health.

AUTHORIZED INSTRUCTOR

---------- Powder Actuated Tools Date _____
(MAKE)
Card No. ---------- Social Security No. ------
This certifies that ----------
(NAME OF INSTRUCTOR)
has received the prescribed training in the operation and maintenance of powder actuated tools manufactured by
---------- and is qualified
(NAME OF MANUFACTURER)
to train and certify operators of ----------
(MAKE)
powder actuated tools.
Model(s) ----------
Authorized by ----------
I have received instruction by the manufacturer's authorized representative in the training of operators of the above tools and agree to conform to all rules and regulations governing the instruction of tool operators.
Date of Birth ----------

(SIGNATURE)

Figure P-1
Sample of Authorized Instructor's Card

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66319, filed 7/31/79.]

WAC 296-24-66321 Qualified operator. (1) The operator shall be trained by an authorized instructor to be familiar with the provisions of this standard and the instructions provided by the manufacturer for operation and maintenance. The operator shall also be capable of:

(a) Reading and understanding the manufacturer's instruction manual.

(b) Cleaning the tool correctly.

(c) Recognizing any worn or damaged parts or defective operation.

(d) Recognizing the number–color code system used in this standard to identify power load levels. In the event the operator is unable to distinguish the colors used, he shall be given special instruction to enable him to avoid error.

(e) Using the tool correctly within the limitations of its use and demonstrating his competence by operating the tool in the presence of the instructor.

(2) After training, the operator shall, to substantiate his competency, satisfactorily complete a written examination provided by the manufacturer of the tool.

(a) The operator's written examination shall consist of questions to establish the operator's competence with respect to:

(i) The requirements of this standard;

(ii) The powder actuated fastening system; and

(iii) The specific details of operation and maintenance of the tool(s) involved.

(b) The examination shall provide a statement, attested to by the instructor, that the applicant can (or cannot) readily distinguish the colors used to identify power load levels (see WAC 296-24-66309).

(3) Each applicant who meets the requirements as set forth in subsections (1) and (2) of this section shall receive a qualified operator's card, issued and signed by both the instructor and applicant. While using the tool, the operator shall have this card in his possession.

(4) The qualified operator's card supplied by the manufacturer shall be wallet size of approximately 6 x 9 cm (2-1/2 x 3-1/2 in), and the face of the card shall bear text similar to that shown in Figure P-2.

(5) There shall be printed on the card a notation reading:

"Revocation of card – failure to comply with any of the rules and regulations for safe operation of powder actuated fastening tools shall be cause for the immediate revocation of this card."

QUALIFIED OPERATOR

---------- Powder Actuated Tools Date -----
(MAKE)
Card No. ---------- Social Security No. ------
This certifies that ----------
(NAME OF OPERATOR)
has received the prescribed training in the operation of powder actuated tools manufactured by
----
(NAME OF MANUFACTURER)
Model(s) ----------
Trained and issued by

(SIGNATURE OF AUTHORIZED INSTRUCTOR)

I have received instruction in the safe operation and maintenance of powder actuated fastening tools of the makes and models specified and agree to conform to all rules and regulations governing that use
Date of Birth ----------

(SIGNATURE)

Figure P-2
Sample of Qualified Operator's Card

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-66321, filed 7/31/79.]

WAC 296-24-665 Power lawnmowers.

[Order 73-5, § 296-24-665, filed 5/9/73 and Order 73-4, § 296-24-665, filed 5/7/73.]

WAC 296-24-66501 Terms. (1) Blade tip circle. The path described by the outermost point of the blade as it is rotated about its shaft axis.

(2) Guards. A part or an assembly provided for shielding a hazardous area of a machine.

(3) Catcher assemblies. Parts or combinations of parts which provide a means for collecting grass clippings or debris.

(4) Walk–behind mower. A mower either pushed or self–propelled and normally guided by the operator walking behind the unit.

(5) Operator area, walk–behind mowers. For discharge interference purposes, that area confined within a circle no smaller than 30 inches in diameter, the center of which is located to the rear of the mower on its longitudinal centerline 30 inches behind the nearest blade tip circle.

(6) Power reel mower. A lawn–cutting machine utilizing a power source to rotate one or more helically formed blades about a horizontal axis to provide a shearing action with a stationary cutter bar or bed knife.

(7) Power rotary mower. A lawn–cutting machine utilizing a power source to rotate one or more cutting blades about a vertical axis.

(8) Lowest blade position. The lowest blade position under static conditions.

(9) Riding mower. A powered, self–propelled lawn–cutting vehicle on which the operator rides and controls the machine.

(10) Sulky type mower. Normally, a walk–behind mower which has been converted to a riding mower by the addition of a sulky.

(11) Deadman control. A control designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed.

[Order 73-5, § 296-24-66501, filed 5/9/73 and Order 73-4, § 296-24-66501, filed 5/7/73.]

WAC 296-24-66503 General requirements. (1) Power lawnmowers of the walk–behind, riding–rotary types, and reel power lawnmowers designed for use by employees shall meet the design specifications in "American National Standard Safety Specifications for

Power Lawnmowers" ANSI B71.1-1968. These specifications do not apply to sulky-type mowers, flail mowers, sickle-bar mowers, or mowers designed for commercial use.

(2) All power-driven chains, belts, and gears shall be so positioned or otherwise guarded to prevent the operator's accidental contact therewith, during normal starting, mounting, and operation of the machine.

(3) A shutoff device shall be provided to stop operation of the motor or engine. This device shall require manual and intentional reactivation to restart the motor or engine.

(4) All positions of the operating controls shall be clearly identified.

(5) The words, "Caution. Be sure the operating control(s) is in neutral before starting the engine," or similar wording shall be clearly visible at an engine starting control point on self-propelled mowers.

[Order 76-6, § 296-24-66503, filed 3/1/76; Order 73-5, § 296-24-66503, filed 5/9/73 and Order 73-4, § 296-24-66503, filed 5/7/73.]

WAC 296-24-66505 Walk-behind and riding rotary mowers. (1) The mower blade shall be enclosed except on the bottom and the enclosure shall extend to or below the lowest cutting point of the blade in the lowest blade position.

(2) Guards which must be removed to install a catcher assembly shall comply with the following:

(a) Warning instructions shall be affixed to the mower near the opening stating that the mower shall not be used without either the catcher assembly or the guard in place.

(b) The catcher assembly or the guard shall be shipped and sold as part of the mower.

(c) The instruction manual shall state that the mower shall not be used without either the catcher assembly or the guard in place.

(d) The catcher assembly, when properly and completely installed, shall not create a condition which violates the limits given for the guarded opening.

(3) Openings in the blade enclosure, intended for the discharge of grass, shall be limited to a maximum vertical angle of the opening of 30°. Measurements shall be taken from the lowest blade position.

(4) The total effective opening area of the grass discharge opening(s) shall not exceed 1,000 square degrees on units having a width of cut less than 27 1/2 inches, or 2,000 square degrees on units having a width of cut 27 1/2 inches or over.

(5) The word "caution" or stronger wording, shall be placed on the mower at or near each discharge opening.

(6) Blade(s) shall stop rotating from the manufacturer's specified maximum speed within 15 seconds after declutching, or shutting off power.

(7) In a multipiece blade, the means of fastening the cutting members to the body of the blade or disc shall be so designed that they will not become worn to a hazardous condition before the cutting members themselves are worn beyond use.

(8) The maximum tip speed of any blade shall be 19,000 feet per minute.

[Order 74-27, § 296-24-66505, filed 5/7/74; Order 73-5, § 296-24-66505, filed 5/9/73 and Order 73-4, § 296-24-66505, filed 5/7/73.]

WAC 296-24-66507 Walk-behind rotary mowers. (1) The horizontal angle of the opening(s) in the blade enclosure, intended for the discharge of grass, shall not contact the operator area.

(2) There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:

(a) A minimum unobstructed horizontal distance of 3 inches from the end of the discharge chute to the blade tip circle.

(b) A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.

(3) The highest point(s) on the front of the blade enclosure, except discharge openings, shall be such that any line extending a maximum of 15° downward from the horizontal toward the blade shaft axis (axes) shall not intersect the horizontal plane within the blade tip circle. The highest point(s) on the blade enclosure front, except discharge-openings, shall not exceed 1 and 1/4 inches above the lowest cutting point of the blade in the lowest blade position. Mowers with a swingover handle are to be considered as having no front in the blade enclosure and therefore shall comply with WAC 296-24-66505(1).

(4) The mower handle shall be fastened to the mower so as to prevent loss of control by unintentional uncoupling while in operation.

(5) A positive upstop or latch shall be provided for the mower handle in the normal operating position(s). The upstop shall not be subject to unintentional disengagement during normal operation of the mower. The upstop or latch shall not allow the center or the handle grips to come closer than 17 inches horizontally behind the closest path of the mower blade(s) unless manually disengaged.

(6) A swing-over handle, which complies with the above requirements, will be permitted.

(7) Wheel drive disengaging controls, except deadman controls, shall move opposite to the direction of the vehicle motion in order to disengage the drive. Deadman controls shall comply with WAC 296-24-66501(11) and may operate in any direction to disengage the drive.

[Order 74-27, § 296-24-66507, filed 5/7/74; Order 73-5, § 296-24-66507, filed 5/9/73 and Order 73-4, § 296-24-66507, filed 5/7/73.]

WAC 296-24-66509 Riding rotary mowers. (1) The highest point(s) of all openings in the blade enclosure, front shall be limited by a vertical angle of opening of 15° and a maximum distance of 1 1/4 inches above the lowest cutting point of the blade in the lowest blade position.

(2) Opening(s) shall be placed so that grass or debris will not discharge directly toward any part of an operator seated in a normal operator position.

(3) There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:

(a) A minimum unobstructed horizontal distance of 6 inches from the end of the discharge chute to the blade tip circle.

(b) A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.

(4) Mowers shall be provided with stops to prevent jackknifing or locking of the steering mechanism.

(5) Vehicle stopping means shall be provided.

(6) Hand-operated wheel drive disengaging controls shall move opposite to the direction of vehicle motion in order to disengage the drive. Foot-operated wheel drive disengaging controls shall be depressed to disengage the drive. Deadman controls, both hand and foot operated, shall comply with WAC 296-24-66501(11) and may operate in any direction to disengage the drive.

[Order 74-27, § 296-24-66509, filed 5/7/74; Order 73-5, § 296-24-66509, filed 5/9/73 and Order 73-4, § 296-24-66509, filed 5/7/73.]

WAC 296-24-670 Jacks.

[Order 73-5, § 296-24-670, filed 5/9/73 and Order 73-4, § 296-24-670, filed 5/7/73.]

WAC 296-24-67001 Jack terms. (1) Jack. A jack is an appliance for lifting and lowering or moving horizontally a load by application of a pushing force.

Note: Jacks may be of the following types: Lever and ratchet, screw and hydraulic.

(2) Rating. The rating of a jack is the maximum working load for which it is designed to lift safely that load throughout its specified amount of travel.

Note: To raise the rated load of a jack, the point of application of the load, the applied force, and the length of lever arm should be those designated by the manufacturer for the particular jack considered.

[Order 73-5, § 296-24-67001, filed 5/9/73 and Order 73-4, § 296-24-67001, filed 5/7/73.]

WAC 296-24-67003 Loading and marking. (1) The operator shall make sure that the jack used has a rating sufficient to lift and sustain the load.

(2) The rated load shall be legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means.

[Order 73-5, § 296-24-67003, filed 5/9/73 and Order 73-4, § 296-24-67003, filed 5/7/73.]

WAC 296-24-67005 Operation and maintenance. (1) In the absence of a firm foundation, the base of the jack shall be blocked. If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load.

(2) The operator shall watch the stop indicator, which shall be kept clean, in order to determine the limit of travel. The indicated limit shall not be overrun.

(3) After the load has been raised, it shall immediately be cribbed, blocked, or otherwise secured.

(4) Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid.

(5) All jacks shall be properly lubricated at regular intervals. The lubricating instructions of the manufacturer should be followed, and only lubricants recommended by him should be used.

(6) Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following:

(a) For constant or intermittent use at one locality, once every 6 months,

(b) For jacks sent out of shop for special work, when sent out and when returned,

(c) For a jack subjected to abnormal load or shock, immediately before and immediately thereafter.

(7) Repair or replacement parts shall be examined for possible defects.

(8) Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made.

[Order 73-5, § 296-24-67005, filed 5/9/73 and Order 73-4, § 296-24-67005, filed 5/7/73.]

Part H-2
SAFE PRACTICES OF ABRASIVE BLASTING OPERATIONS, VENTILATION

WAC

WAC 296-24-675 Safe practices of abrasive blasting operations.

[Order 73-5, § 296-24-675, filed 5/9/73 and Order 73-4, § 296-24-675, filed 5/7/73.]

WAC 296-24-67501 Purpose. The safety and health standards of this section are intended to protect health and to prevent injury to personnel engaged in abrasive blasting operations and to others working in the vicinity by:

(1) Control of dusts which are dispersed during abrasive blasting.

(2) Provision of an adequate amount of clean air to personnel.

(3) Protection of personnel from injury from flying particles or from moving equipment.

[Order 73-5, § 296-24-67501, filed 5/9/73 and Order 73-4, § 296-24-67501, filed 5/7/73.]

WAC 296-24-67503 Application. This standard applies to all operations where an abrasive is forcibly applied to a surface by pneumatic or hydraulic pressure or

by centrifugal force. It does not apply to steam blasting, or steam cleaning, or hydraulic cleaning methods where this work is done without the aid of abrasives.

[Order 73-5, § 296-24-67503, filed 5/9/73 and Order 73-4, § 296-24-67503, filed 5/7/73.]

WAC 296-24-67505 Selection of abrasives and equipment. Each type of abrasive and each type of equipment has its particular advantages in producing the quality of work desired, and the selection will depend on the specific requirements of the user. Therefore, no rule or suggestion can be given in this standard for the selection of a particular abrasive or of particular equipment. With properly designed equipment and proper operation and maintenance all types of abrasives and equipment can be used safely. However, abrasives which create the minimum hazard should be used wherever feasible.

[Order 73-5, § 296-24-67505, filed 5/9/73 and Order 73-4, § 296-24-67505, filed 5/7/73.]

WAC 296-24-67507 Definitions. (1) Abrasive. A solid substance used in an abrasive blasting operation.

(2) Abrasive blasting. The forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force.

(3) Abrasive-blasting respirator. A continuous flow airline respirator constructed so that it will cover the wearer's head, neck, and shoulders to protect him from rebounding abrasive.

(4) Air-line respirator. A device consisting of a face-piece, helmet, or hood to which clean air is supplied to the wearer through a small-diameter hose from a source not on the wearer's body.

(5) Blast cleaning barrel. A complete enclosure which rotates on an axis, or which has an internal moving tread to tumble the parts, in order to expose various surfaces of the parts to the action of an automatic blast spray.

(6) Blast cleaning room. A complete enclosure in which blasting operations are performed and where the operator works inside of the room to operate the blasting nozzle and direct the flow of the abrasive material.

(7) Blasting cabinet. An enclosure where the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure.

(8) Clean air. Air of such purity that it will not cause harm or discomfort to an individual if it is inhaled for extended periods of time.

(9) Dust collector. A device or combination of devices for separating dust from the air handled by an exhaust ventilation system.

(10) Exhaust ventilation system. A system for removing contaminated air from a space, comprising two or more of the elements; (a) enclosure or hood, (b) duct work, (c) dust collecting equipment, (d) exhauster, and (e) discharge stack.

(11) Particulate-filter respirator. An air purifying respirator, commonly referred to as a dust or a fume respirator, which removes most of the dust or fume from the air passing through the device.

(12) Respirable dust. Airborne dust in sizes capable of passing through the upper respiratory system to reach the lower lung passages.

(13) Rotary blast cleaning table. An enclosure where the pieces to be cleaned are positioned on a rotating table and are passed automatically through a series of blast sprays.

[Order 73-5, § 296-24-67507, filed 5/9/73 and Order 73-4, § 296-24-67507, filed 5/7/73.]

WAC 296-24-67509 Dust hazards from abrasive blasting. (1) Dust sources. Abrasives and the surface coatings on the materials blasted are shattered and pulverized during blasting operations and the dust formed will contain particles of respirable size. The composition and toxicity of the dust from these sources shall be considered in making an evaluation of the potential health hazards.

(2) Types of abrasives. A large variety of solid materials may be used as abrasives, with qualities varying from hard deep-cutting to soft polishing. These include; (a) mineral grains, either synthetic or natural, (b) metallic shot or grit, generally of steel or chilled cast iron, and (c) organic abrasives, such as ground corncobs or walnut shells.

Silica sand is the most hazardous mineral abrasive commonly used and its use should be limited wherever possible.

The potential hazard from steel or iron dust is considered to be minimal.

Readily combustible organic abrasives may be pulverized fine enough to be capable of forming explosive mixtures with air.

(3) Types of coatings. A surface coating formed during the fabrication of a part, or a protective coating applied after fabrication, will be removed and dispersed as a dust by abrasive blasting. The type of coating should be known to make a proper evaluation of the potential hazard.

(a) Silica sand is frequently imbedded in the surface of castings and may be pulverized by blast cleaning.

(b) Coatings containing toxic metals will add to the potential seriousness of the dust exposures. Examples of such coatings are anti-fouling paints containing mercury, lead paints on structural steel, cadmium plating, and lead deposits on pistons of internal combustion engines.

(c) Plastic or resin coatings may be decomposed by the action of the abrasives to form irritating by-products.

(4) Wet abrasive blasting. Wet methods will tend to keep dust exposures minimal, but droplets dispersed and dried residues which become airborne may create potential exposures.

(5) Concentrations of contaminants. The concentration of respirable dust or fumes in the breathing zone of the abrasive-blasting operator or any other worker shall be kept below the levels recommended by chapter 296-62 WAC.

(6) Use of combustible abrasives. Organic abrasives which are combustible shall be used only in automatic

systems because the fine dust produced presents a potential fire and explosion hazard.

(a) Where flammable or explosive dust mixtures may be present, the construction of the equipment, including the exhaust system and all electric wiring shall conform to the requirements of American National Standard Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z 33.1–1961 (NFPA 91–1961; NBFU 91–1961), and American National Standard National Electrical Code, C1–1968 (NFPA 70–1968). The blast nozzle shall be bonded and grounded to prevent the buildup of static charges.

(b) Where flammable or explosive dust mixtures may be present, the abrasive blasting enclosure, the ducts, and the dust collector shall be constructed with loose panels or explosion venting areas, located on sides away from any occupied area, to provide for pressure relief in case of explosion, following the principles set forth in the National Fire Protection Association Explosion Venting Guide, NFPA 68–1954.

[Order 73–5, § 296–24–67509, filed 5/9/73 and Order 73–4, § 296–24–67509, filed 5/7/73.]

WAC 296–24–67511 Blast cleaning enclosures. (1) Blast cleaning enclosures. These include rotary blast cleaning tables, blast cleaning barrels and drums, abrasive blasting cabinets, blast cleaning rooms, abrasive separators, and similar enclosures.

(2) Ventilation. Blast cleaning enclosures shall be exhaust ventilated in such a way that a continuous inward flow of air will be maintained at all openings in the enclosure, during the blasting operation. (See WAC 296–24–677.)

(3) All air inlets and access openings shall be baffled or so arranged that by the combination of inward air flow and baffling the escape of abrasive or dust particles into an adjacent work area will be minimized, not to exceed the allowable threshold limits as specified in occupational health standards, chapter 296–62 WAC.

(4) The rate of exhaust shall be sufficient to provide prompt clearance of the dust–laden air within the enclosure after the cessation of blasting.

(5) Before the enclosure is opened, the blast shall be turned off and the exhaust system shall be run for a sufficient period of time to remove the airborne dust particles within the enclosure.

(6) Observation window. Safety glass protected by screening shall be used in observation windows, where hard deep–cutting abrasives are used.

(7) Access openings. Slit abrasive–resistant baffles shall be installed in multiple sets at all small access openings where dust might escape, and shall be inspected regularly and replaced when needed.

(8) Doors shall be flanged and tight when closed.

[Order 73–5, § 296–24–67511, filed 5/9/73 and Order 73–4, § 296–24–67511, filed 5/7/73.]

WAC 296–24–67513 Exhaust ventilation systems. (1) Exhaust systems. The construction, installation, inspection, and maintenance of exhaust systems shall conform to the principles and requirements set forth in chapter 296–62 WAC.

(2) When dust leaks are noted, repairs shall be made.

(3) The static pressure drop at the exhaust ducts leading from the equipment shall be checked when the installation is completed and periodically thereafter to assure continued satisfactory operation. Whenever an appreciable change in the pressure drop indicates a partial blockage, the system shall be cleaned and returned to normal operating conditions.

(4) Abrasive separator. In installations where the abrasive is recirculated, the exhaust ventilation system for the blasting enclosure shall not be relied upon for the removal of fines from the spent abrasive instead of an abrasive separator. An abrasive separator shall be provided for the purpose.

(5) Dust collecting equipment. The air exhausted from blast cleaning equipment shall be discharged through dust collecting equipment.

(6) Dust collectors shall be set up so that the accumulated dust can be emptied and removed without contaminating other working areas.

Note: Disposal of waste. The fine dust from dry collectors should be emptied into and transported in enclosed containers to prevent dispersal of the fines, or discharged into a sluice with some method to assure wetting of the dust.

[Order 73–5, § 296–24–67513, filed 5/9/73 and Order 73–4, § 296–24–67513, filed 5/7/73.]

WAC 296–24–67515 Personal protective equipment. (1) Abrasive–blasting respirators. Abrasive–blasting respirators shall be worn by all abrasive–blasting operators (a) when working inside of blast cleaning rooms, or (b) when using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust ventilated enclosure, or (c) where concentrations of toxic dusts dispersed by the abrasive blasting may exceed the limits set in chapter 296–62 WAC.

(2) Particulate–filter respirators. Particulate–filter respirators, commonly referred to as dust–filter respirators, properly fitted, may be used for short, intermittent, or occasional dust exposures such as clean–up, dumping of dust collectors, or unloading shipments of sand at a receiving point, when it is not feasible to control the dust by enclosure, exhaust ventilation, or other means. Respirators used shall be approved for protection against the specific type of dust encountered.

(a) Dust–filter respirators shall not be used for continuous protection where silica sand is used as the blasting abrasive, or toxic materials are blasted.

(3) Personal protective clothing. Operators shall be equipped with heavy canvas or leather gloves and aprons or equivalent protection to protect them from the impact of abrasives. Safety shoes shall be worn where there is a hazard of foot injury.

(4) Personal protective clothing, equipment and their use shall comply with the provisions of WAC 296–24–

07501, 296–24–07801, 296–24–08101 through 296–24–08113, 296–24–084, and 296–24–088.

[Order 73–5, § 296–24–67515, filed 5/9/73 and Order 73–4, § 296–24–67515, filed 5/7/73.]

WAC 296–24–67517 Air supply and air compressors. (1) Clean air supply. The air for abrasive–blasting respirators shall be free of harmful quantities of dusts, mists, or noxious gases, and shall meet the requirements for air purity set forth in American National Standard Z 9.2–1960.

Note: It is preferable to provide air for an abrasive–blasting respirator by means of low pressure blowers or compressors, which do not require internal organic lubricants and which are used solely for that purpose.

(a) When air from the regular compressed air line of the plant is used for the abrasive–blasting respirator the following shall be complied with: A trap and carbon filter will be installed and regularly maintained, to remove oil, water, scale, and odor; a pressure reducing diaphragm or valve will be installed to reduce the pressure down to requirements of the particular type of abrasive–blasting respirator; and an automatic control will be provided to either sound an alarm or shut down the compressor in case of over–heating.

[Order 73–5, § 296–24–67517, filed 5/9/73 and Order 73–4, § 296–24–67517, filed 5/7/73.]

WAC 296–24–67519 Operational procedures and general safety. (1) Housekeeping. Dusts shall not be permitted to accumulate on the floor or on ledges outside of an abrasive blasting enclosure, and dust spills shall be cleaned up promptly, preferable by vacuum cleaning.

Note: Removal of dust accumulations from ledges and other dust catching surfaces should be done with a vacuum cleaner during a time when the plant is not in operation. The cleaning operator should wear a respirator approved for the existing conditions.

(a) Aisles and walkways shall be kept clear of steel shot or similar abrasive which may create a slipping hazard.

Note: Pressurized tanks for abrasive supply. If a pressurized tank is used for an abrasive supply, it should be tied in with the manual control of the nozzle mentioned in WAC 296–24–65719(2) and the relief valve or opening on the tank should be located so as to be safely vented.

(2) Nozzles. Blast cleaning nozzle shall be equipped with an operating valve which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.

(3) Tempered air. If taken directly from the outside of the building, the air entering a blast cleaning room through the air supply inlets should be tempered during cold weather.

[Order 73–5, § 296–24–67519, filed 5/9/73 and Order 73–4, § 296–24–67519, filed 5/7/73.]

WAC 296–24–677 Ventilation.

[Order 73–5, § 296–24–677, filed 5/9/73 and Order 73–4, § 296–24–677, filed 5/7/73.]

WAC 296–24–67701 Scope. The applicable minimum requirements as specified in chapter 296–62 WAC relating to ventilation and the following rules shall be complied with:

(1) Blast cleaning enclosures. Blast cleaning enclosures shall be exhaust ventilated in such a way that a continuous inward flow of air will be maintained at all openings in the enclosure, during the blasting operation.

(2) Inlet baffled. Because of the wide variety of conditions, it is not possible to set rigid standards for rates of exhaust or for control velocities that will be suited to all types of enclosures and all types of work. In general, the use of free silica abrasives and the generation of toxic dusts in abrasive blasting require higher control velocities. With well designed equipment and excellent labyrinth baffling at openings it is possible to prevent the escape of abrasives and dust with lower control velocities.

(3) Air velocities. The performance of the equipment will be the final criterion and the exhaust ventilation must (a) keep the escape of dust from the enclosure to a minimum, (b) maintain a reasonable visibility in blast cleaning rooms and cabinets, and (c) provide for rapid clearance of the dust laden air within the enclosure to permit the enclosure to be opened. Experience has indicated control velocities that are needed to minimize the escape of dust from enclosures and these are given in the following subsections.

(4) Blast cleaning cabinet. The recommended inward air velocity at the hand openings is a minimum of 500 fpm calculated on the free opening without the curtains. The high control velocity is needed because the operator's working position is close to the openings.

(5) Rotary blast cleaning tables. The access openings should be baffled with multiple slit–baffle curtains. The recommended inward air velocity at the access opening is 200 to 250 fpm calculated on the free opening without the curtains.

(6) Blast cleaning rooms. In blast cleaning rooms, the air inlets must be well baffled to prevent the escape of abrasive and the recommended inward air velocity at the air inlets is a minimum of 300 feet per minute.

(7) Abrasive separators, bucket elevators, and other accessory abrasive handling systems. The recommended inward air velocity at all openings is 200 to 250 fpm.

[Order 73–5, § 296–24–67701, filed 5/9/73 and Order 73–4, § 296–24–67701, filed 5/7/73.]

Part I
WELDING, CUTTING AND BRAZING

WAC

WAC 296–24–680 Welding, cutting, and brazing.

[Order 73–5, § 296–24–680, filed 5/9/73 and Order 73–4, § 296–24–680, filed 5/7/73.]

WAC 296–24–68001 Definitions. (1) "Welder" and "welding operator" mean any operator of electric or gas welding and cutting equipment.

(2) "Approved" means listed or approved by a nationally recognized testing laboratory. Refer to WAC 296–24–58501(19) for definitions of listed and approved, and federal regulation 29 CFR 1910.7 for nationally recognized testing laboratory.

(3) All other welding terms are used in accordance with American Welding Society–Terms and Definitions–A3.0–1969.

[Statutory Authority: Chapter 49.17 RCW. 88–23–054 (Order 88–25), § 296–24–68001, filed 11/14/88; Order 73–5, § 296–24–68001, filed 5/9/73 and Order 73–4, § 296–24–68001, filed 5/7/73.]

WAC 296–24–682 Installation and operation of oxygen fuel gas systems for welding and cutting.

[Order 73–5, § 296–24–682, filed 5/9/73 and Order 73–4, § 296–24–682, filed 5/7/73.]

WAC 296–24–68201 General requirements. (1) Flammable mixture. Mixtures of fuel gases and air or oxygen may be explosive and shall be guarded against. No device or attachment facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption, except at the burner or in a standard torch, shall be allowed unless approved for the purpose.

(2) Maximum pressure. Under no condition shall acetylene be generated, piped (except in approved cylinder manifolds) or utilized at a pressure in excess of 15 p.s.i. gage pressure or 30 p.s.i. absolute pressure. (The 30 p.s.i. absolute pressure limit is intended to prevent unsafe use of acetylene in pressurized chambers such as caissons, underground excavations or tunnel construction.) This requirement does not apply to storage of acetylene dissolved in a suitable solvent in cylinders manufactured and maintained according to U.S. Department of Transportation requirements, or to acetylene for chemical use. The use of liquid acetylene shall be prohibited.

(3) Apparatus. Only approved apparatus such as torches, regulators or pressure–reducing valves, acetylene generators, and manifolds shall be used. Use of replacement tips will not nullify the "approved apparatus" status of a torch, if such replacement tips are made to the same specifications as the original tip of the torch at the time of approval by the nationally recognized testing laboratory, or if the use of such tips in conjunction with convertor/adaptors results in the same specifications as the original tip at the time of approval by the nationally recognized testing laboratory.

(4) Personnel. Workmen in charge of the oxygen or fuel–gas supply equipment, including generators, and oxygen or fuel–gas distribution piping systems shall be instructed and judged competent by their employers for this important work before being left in charge. Rules and instructions covering the operation and maintenance of oxygen or fuel–gas supply equipment including generators, and oxygen or fuel–gas distribution piping systems shall be readily available.

[Statutory Authority: Chapter 49.17 RCW. 89–11–035 (Order 89–03), § 296–24–68201, filed 5/15/89, effective 6/30/89; Order 73–5, § 296–24–68201, filed 5/9/73 and Order 73–4, § 296–24–68201, filed 5/7/73.]

WAC 296–24–68203 Cylinders and containers. (1) Approval and marking. All portable cylinders used for the storage and shipment of compressed gases shall be constructed and maintained in accordance with the regulations of the United States Department of Transportation, 49 CFR Parts 171–179.

(a) Compressed gas cylinders shall be legibly marked, for the purpose of identifying the gas content, with either the chemical or the trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable. Whenever practical, the marking shall be located on the shoulder of the cylinder.

Note: This method conforms to the American National Standard Method for Marking Portable Compressed Gas Containers to Identify the Material Contained, ANSI Z 48.1–1954.

(b) Compressed gas cylinders shall be equipped with connections complying with the American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI B 57.1–1965.

(c) All cylinders with a water weight capacity of over thirty pounds shall be equipped with means of connecting a valve protection cap or with a collar or recess to protect the valve.

(2) Storage of cylinders – general.

(a) Cylinders shall be kept away from radiators and other sources of heat.

(b) Inside of buildings, cylinders shall be stored in a well–protected, well–ventilated, dry location, at least twenty feet from highly combustible materials such as oil or excelsior. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.

(c) Empty cylinders shall have their valves closed.

(d) Valve protection caps, where cylinder is designed to accept a cap, shall always be in place, hand–tight, except when cylinders are in use or connected for use.

(3) Fuel–gas cylinder storage. Inside a building, cylinders, except those in actual use or attached ready for use, shall be limited to a total gas capacity of two thousand cubic feet or three hundred pounds of liquefied petroleum gas.

(a) For storage in excess of two thousand cubic feet total gas capacity of cylinders or three hundred pounds of liquefied petroleum gas, a separate room or compartment conforming to the requirements specified in WAC 296–24–68211 (6)(h) and (i) shall be provided, or cylinders shall be kept outside or in a special building. Special buildings, rooms or compartments shall have no open flame for heating or lighting and shall be well ventilated. They may also be used for storage of calcium carbide in quantities not to exceed six hundred pounds, when contained in metal containers complying with WAC 296–24–68213 (1)(a) and (b). Signs should be conspicuously posted in such rooms reading, "Danger—No smoking, matches or open lights," or other equivalent wording.

(b) Acetylene cylinders shall be stored valve end up.

(4) Oxygen storage.

(a) Oxygen cylinders shall not be stored near highly combustible material, especially oil and grease; or near reserve stocks of carbide and acetylene or other fuel–gas cylinders, or near any other substance likely to cause or accelerate fire; or in an acetylene generator compartment.

(b) Oxygen cylinders stored in outside generator houses shall be separated from the generator or carbide storage rooms by a noncombustible partition having a fire–resistance rating of at least one hour. This partition shall be without openings and shall be gastight.

(c) Oxygen cylinders in storage shall be separated from fuel–gas cylinders or combustible materials (especially oil or grease), a minimum distance of twenty feet or by a noncombustible barrier at least five feet high having a fire–resistance rating of at least one–half hour.

(d) Where a liquid oxygen system is to be used to supply gaseous oxygen for welding or cutting and the system has a storage capacity of more than thirteen thousand cubic feet of oxygen (measured at 14.7 psi(a) and 70°F), connected in service or ready for service, or more than twenty–five thousand cubic feet of oxygen (measured at 14.7 psi(a) and 70°F), including unconnected reserves on hand at the site, it shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566–1965.

(5) Operating procedures.

(a) Cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free from oily or greasy substances. Oxygen cylinders or apparatus shall not be handled with oily hands or gloves. A jet of oxygen must never be permitted to strike an oily surface, greasy clothes, or enter a fuel oil or other storage tank.

(b) When transporting cylinders by a crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or electric magnets shall not be used for this purpose. Valve–protection caps, where cylinder is designed to accept a cap, shall always be in place.

(c) Cylinders shall not be dropped or struck or permitted to strike each other violently.

(d) Valve–protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve–protection caps to pry cylinders loose when frozen to the ground or otherwise fixed; the use of warm (not boiling) water is recommended. Valve–protection caps are designed to protect cylinder valves from damage.

(e) Unless cylinders are secured on a special truck, regulators shall be removed and valve–protection caps, when provided for, shall be put in place before cylinders are moved.

(f) Cylinders not having fixed hand wheels shall have keys, handles, or nonadjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installations only one key or handle is required for each manifold.

(g) Cylinder valves shall be closed before moving cylinders.

(h) Cylinder valves shall be closed when work is finished.

(i) Valves of empty cylinders shall be closed.

(j) Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them, or fire–resistant shields shall be provided.

(k) Cylinders shall not be placed where they might become part of an electric circuit. Contacts with third rails, trolley wires, etc., shall be avoided. Cylinders shall be kept away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines. Any practice such as the tapping of an electrode against a cylinder to strike an arc shall be prohibited.

(l) Cylinders shall never be used as rollers or supports, whether full or empty.

(m) The numbers and markings stamped into cylinders shall not be tampered with.

(n) No person, other than the gas supplier, shall attempt to mix gases in a cylinder. No one, except the owner of the cylinder or person authorized by him, shall refill a cylinder.

(o) No one shall tamper with safety devices in cylinders or valves.

(p) Cylinders shall not be dropped or otherwise roughly handled.

(q) Unless connected to a manifold, oxygen from a cylinder shall not be used without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, the valve shall be opened slightly for an instant and then closed. (Always stand to one side of the outlet when opening the cylinder valve.)

(r) A hammer or wrench shall not be used to open cylinder valves. If valves cannot be opened by hand, the supplier shall be notified.

(s) Cylinder valves shall not be tampered with nor should any attempt be made to repair them. If trouble is experienced, the supplier should be sent a report promptly indicating the character of the trouble and the cylinder's serial number. Supplier's instructions as to its disposition shall be followed.

(t) Complete removal of the stem from a diaphragm–type cylinder valve shall be avoided.

(u) Fuel–gas cylinders shall be placed with valve end up whenever they are in use. Liquefied gases shall be stored and shipped with the valve end up.

(v) Cylinders shall be handled carefully. Cylinders shall not be subjected to rough handling, knocks, or falls which are liable to damage the cylinder, valve or safety devices and cause leakage.

(w) Before connecting a regulator to a cylinder valve, the valve shall be opened slightly and closed immediately. The valve shall be opened while standing to one side of the outlet; never in front of it. Fuel–gas cylinder valves shall not be cracked near other welding work or near sparks, flame, or other possible sources of ignition.

(x) Before a regulator is removed from a cylinder valve, the cylinder valve shall be closed and the gas released from the regulator.

(y) Nothing shall be placed on top of an acetylene cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.

(z) If cylinders are found to have leaky valves or fittings which cannot be stopped by closing of the valve, the cylinders shall be taken outdoors away from sources of ignition and slowly emptied.

(aa) A warning should be placed near cylinders having leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition. Such cylinders should be plainly tagged; the supplier should be promptly notified and his instructions followed as to their return.

(bb) Safety devices shall not be tampered with.

(cc) Fuel–gas shall not be used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.

(dd) The cylinder valve shall always be opened slowly.

(ee) An acetylene cylinder valve shall not be opened more than one and one–half turns of the spindle, and preferably no more than three–fourths of a turn.

(ff) Where a special wrench is required it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel–gas flow can be quickly turned off in case of emergency. In the case of manifolded or coupled cylinders at least one such wrench shall always be available for immediate use.

(gg) When cylinders are transported by powered vehicle they shall be secured in a vertical position.

(hh) A suitable cylinder truck, chain, or other steadying device shall be used to prevent cylinders from being knocked over while in use.

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-24-68203, filed 5/11/88; Order 73-5, § 296-24-68203, filed 5/9/73 and Order 73-4, § 296-24-68203, filed 5/7/73.]

WAC 296-24-68205 Manifolding of cylinders. (1) Fuel–gas manifolds.

(a) Manifolds shall be approved either separately for each component part or as an assembled unit.

(b) Except as provided in (1)(c) of this section fuel–gas cylinders connected to one manifold inside a building shall be limited to a total capacity not exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel–gas. More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet apart or separated by a noncombustible barrier at least 5 feet high having a fire–resistance rating of at least one–half hour.

(c) Fuel–gas cylinders connected to one manifold having an aggregate capacity exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel–gas shall be located outdoors, or in a separate building or room constructed in accordance with WAC 296-24-68211 (6)(h) and (i).

(d) Separate manifold buildings or rooms may also be used for the storage of drums of calcium carbide and cylinders containing fuel gases as provided in WAC 296-24-68203(3). Such buildings or rooms shall have no open flames for heating or lighting and shall be well–ventilated.

(e) High–pressure fuel–gas manifolds shall be provided with approved pressure regulating devices.

(2) High–pressure oxygen manifolds (for use with cylinders having a department of transportation service pressure above 200 p.s.i.g.).

(a) Manifolds shall be approved either separately for each component or as an assembled unit.

(b) Oxygen manifolds shall not be located in an acetylene generator room. Oxygen manifolds shall be separated from fuel–gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire–resistance rating of at least one–half hour.

(c) Except as provided in WAC 296-24-68205 (2)(d) oxygen cylinders connected to one manifold shall be limited to a total gas capacity of 6,000 cubic feet. More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet apart or separated by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

(d) An oxygen manifold, to which cylinders having an aggregate capacity of more than 6,000 cubic feet of oxygen are connected, should be located outdoors or in a separate noncombustible building. Such a manifold, if located inside a building having other occupancy, shall be located in a separate room of noncombustible construction having a fire-resistance rating of at least one-half hour or in an area with no combustible material within 20 feet of the manifold.

(e) An oxygen manifold or oxygen bulk supply system which has storage capacity of more than 13,000 cubic feet of oxygen (measured at 14.7 p.s.i.a. and 70°F), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (measured at 14.7 p.s.i.a. and 70°F), including unconnected reserves on hand at the site, shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566-1965.

(f) High-pressure oxygen manifolds shall be provided with approved pressure-regulating devices.

(3) Low-pressure oxygen manifolds (for use with cylinders having a department of transportation service pressure not exceeding 200 p.s.i.g.).

(a) Manifolds shall be of substantial construction suitable for use with oxygen at a pressure of 250 p.s.i.g. They shall have a minimum bursting pressure of 1,000 p.s.i.g. and shall be protected by a safety relief device which will relieve at a maximum pressure of 500 p.s.i.g.

Note: DOT-4L200 cylinders have safety devices which relieve at a maximum pressure of 250 p.s.i.g. (or 235 p.s.i.g. if vacuum insulation is used).

(b) Hose and hose connections subject to cylinder pressure shall comply with WAC 296-24-68209(5). Hose shall have a minimum bursting pressure of 1,000 p.s.i.g.

(c) The assembled manifold including leads shall be tested and proven gas-tight at a pressure of 300 p.s.i.g. The fluid used for testing oxygen manifolds shall be oil-free and not combustible.

(d) The location of manifolds shall comply with WAC 296-24-68205 (2)(b), (c), (d) and (e).

(e) The following sign shall be conspicuously posted at each manifold:

Low-Pressure Manifold
Do Not Connect High-Pressure Cylinders
Maximum Pressure—250 P.S.I.G.

(4) Portable outlet headers.

(a) Portable outlet headers shall not be used indoors except for temporary service where the conditions preclude a direct supply from outlets located on the service piping system.

(b) Each outlet on the service piping from which oxygen or fuel-gas is withdrawn to supply a portable outlet header shall be equipped with a readily accessible shutoff valve.

(c) Hose and hose connections used for connecting the portable outlet header to the service piping shall comply with WAC 296-24-68209(5).

(d) Master shutoff valves for both oxygen and fuel-gas shall be provided at the entry end of the portable outlet header.

(e) Portable outlet headers for fuel-gas service shall be provided with an approved hydraulic back-pressure valve installed at the inlet and preceding the service outlets, unless an approved pressure-reducing regulator, an approved backflow check valve, or an approved hydraulic back-pressure valve is installed at each outlet. Outlets provided on headers for oxygen service may be fitted for use with pressure-reducing regulators or for direct hose connection.

(f) Each service outlet on portable outlet headers shall be provided with a valve assembly that includes a detachable outlet seal cap, chained or otherwise attached to the body of the valve.

(g) Materials and fabrication procedures for portable outlet headers shall comply with WAC 296-24-68207 (1), (2) and (5).

(h) Portable outlet headers shall be provided with frames which will support the equipment securely in the correct operating position and protect them from damage during handling and operation.

(5) Manifold operating procedures.

(a) Cylinder manifolds shall be installed under the supervision of someone familiar with the proper practices with reference to their construction and use.

(b) All component parts used in the methods of manifolding described in (1)(a) through (e) of this section shall be approved as to materials, design and construction either separately or as an assembled unit.

(c) All manifolds and parts used in methods of manifolding shall be used only for the gas or gases for which they are approved.

(d) When acetylene cylinders are coupled, approved flash arresters shall be installed between each cylinder and the coupler block. For outdoor use only, and when the number of cylinders coupled does not exceed three, one flash arrester installed between the coupler block and regulator is acceptable.

(e) Each fuel-gas cylinder lead should be provided with a backflow check valve.

(f) The aggregate capacity of fuel-gas cylinders connected to a portable manifold inside a building shall not exceed 3,000 cubic feet of gas.

(g) Acetylene and liquefied fuel-gas cylinders shall be manifolded in a vertical position.

(h) The pressure in the gas cylinders connected to and discharged simultaneously through a common manifold shall be approximately equal.

[Order 73-5, § 296-24-68205, filed 5/9/73 and Order 73-4, § 296-24-68205, filed 5/7/73.]

WAC 296-24-68207 Service piping systems. (1) Materials and design. (a) Piping and fittings shall comply with Section 2, Industrial Gas and Air Piping Systems, of the American National Standard Code for Pressure Piping, ANSI B 31.1-1967, insofar as it does not conflict with WAC 296-24-68207 (1)(b) and (c).

(b) Pipe shall be at least Schedule 40 and fittings shall be at least standard weight in sizes up to and including 6-inch nominal.

(c) Copper tubing shall be Types K or L in accordance with the Standard Specification for Seamless Copper Water Tube, ASTM B88-66a.

(d) Piping shall be steel, wrought iron, brass or copper pipe, or seamless copper, brass or stainless steel tubing, except as provided in WAC 296-24-68207 (1)(e), (f), (g), (h) and (i).

(e) Oxygen piping and fittings at pressures in excess of 700 p.s.i.g., shall be stainless steel or copper alloys.

(f) Hose connections and hose complying with WAC 296-24-68209(5) may be used to connect the outlet of a manifold pressure regulator to piping providing the working pressure of the piping is 250 p.s.i.g. or less and the length of the hose does not exceed 5 feet. Hose shall have a minimum bursting pressure of 1,000 p.s.i.g.

(g) When oxygen is supplied to a service piping system from a low-pressure oxygen manifold without an intervening pressure regulating device, the piping system shall have a minimum design pressure of 250 p.s.i.g. A pressure regulating device shall be used at each station outlet when the connected equipment is for use at pressures less than 250 p.s.i.g.

(h) Piping for acetylene or acetylenic compounds shall be steel or wrought iron.

(i) Unalloyed copper shall not be used for acetylene or acetylenic compounds except in listed equipment.

(2) Piping joints.

(a) Joints in steel or wrought iron piping shall be welded, threaded or flanged. Fittings, such as ells, tees, couplings, and unions, may be rolled, forged or cast steel, maleable iron or nodular iron. Gray or white cast iron fittings are prohibited.

(b) Joints in brass or copper pipe shall be welded, brazed, threaded, or flanged. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800°F) filler metal.

(c) Joints in seamless copper, brass, or stainless steel tubing shall be approved gas tubing fittings or the joints shall be brazed. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800°F) filler metal.

(3) Installation.

(a) Distribution lines shall be installed and maintained in a safe operating condition.

(b) Piping located inside or outside of buildings may be placed above or below ground. All piping shall be run as directly as practicable, protected against physical damage, proper allowance being made for expansion and contraction, jarring and vibration. Pipe laid underground in earth shall be located below the frost line and protected against corrosion. After assembly, piping shall be thoroughly blown out with air or nitrogen to remove foreign materials. For oxygen piping, only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used.

(c) Only piping which has been welded or brazed shall be installed in tunnels, trenches or ducts. Shutoff valves shall be located outside such conduits. Oxygen piping may be placed in the same tunnel, trench or duct with fuel-gas pipelines, provided there is good natural or forced ventilation.

(d) Low points in piping carrying moist gas shall be drained into drip pots constructed so as to permit pumping or draining out the condensate at necessary intervals. Drain valves shall be installed for this purpose having outlets normally closed with screw caps or plugs. No open end valves or petcocks shall be used, except that in drips located out of doors, underground, and not readily accessible, valves may be used at such points if they are equipped with means to secure them in the closed position. Pipes leading to the surface of the ground shall be cased or jacketed where necessary to prevent loosening or breaking.

(e) Gas cocks or valves shall be provided for all buildings at points where they will be readily accessible for shutting off the gas supply to these buildings in any emergency. Underground valve boxes or manholes should be avoided wherever possible. There shall also be provided a shutoff valve in the discharge line from the generator, gas holder, manifold or other source of supply.

(f) Shutoff valves shall not be installed in safety relief lines in such a manner that the safety relief device can be rendered ineffective.

(g) Fittings and lengths of pipe shall be examined internally before assembly and, if necessary, freed from scale or dirt. Oxygen piping and fittings shall be washed out with a suitable solution which will effectively remove grease and dirt but will not react with oxygen.

Note: Hot water solutions of caustic soda or trisodium phosphate are effective cleaning agents for this purpose.

(h) Piping shall be thoroughly blown out after assembly to remove foreign materials. For oxygen piping, oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used. For other piping, air or inert gas may be used.

(i) When flammable gas lines or other parts of equipment are being purged of air or gas, open lights or other sources of ignition shall not be permitted near uncapped openings.

(j) No welding or cutting shall be performed on an acetylene or oxygen pipeline, including the attachment of hangers or supports, until the line has been purged. Only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used to purge oxygen lines.

(4) Painting and signs.

(a) Underground pipe and tubing and outdoor ferrous pipe and tubing shall be covered or painted with a suitable material for protection against corrosion.

(b) Aboveground piping systems shall be marked in accordance with the American National Standard

Scheme for the Identification of Piping Systems, ANSI A 13.1–1956.

(c) Station outlets shall be marked to indicate the name of the gas.

(5) Testing.

(a) Piping systems shall be tested and proved gastight at 1 1/2 times the maximum operating pressure, and shall be thoroughly purged of air before being placed in service. The material used for testing oxygen lines shall be oil free and noncombustible. Flames shall not be used to detect leaks.

(b) When flammable gas lines or other parts of equipment are being purged of air or gas, sources of ignition shall not be permitted near uncapped openings.

[Order 73–5, § 296–24–68207, filed 5/9/73 and Order 73–4, § 296–24–68207, filed 5/7/73.]

WAC 296-24-68209 Protective equipment, hose, and regulators. (1) General. Equipment shall be installed and used only in the service for which it is approved and as recommended by the manufacturer.

(2) Pressure relief devices. Service piping systems shall be protected by pressure relief devices set to function at not more than the design pressure of the systems and discharging upwards to a safe location.

(3) Piping protective equipment.

(a) The fuel–gas and oxygen piping systems, including portable outlet headers shall incorporate the protective equipment shown in Figures Q–1, Q–2, and Q–3.

When only a portion of a fuel–gas system is to be used with oxygen, only that portion need comply with (3)(a) of this section.

(b) Approved protective equipment (designated P_F in Figs. Q–1, Q–2, and Q–3) shall be installed in fuel–gas piping to prevent:

(i) Backflow of oxygen into the fuel–gas supply system;

(ii) Passage of a flash back into the fuel–gas supply system; and

(iii) Excessive back pressure of oxygen in the fuel–gas supply system. The three functions of the protective equipment may be combined in one device or may be provided by separate devices.

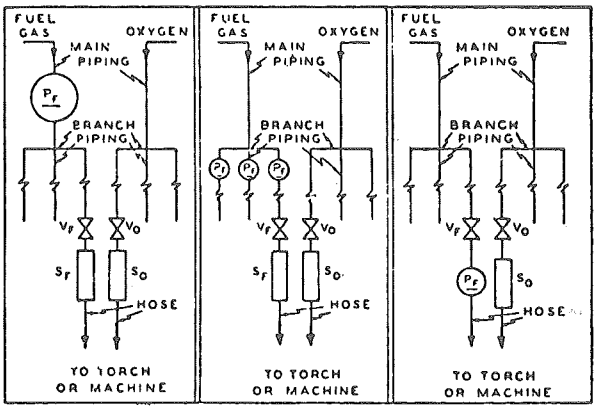


Fig. Q–1 Fig. Q–2 Fig. Q–3

LEGEND
P_F—Protective equipment in fuel gas piping
V_F—Fuel gas station outlet valve
V_O—Oxygen station outlet valve
S_F—Backflow prevention device(s) at fuel gas station outlet
S_O—Backflow prevention device(s) at oxygen station outlet

(c) The protective equipment shall be located in the main supply line, as in Figure Q–1 or at the head of each branch line, as in Figure Q–2 or at each location where fuel–gas is withdrawn, as in Figure Q–3. Where branch lines are of 2–inch pipe size or larger or of substantial length, protective equipment (designated as P_F) shall be located as shown in either Q–2 and Q–3.

(d) Backflow protection shall be provided by an approved device that will prevent oxygen from flowing into the fuel–gas system or fuel from flowing into the oxygen system (see S_F, Figs. Q–1 and Q–2).

(e) Flash–back protection shall be provided by an approved device that will prevent flame from passing into the fuel–gas system.

(f) Back–pressure protection shall be provided by an approved pressure–relief device set at a pressure not greater than the pressure rating of the backflow or the flashback protection device, whichever is lower. The pressure–relief device shall be located on the downstream side of the backflow and flashback protection devices. The vent from the pressure–relief device shall be at least as large as the relief device inlet and shall be installed without low points that may collect moisture. If low points are unavoidable, drip pots with drains closed with screw plugs or caps shall be installed at the low points. The vent terminus shall not endanger personnel or property through gas discharge; shall be located away from ignition sources; and shall terminate in a hood or bend.

(g) If pipeline protective equipment incorporates a liquid, the liquid level shall be maintained, and a suitable anti–freeze may be used to prevent freezing.

(h) Fuel gas for use with equipment not requiring oxygen shall be withdrawn upstream of the piping protective devices.

(4) Station outlet protective equipment.

(a) A check valve pressure regulator, hydraulic seal, or combination of these devices shall be provided at each station outlet, including those on portable headers, to prevent backflow, as shown in Figures Q–1, Q–2, and Q–3 and designated as S_F and S_O.

(b) When approved pipeline protective equipment (designated P_F) is located at the station outlet as in Figure Q–3, no additional check valve, pressure regulator, or hydraulic seal is required.

(c) A shutoff valve (designated V_F and V_O) shall be installed at each station outlet and shall be located on the upstream side of other station outlet equipment.

(d) If the station outlet is equipped with a detachable regulator, the outlet shall terminate in a union connection that complies with the Regulator Connection Standards, 1958, Compressed Gas Association.

(e) If the station outlet is connected directly to a hose, the outlet shall terminate in a union connection complying with the Standard Hose Connection Specifications, 1957, Compressed Gas Association.

(f) Station outlets may terminate in pipe threads to which permanent connections are to be made, such as to a machine.

(g) Station outlets shall be equipped with a detachable outlet seal cap secured in place. This cap shall be used to seal the outlet except when a hose, a regulator, or piping is attached.

(h) Where station outlets are equipped with approved backflow and flashback protective devices, as many as four torches may be supplied from one station outlet through rigid piping, provided each outlet from such piping, is equipped with a shutoff valve and provided the fuel–gas capacity of any one torch does not exceed 15 cubic feet per hour. This rule does not apply to machines.

(5) Hose and hose connections.

(a) Hose for oxy–fuel gas service shall comply with the Specification for Rubber Welding Hose, 1958, Compressed Gas Association and Rubber Manufacturers Association.

(b) The generally recognized colors are red for acetylene and other fuel–gas hose, green for oxygen hose, and black for inert–gas and air hose.

(c) When parallel lengths of oxygen and acetylene hose are taped together for convenience and to prevent tangling, not more than 4 inches out of 12 inches shall be covered by tape.

(d) Hose connections shall comply with the Standard Hose Connection Specifications, 1957, Compressed Gas Association.

(e) Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than a pressure of 300 p.s.i. Oil–free air or an oil–free inert gas shall be used for the test.

(f) Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall be repaired or replaced.

(6) Pressure–reducing regulators.

(a) Pressure–reducing regulators shall be used only for the gas and pressures for which they are intended. The regulator inlet connections shall comply with Regulator Connection Standards, 1958, Compressed Gas Association.

(b) When regulators or parts of regulators, including gages, need repair, the work shall be performed by skilled mechanics who have been properly instructed.

(c) Gages on oxygen regulators shall be marked "USE NO OIL."

(d) Union nuts and connections on regulators shall be inspected before use to detect faulty seats which may cause leakage of gas when the regulators are attached to the cylinder valves. Damaged nuts or connections shall be destroyed.

[Order 73–5, § 296–24–68209, filed 5/9/73 and Order 73–4, § 296–24–68209, filed 5/7/73.]

WAC 296–24–68211 Acetylene generators. (1) Approval and marking.

(a) Generators shall be of approved construction and shall be plainly marked with the maximum rate of acetylene in cubic feet per hour for which they are designed; the weight and size of carbide necessary for a single charge; the manufacturer's name and address; and the name or number of the type of generator.

(b) Carbide shall be of the size marked on the generator nameplate.

(2) Rating and pressure limitations.

(a) The total hourly output of a generator shall not exceed the rate for which it is approved and marked. Unless specifically approved for higher ratings, carbide–feed generators shall be rated at 1 cubic foot per hour per pound of carbide required for a single complete charge.

(b) Relief valves shall be regularly operated to insure proper functioning. Relief valves for generating chambers shall be set to open at a pressure not in excess of 15 p.s.i.g. Relief valves for hydraulic back pressure valves shall be set to open at a pressure not in excess of 20 p.s.i.g.

(c) Nonautomatic generators shall not be used for generating acetylene at pressures exceeding 1 p.s.i.g., and all water overflows shall be visible.

(3) Location. The space around the generator shall be ample for free, unobstructed operation and maintenance and shall permit ready adjustment and charging.

(4) Stationary acetylene generators (automatic and nonautomatic).

(a) The foundation shall be so arranged that the generator will be level and so that no excessive strain will be placed on the generator or its connections. Acetylene generators shall be grounded.

(b) Generators shall be placed where water will not freeze. The use of common salt (sodium chloride) or other corrosive chemicals for protection against freezing is not permitted. (For heating systems see WAC 296–24–68211 (6)(k).)

(c) Except when generators are prepared in accordance with WAC 296-24-68211 (7)(i), sources of ignition shall be prohibited in outside generator houses or inside generator rooms.

(d) Water shall not be supplied through a continuous connection to the generator except when the generator is provided with an adequate open overflow or automatic water shutoff which will effectively prevent overfilling of the generator. Where a noncontinuous connection is used, the supply line shall terminate at a point not less than 2 inches above the regularly provided opening for filling so that the water can be observed as it enters the generator.

(e) Unless otherwise specifically approved, generators shall not be fitted with continuous drain connections leading to sewers, but shall discharge through an open connection into a suitably vented outdoor receptacle or residue pit which may have such connections. An open connection for the sludge drawoff is desirable to enable the generator operator to observe leakage of generating water from the drain valve or sludge cock.

(f) Each generator shall be provided with a vent pipe of Schedule 40 galvanized iron or steel, except that outside of buildings, vent pipes larger than 4 inches in diameter may be not less than 14 gage galvanized tubing or sheet steel.

(g) The escape or relief pipe shall be rigidly installed without traps and so that any condensation will drain back to the generator.

(h) The escape or relief pipe shall be carried full size to a suitable point outside the building. It shall terminate in a hood or bend located at least 12 feet above the ground, preferably above the roof, and as far away as practicable from windows or other openings into buildings and as far away as practicable from sources of ignition such as flues or chimneys and tracks used by locomotives. Generating chamber relief pipes shall not be inter-connected but shall be separately led to the outside air. The hood or bend shall be so constructed that it will not be obstructed by rain, snow, ice, insects, or birds. The outlet shall be at least 3 feet from combustible construction.

(i) Gas holders shall be constructed on the gasometer principle, the bell being suitably guided. The gas bell shall move freely without tendency to bind and shall have a clearance of at least 2 inches from the shell.

(j) The gas holder may be located in the generator room, in a separate room or out of doors. In order to prevent collapse of the gas bell or infiltration of air due to a vacuum caused by the compressor or booster pump or cooling of the gas, a compressor or booster cutoff shall be provided at a point 12 inches or more above the landing point of the bell. When the gas holder is located indoors, the room shall be ventilated in accordance with WAC 296-24-68211 (6)(j) and heated and lighted in accordance with WAC 296-24-68211 (6)(k) and (1).

(k) When the gas holder is not located within a heated building, gas holder seals shall be protected against freezing.

(l) Means shall be provided to stop the generator-feeding mechanism before the gas holder reaches the upper limit of its travel.

(m) When the gas holder is connected to only one generator, the gas capacity of the holder shall be not less than one-third of the hourly rating of the generator.

(n) If acetylene is used from the gas holder without increase in pressure at some points but with increase in pressure by a compressor or booster pump at other points, approved piping protective devices shall be installed in each supply line. The low-pressure protective device shall be located between the gas holder and the shop piping, and the medium-pressure protective device shall be located between the compressor or booster pump and the shop piping (see Figure Q-4). Approved protective equipment (designated P_F) is used to prevent: Backflow of oxygen into the fuel-gas supply system; passage of a flashback into the fuel-gas supply system; and excessive back pressure of oxygen in the fuel-gas supply system. The three functions of the protective equipment may be combined in one device or may be provided by separate devices.

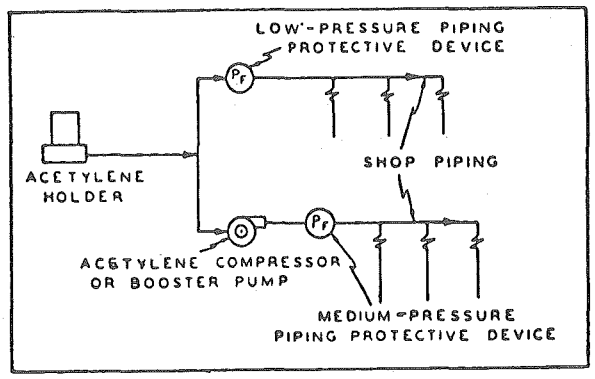


Figure Q-4

(o) The compressor or booster system shall be of an approved type.

(p) Wiring and electrical equipment in compressor or booster pump rooms or enclosures shall conform to the provisions of the National Electrical Code, Part 5, NFPA-1971, Article 501, (ANSI-C 1-1971) for Class I, Division 2 locations.

(q) Compressors and booster pump equipment shall be located in well-ventilated areas away from open flames, electrical or mechanical sparks, or other ignition sources.

(r) Compressor or booster pumps shall be provided with pressure relief valves which will relieve pressure exceeding 15 p.s.i.g. to a safe outdoor location as provided in WAC 296-24-68211 (2)(b), or by returning the gas to the inlet side or to the gas supply source.

(s) Compressor or booster pump discharge outlets shall be provided with approved protective equipment. (See WAC 296-24-68211 (4)(e).)

(5) Portable acetylene generators.

(a) All portable generators shall be of a type approved for portable use.

(b) Portable generators shall not be used within 10 feet of combustible material other than the floor.

(c) Portable generators shall not be used in rooms of total volume less than 35 times the total gas-generating capacity per charge of all generators in the room. Generators shall not be used in rooms having a ceiling height of less than 10 feet. (To obtain the gas-generating capacity in cubic feet per charge, multiply the pounds of carbide per charge by 4.5.)

(d) Portable generators shall be protected against freezing. The use of salt or other corrosive chemical to prevent freezing is prohibited.

(e) Portable generators shall be cleaned and recharged and the air mixture blown off outside buildings.

(f) When charged with carbide, portable generators shall not be moved by crane or derrick.

(g) When not in use, portable generators shall not be stored in rooms in which open flames are used unless the generators contain no carbide and have been thoroughly purged of acetylene. Storage rooms shall be well ventilated.

(h) When portable acetylene generators are to be transported and operated on vehicles, they shall be securely anchored to the vehicles. If transported by truck, the motor shall be turned off during charging, cleaning, and generating periods.

(i) Portable generators shall be located at a safe distance from the welding position so that they will not be exposed to sparks, slag, or misdirection of the torch flame or overheating from hot materials or processes.

(6) Outside generator houses and inside generator rooms for stationary acetylene generators.

(a) No opening in any outside generator house shall be located within 5 feet of any opening in another building.

(b) Walls, floors and roofs of outside generator houses shall be of noncombustible construction.

(c) When a part of the generator house is to be used for the storage or manifolding of oxygen cylinders, the space to be so occupied shall be separated from the generator carbide storage section by partition walls continuous from floor to roof or ceiling, of the type of construction stated in WAC 296-24-68211 (6)(h). Such separation walls shall be without openings and shall be joined to the floor, other walls and ceiling or roof in a manner to effect a permanent gas-tight joint.

(d) Exit doors shall be located so as to be readily accessible in case of emergency.

(e) Explosion venting for outside generator houses and inside generator rooms shall be provided in exterior walls or roofs. The venting areas shall be equal to not less than 1 square foot per 50 cubic feet of room volume and may consist of any one or any combination of the following: Walls of light, noncombustible material preferably single-thickness, single-strength glass; lightly fastened hatch covers; lightly fastened swinging doors in exterior walls opening outward; lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot.

(f) The installation of acetylene generators within buildings shall be restricted to buildings not exceeding one story in height: *Provided, however,* That this will not be construed as prohibiting such installations on the roof or top floor of a building exceeding such height.

(g) Generators installed inside buildings shall be enclosed in a separate room of ample size.

(h) The walls, partitions, floors, and ceilings of inside generator rooms shall be of noncombustible construction having a fire-resistance rating of at least 1 hour. The walls or partitions shall be continuous from floor to ceiling and shall be securely anchored. At least one wall of the room shall be an exterior wall.

(i) Openings from an inside generator room to other parts of the building shall be protected by a swinging type, self-closing fire door for a Class B opening and having a rating of at least 1 hour. Windows in partitions shall be wired glass and approved metal frames with fixed sash. Installation shall be in accordance with the Standard for the Installation of Fire Doors and Windows, NFPA 80-1970.

(j) Inside generator rooms or outside generator houses shall be well ventilated with vents located at floor and ceiling levels.

(k) Heating shall be by steam, hot water, enclosed electrically heated elements or other indirect means. Heating by flames or fires shall be prohibited in outside generator houses or inside generator rooms, or in any enclosure communicating with them.

(l) Generator houses or rooms shall have natural light during daylight hours. Where artificial lighting is necessary it shall be restricted to electric lamps installed in a fixed position. Unless specifically approved for use in atmospheres containing acetylene, such lamps shall be provided with enclosures of glass or other noncombustible material so designed and constructed as to prevent gas vapors from reaching the lamp or socket and to resist breakage. Rigid conduit with threaded connections shall be used.

(m) Lamps installed outside of wired-glass panels set in gas-tight frames in the exterior walls or roof of the generator house or room are acceptable.

(n) Electric switches, telephones, and all other electrical apparatus which may cause a spark, unless specifically approved for use inside acetylene generator rooms, shall be located outside the generator house or in a room or space separated from the generator room by a gas-tight partition, except that where the generator system is designed so that no carbide fill opening or other part of the generator is open to the generator house or room during the operation of the generator, and so that residue is carried in closed piping from the residue discharge valve to a point outside the generator house or room, electrical equipment in the generator house or room shall conform to the provisions of the National Electrical Code, Part 5, NFPA-1971, Article 501, (ANSI-C 1-1971) for Class I, Division 2 locations.

(7) Maintenance and operation.

(a) Unauthorized persons shall not be permitted in outside generator houses or inside generator rooms.

(b) Operating instructions shall be posted in a conspicuous place near the generator or kept in a suitable place available for ready reference.

(c) When recharging generators the order of operations specified in the instructions supplied by the manufacturer shall be followed.

(d) In the case of batch–type generators, when the charge of carbide is exhausted and before additional carbide is added, the generating chamber shall always be flushed out with water, renewing the water supply in accordance with the instruction card furnished by the manufacturer.

(e) The water–carbide residue mixture drained from the generator shall not be discharged into sewer pipes or stored in areas near open flames. Clear water from residue settling pits may be discharged into sewer pipes.

(f) The carbide added each time the generator is recharged shall be sufficient to refill the space provided for carbide without ramming the charge. Steel or other ferrous tools shall not be used in distributing the charge.

(g) Generator water chambers shall be kept filled to proper level at all times except while draining during the recharging operation.

(h) Whenever repairs are to be made or the generator is to be charged or carbide is to be removed, the water chamber shall be filled to the proper level.

(i) Previous to making repairs involving welding, soldering, or other hot work or other operations which produce a source of ignition, the carbide charge and feed mechanism shall be completely removed. All acetylene shall be expelled by completely flooding the generator shell with water and the generator shall be disconnected from the piping system. The generator shall be kept filled with water, if possible, or positioned to hold as much water as possible.

(j) Hot repairs shall not be made in a room where there are other generators unless all the generators and piping have been purged of acetylene. Hot repairs should preferably be made out of doors.

[Order 73–5, § 296–24–68211, filed 5/9/73 and Order 73–4, § 296–24–68211, filed 5/7/73.]

WAC 296–24–68213 Calcium carbide storage. (1) Packaging.

(a) Calcium carbide shall be contained in metal packages of sufficient strength to prevent rupture. The packages shall be provided with a screw top or equivalent. These packages shall be constructed water– and air–tight. Solder shall not be used in such a manner that the package will fail if exposed to fire.

(b) Packages containing calcium carbide shall be conspicuously marked "calcium carbide–dangerous if not kept dry" or with equivalent warning.

(c) Caution: Metal tools, even the so–called spark resistant type may cause ignition of an acetylene and air mixture when opening carbide containers.

(d) Sprinkler systems shall not be installed in carbide storage rooms.

(2) Storage indoors.

(a) Calcium carbide in quantities not to exceed 600 pounds may be stored indoors in dry, waterproof, and well–ventilated locations.

(b) Calcium carbide not exceeding 600 pounds may be stored indoors in the same room with fuel–gas cylinders.

(c) Packages of calcium carbide, except for one of each size, shall be kept sealed. The seals shall not be broken when there is carbide in excess of 1 pound in any other unsealed package of the same size of carbide in the room.

(d) Calcium carbide exceeding 600 pounds but not exceeding 5,000 pounds shall be stored:

(i) In accordance with (2)(e) of this section.

(ii) In an inside generator room or outside generator house; or

(iii) In a separate room in a one–story building which may contain other occupancies, but without cellar or basement beneath the carbide storage section. Such rooms shall be constructed in accordance with WAC 296–24–68211 (6)(h) and (i) and ventilated in accordance with WAC 296–24–68211 (6)(j). These rooms shall be used for no other purpose.

(e) Calcium carbide in excess of 5,000 pounds shall be stored in one–story buildings without cellar or basement and used for no other purpose, or in outside generator houses. The location of such storage buildings shall be away from congested mercantile and manufacturing districts. If the storage building is of noncombustible construction, it may adjoin other one–story buildings if separated therefrom by unpierced firewalls; if it is detached less than 10 feet from such building or buildings, there shall be no opening in any of the mutually exposing sides of such buildings within 10 feet. If the storage building is of combustible construction, it shall be at least 20 feet from any other one– or two–story building, and at least 30 feet from any other building exceeding two stories.

(3) Storage outdoors.

(a) Calcium carbide in unopened metal containers may be stored outdoors.

(b) Carbide containers to be stored outdoors shall be examined to make sure that they are airtight and watertight. Periodic reexaminations shall be made for rusting or other damage to a container that might affect its water or air tightness.

(c) The bottom tier of each row shall be placed on wooden planking or equivalent so that the containers will not come in contact with the ground or ground water.

(d) Storage areas shall be at least 10 feet from lines of adjoining property that may be built upon.

(e) Containers of carbide which have been in storage the longest shall be used first.

[Order 73–5, § 296–24–68213, filed 5/9/73 and Order 73–4, § 296–24–68213, filed 5/7/73.]

WAC 296–24–68215 Public exhibitions and demonstrations. (1) Installation requirements. Installation and operation of welding, cutting, and related equipment shall be done by, or under the supervision of, a competent operator to insure the personal protection of viewers and demonstrators as well as the protection from fire, of materials in and around the site and the building itself.

(2) Procedures.

(a) Cylinders containing compressed gases for use at the site shall not be charged in excess of one-half their maximum permissible content. (Cylinders of nonliquefied gases and acetylene shall be charged to not more than one-half their maximum permissible charged pressure in p.s.i.g. Cylinders of liquefied gases shall be charged to not more than one-half the maximum permissible capacity in pounds.)

(b) Cylinders located at the site shall be connected for use except that enough additional cylinders may be stored at the site to furnish approximately 1 day's consumption of each gas used. Other cylinders shall be stored, in an approved storage area, preferably outdoors, but this storage area shall not be located near a building exit.

(c) Cylinders in excess of 40 pounds total weight being transported to or from the site shall be carried on a hand or motorized truck.

(d) The site shall be constructed, equipped, and operated in such a manner that the demonstration will be carried out so as to minimize the possibility of injury to viewers.

(e) Sites involving the use of compressed gases shall be located so as not to interfere with the egress of people during an emergency.

(f) The fire department shall be notified in advance of such use of the site.

(g) Each site shall be provided with a portable fire extinguisher of appropriate size and type and with a pail of water.

(h) The public and combustible materials at the site shall be protected from flames, sparks, and molten metal.

(i) Hoses shall be located and protected so that they will not be physically damaged.

(j) Cylinder valves shall be closed when equipment is unattended.

(k) Where caps are provided for valve protection, such caps shall be in place except when the cylinders are in service or connected ready for service.

(l) Cylinders shall be located or secured so that they cannot be knocked over.

[Order 73-5, § 296-24-68215, filed 5/9/73 and Order 73-4, § 296-24-68215, filed 5/7/73.]

WAC 296-24-685 Application, installation, and operation of arc welding and cutting equipment.

[Order 73-5, § 296-24-685, filed 5/9/73 and Order 73-4, § 296-24-685, filed 5/7/73.]

WAC 296-24-68501 General. (1) Equipment selection. Welding equipment shall be chosen for safe application to the work to be done as specified in WAC 296-24-68503.

(2) Installation. Welding equipment shall be installed safely as specified by WAC 296-24-68505.

(3) Instruction. Workmen designated to operate arc welding equipment shall have been properly instructed and qualified to operate such equipment as specified in WAC 296-24-68507.

[Order 73-5, § 296-24-68501, filed 5/9/73 and Order 73-4, § 296-24-68501, filed 5/7/73.]

WAC 296-24-68503 Application of arc welding equipment.

Note: Assurance of consideration of safety in design is obtainable by choosing apparatus complying with the Requirements for Electric Arc-Welding Apparatus, NEMA EW-1-1962, National Electrical Manufacturers Association or the Safety Standard for Transformer-Type Arc-Welding Machines, ANSI C33.2-1956, Underwriters' Laboratories.

(1) Environmental conditions.

(a) Standard machines for arc welding service shall be designed and constructed to carry their rated load with rated temperature rises where the temperature of the cooling air does not exceed 40°C (104°F) and where the altitude does not exceed 3,300 feet, and shall be suitable for operation in atmospheres containing gases, dust, and light rays produced by the welding arc.

(b) Unusual service conditions may exist, and in such circumstances machines shall be especially designed to safely meet the requirements of the service. Chief among these conditions are exposure to:

(i) Unusually corrosive fumes.

(ii) Steam or excessive humidity.

(iii) Excessive oil vapor.

(iv) Flammable gases.

(v) Abnormal vibration or shock.

(vi) Excessive dust.

(vii) Weather.

(viii) Unusual seacoast or shipboard conditions.

(2) Voltage. Open circuit (no load) voltages of arc welding and cutting machines should be as low as possible consistent with satisfactory welding or cutting being done. The following limits shall not be exceeded:

(a) Alternating-current machines.

(i) Manual arc welding and cutting—80 volts.

(ii) Automatic (machine or mechanized) arc welding and cutting—100 volts.

(b) Direct-current machines.

(i) Manual arc welding and cutting—100 volts.

(ii) Automatic (machine or mechanized) arc welding and cutting—100 volts.

(c) When special welding and cutting processes require values of open circuit voltages higher than the above, means shall be provided to prevent the operator from making accidental contact with the high voltage by adequate insulation or other means.

Note: For a.c. welding under wet conditions or warm surroundings where perspiration is a factor, the use of reliable automatic controls for reducing no load voltage is recommended to reduce the shock hazard.

(3) Design.

(a) A controller integrally mounted in an electric motor driven welder shall have capacity for carrying rated motor current, shall be capable of making and interrupting stalled rotor current of the motor, and may serve as the running overcurrent device if provided with the number of over-current units as specified by the National Electrical Code, Part 5 of NFPA-1971 (ANSI-C 1-1971). Starters with magnetic undervoltage release should be used with machines installed more than one to

a circuit to prevent circuit overload caused by simultaneously starting of several motors upon return of voltage.

(b) On all types of arc welding machines, control apparatus shall be enclosed except for the operating wheels, levers, or handles.

Note: Control handles and wheels should be large enough to be easily grasped by a gloved hand.

(c) Input power terminals, tap change devices and live metal parts connected to input circuits shall be completely enclosed and accessible only by means of tools.

(d) Terminals for welding leads should be protected from accidental electrical contact by employees or by metal objects i.e., vehicles, crane hooks, etc. Protection may be obtained by use of: Dead–front receptacles for plug connections; recessed openings with nonremovable hinged covers; heavy insulating sleeving or taping or other equivalent electrical and mechanical protection. If a welding lead terminal which is intended to be used exclusively for connection to the work is connected to the grounded enclosure, it must be done by a conductor at least two AWG sizes smaller than the grounding conductor and the terminal shall be marked to indicate that it is grounded.

(e) No connections for portable control devices such as push buttons to be carried by the operator shall be connected to an a.c. circuit of higher than 120 volts. Exposed metal parts of portable control devices operating on circuits above 50 volts shall be grounded by a grounding conductor in the control cable.

(f) Auto transformers or a.c. reactors shall not be used to draw welding current directly from any a.c. power source having a voltage exceeding 80 volts.

[Order 73–5, § 296–24–68503, filed 5/9/73 and Order 73–4, § 296–24–68503, filed 5/7/73.]

WAC 296-24-68505 Installation of arc welding equipment. (1) General. Installation including power supply shall be in accordance with the requirements of the National Electrical Code, Part 5 of NFPA–1971 (ANSI–C 1–1971).

(2) Grounding.

(a) The frame or case of the welding machine (except engine–driven machines) shall be grounded under the conditions and according to the methods prescribed in National Electrical Code, Part 5 of NFPA–1971 (ANSI–C 1–1971).

(b) Conduits containing electrical conductors shall not be used for completing a work–lead circuit. Pipelines shall not be used as a permanent part of a work–lead circuit, but may be used during construction, extension or repair providing current is not carried through threaded joints, flanged bolted joints, or caulked joints and that special precautions are used to avoid sparking at connection of the work–lead cable.

(c) Chains, wire ropes, cranes, hoists, and elevators shall not be used to carry welding current.

(d) Where a structure, conveyor, or fixture is regularly employed as a welding current return circuit, joints shall be bonded or provided with adequate current collecting devices and appropriate periodic inspection should be conducted to ascertain that no condition of electrolysis or shock, or fire hazard exists by virtue of such use.

(e) All ground connections shall be checked to determine that they are mechanically strong and electrically adequate for the required current.

(3) Supply connections and conductors.

(a) A disconnecting switch or controller shall be provided at or near each welding machine which is not equipped with such a switch or controller mounted as an integral part of the machine. The switch shall be in accordance with the National Electrical Code, Part 5 of NFPA–1971 (ANSI–C 1–1971). Overcurrent protection shall be provided as specified in the National Electrical Code, Part 5 of NFPA–1971 (ANSI–C 1–1971). A disconnect switch with overload protection or equivalent disconnect and protection means, permitted by the National Electrical Code, Part 5 of NFPA–1971 (ANSI–C 1–1971) shall be provided for each outlet intended for connection to a portable welding machine.

(b) For individual welding machines, the rated current–carrying capacity of the supply conductors shall be not less than the rated primary current of the welding machines.

(c) For groups of welding machines, the rated current–carrying capacity of conductors may be less than the sum of the rated primary currents of the welding machines supplied. The conductor rating shall be determined in each case according to the machine loading based on the use to be made of each welding machine and the allowance permissible in the event that all the welding machines supplied by the conductors will not be in use at the same time.

(d) In operations involving several welders on one structure, d.c. welding process requirements may require the use of both polarities; or supply circuit limitations for a.c. welding may require distribution of machines among the phases of the supply circuit. In such cases no load voltages between electrode holders will be 2 times normal in d.c. or 1, 1.4, 1.73, or 2 times normal on a.c. machines. Similar voltage differences will exist if both a.c. and d.c. welding are done on the same structure.

(i) All d.c. machines shall be connected with the same polarity.

(ii) All a.c. machines shall be connected to the same phase of the supply circuit and with the same instantaneous polarity.

[Order 73–5, § 296–24–68505, filed 5/9/73 and Order 73–4, § 296–24–68505, filed 5/7/73.]

WAC 296-24-68507 Operation and maintenance. (1) General. Workmen assigned to operate or maintain arc welding equipment shall be acquainted with the requirements of WAC 296–24–68501 through 296–24–68505, 296–24–69501 through 296–24–69507, 296–24–70001 through 296–24–70007 and 296–24–71501 through 296–24–71525; if doing gas–shielded arc welding, also Recommended Safe Practices for Gas–Shielded Arc Welding, A6.1–1966, American Welding Society.

(2) Machine hook up. Before starting operations all connections to the machine shall be checked to make

certain they are properly made. The work lead shall be firmly attached to the work; magnetic work clamps shall be freed from adherent metal particles of spatter on contact surfaces. Coiled welding cable shall be spread out before use to avoid serious overheating and damage to insulation.

(3) Grounding. Grounding of the welding machine frame shall be checked. Special attention shall be given to safety ground connections of portable machines.

(4) Leaks. There shall be no leaks of cooling water, shielding gas or engine fuel.

(5) Switches. It shall be determined that proper switching equipment for shutting down the machine is provided.

(6) Manufacturers' instructions. Printed rules and instructions covering operation of equipment supplied by the manufacturers shall be strictly followed.

(7) Electrode holders. Electrode holders when not in use shall be so placed that they cannot make electrical contact with persons, conducting objects, fuel or compressed gas tanks.

(8) Electric shock. Cables with splices within 10 feet of the holder shall not be used. The welder should not coil or loop welding electrode cable around parts of his body.

(9) Maintenance.

(a) The operator should report any equipment defect or safety hazard to his supervisor and the use of the equipment shall be discontinued until its safety has been assured. Repairs shall be made only by qualified personnel.

(b) Machines which have become wet shall be thoroughly dried and tested before being used.

(c) Work and electrode lead cables should be frequently inspected for wear and damage. Cables with damaged insulation or exposed bare conductors shall be replaced. Joining lengths of work and electrode cables shall be done by the use of connecting means specifically intended for the purpose. The connecting means shall have insulation adequate for the service conditions.

[Order 73-5, § 296-24-68507, filed 5/9/73 and Order 73-4, § 296-24-68507, filed 5/7/73.]

WAC 296-24-690 Installation and operation of resistance welding equipment.

[Order 73-5, § 296-24-690, filed 5/9/73 and Order 73-4, § 296-24-690, filed 5/7/73.]

WAC 296-24-69001 General. (1) Installation. All equipment shall be installed by a qualified electrician in conformance with the National Electrical Code, Part 5 of NFPA-1971 (ANSI-C 1-1971). There shall be a safety-type disconnecting switch or a circuit breaker or circuit interrupter to open each power circuit to the machine, conveniently located at or near the machine, so that the power can be shut off when the machine or its controls are to be serviced.

(2) Thermal protection. Ignitron tubes used in resistance welding equipment shall be equipped with a thermal protection switch.

(3) Personnel. Workmen designated to operate resistance welding equipment shall have been properly instructed and judged competent to operate such equipment.

(4) Guarding. Controls of all automatic or air and hydraulic clamps shall be arranged or guarded to prevent the operator from accidentally activating them.

[Order 73-5, § 296-24-69001, filed 5/9/73 and Order 73-4, § 296-24-69001, filed 5/7/73.]

WAC 296-24-69003 Spot and seam welding machines (nonportable). (1) Voltage. All external weld initiating control circuits shall operate on low voltage, not over 120 volts.

(2) Capacitor welding. Stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over 550 volts) shall be suitably insulated and protected by complete enclosures, all doors of which shall be provided with suitable interlocks and contacts wired into the control circuit (similar to elevator interlocks). Such interlocks or contacts shall be so designed as to effectively interrupt power and short circuit all capacitors when the door or panel is open. A manually operated switch or suitable positive device shall be installed, in addition to the mechanical interlocks or contacts, as an added safety measure assuring absolute discharge of all capacitors.

(3) Interlocks. All doors and access panels of all resistance welding machines and control panels shall be kept locked and interlocked to prevent access, by unauthorized persons, to live portions of the equipment.

(4) Guarding. All press welding machine operations, where there is a possibility of the operator's fingers being under the point of operation, shall be effectively guarded by the use of a device such as an electronic eye safety circuit, two hand controls or protections similar to that prescribed for punch press operation, WAC 296-24-19501 through 296-24-19513. All chains, gears, operating bus linkage, and belts shall be protected by adequate guards, in accordance with WAC 296-24-20501 through 296-24-20533.

(5) Shields. The hazard of flying sparks shall be, wherever practical, eliminated by installing a shield guard of safety glass or suitable fire-resistant plastic at the point of operation. Additional shields or curtains shall be installed as necessary to protect passing persons from flying sparks. (See WAC 296-24-70003 (1)(c).)

(6) Foot switches. All foot switches shall be guarded to prevent accidental operation of the machine.

(7) Stop buttons. Two or more safety emergency stop buttons shall be provided on all special multispot welding machines, including 2-post and 4-post weld presses.

(8) Safety pins. On large machines, four safety pins with plugs and receptacles (one in each corner) shall be provided so that when safety pins are removed and inserted in the ram or platen, the press becomes inoperative.

(9) Grounding. Where technically practical, the secondary of all welding transformers used in multispot, protection and seam welding machines shall be grounded. This may be done by permanently grounding

one side of the welding secondary current circuit. Where not technically practical, a center tapped grounding reactor connected across the secondary or the use of a safety disconnect switch in conjunction with the welding control are acceptable alternates. Safety disconnect shall be arranged to open both sides of the line when welding current is not present.

[Order 73-5, § 296-24-69003, filed 5/9/73 and Order 73-4, § 296-24-69003, filed 5/7/73.]

WAC 296-24-69005 Portable welding machines. (1) Counter-balance. All portable welding guns shall have suitable counter-balanced devices for supporting the guns, including cables, unless the design of the gun or fixture makes counterbalancing impractical or unnecessary.

(2) Safety chains. All portable welding guns, transformers and related equipment that is suspended from overhead structures, eye beams, trolleys, etc., shall be equipped with safety chains or cables. Safety chains or cables shall be capable of supporting the total shock load in the event of failure of any component of the supporting system.

(3) Clevis. When trolleys are used to support portable welding equipment, they shall be equipped with suitable forged steel clevis for the attachment of safety chains. Each clevis shall be capable of supporting the total shock load of the suspended equipment in the event of trolley failure.

(4) Switch guards. All initiating switches, including retraction and dual schedule switches, located on the portable welding gun shall be equipped with suitable guards capable of preventing accidental initiation through contact with fixturing, operator's clothing, etc. Initiating switch voltage shall not exceed 24 volts.

(5) Moving holder. The movable holder, where it enters the gun frame, shall have sufficient clearance to prevent the shearing of fingers carelessly placed on the operating movable holder.

(6) Grounding. The secondary and case of all portable welding transformers shall be grounded. Secondary grounding may be by center tapped secondary or by a center tapped grounding reactor connected across the secondary.

[Order 73-5, § 296-24-69005, filed 5/9/73 and Order 73-4, § 296-24-69005, filed 5/7/73.]

WAC 296-24-69007 Flash welding equipment. (1) Ventilation and flash guard. Flash welding machines shall be equipped with a hood to control flying flash. In cases of high production, where materials may contain a film of oil and where toxic elements and metal fumes are given off, ventilation shall be provided in accordance with WAC 296-24-71501 through 296-24-71525.

(2) Fire curtains. For the protection of the operators of nearby equipment, fire-resistant curtains or suitable shields shall be set up around the machine and in such a manner that the operators movements are not hampered.

(3) If the welding process cannot be isolated, all persons who may be exposed to the hazard of arc flash shall be properly protected.

[Order 74-27, § 296-24-69007, filed 5/7/74; Order 73-5, § 296-24-69007, filed 5/9/73 and Order 73-4, § 296-24-69007, filed 5/7/73.]

WAC 296-24-69009 Hazards and precautions. A job hazard analysis shall be made, by qualified personnel, of the operations to be performed on each welding machine to determine the safeguards and personal protective equipment that shall be used for each job.

[Order 73-5, § 296-24-69009, filed 5/9/73 and Order 73-4, § 296-24-69009, filed 5/7/73.]

WAC 296-24-69011 Maintenance. Periodic inspection shall be made by qualified maintenance personnel, and records of the same maintained. The operator shall be instructed to report any equipment defects to his supervisor and the use of the equipment shall be discontinued until safety repairs have been completed.

[Order 73-5, § 296-24-69011, filed 5/9/73 and Order 73-4, § 296-24-69011, filed 5/7/73.]

WAC 296-24-695 Fire prevention and protection.

[Order 73-5, § 296-24-695, filed 5/9/73 and Order 73-4, § 296-24-695, filed 5/7/73.]

WAC 296-24-69501 Basic precautions. For elaboration of these basic precautions and of the special precautions of WAC 296-24-69503 as well as a delineation of the fire protection and prevention responsibilities of welders and cutters, their supervisors (including outside contractors) and those in management on whose property cutting and welding is to be performed, see, Standard for Fire Prevention in Use of Cutting and Welding Processes, NFPA Standard 51B, 1962. The basic precautions for fire prevention in welding or cutting work are:

(1) Fire hazards. If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity shall be taken to a safe place.

(2) Guards. If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.

(3) Restrictions. If the requirements stated in WAC 296-24-69501 (1) and (2) cannot be followed then welding and cutting shall not be performed.

[Order 73-5, § 296-24-69501, filed 5/9/73 and Order 73-4, § 296-24-69501, filed 5/7/73.]

WAC 296-24-69503 Special precautions. When the nature of the work to be performed falls within the scope of WAC 296-24-69501(2) certain additional precautions may be necessary:

(1) Combustible material. Wherever there are floor openings or cracks in the flooring that cannot be closed, precautions shall be taken so that no readily combustible materials on the floor below will be exposed to sparks which might drop through the floor. The same precautions shall be observed with regard to cracks or holes in walls, open doorways and open or broken windows.

(2) Fire extinguishers. Suitable fire extinguishing equipment shall be maintained in a state of readiness for

instant use. Such equipment may consist of pails of water, buckets of sand, hose or portable extinguishers depending upon the nature and quantity of the combustible material exposed.

(3) Fire watch.

(a) Fire watchers shall be required whenever welding or cutting is performed in locations where other than a minor fire might develop, or any of the following conditions exist:

(i) Appreciable combustible material, in building construction or contents, closer than 35 feet to the point of operation.

(ii) Appreciable combustibles are more than 35 feet away but are easily ignited by sparks.

(iii) Wall or floor openings within a 35–foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors.

(iv) Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

(b) Fire watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm. A fire watch shall be maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

(4) Authorization. Before cutting or welding is permitted, the area shall be inspected by the individual responsible for authorizing cutting and welding operations. He shall designate precautions to be followed in granting authorization to proceed preferably in the form of a written permit.

(5) Floors. Where combustible materials such as paper clippings, wood shavings, or textile fibers are on the floor, the floor shall be swept clean for a radius of 35 feet. Combustible floors shall be kept wet, covered with damp sand, or protected by fire–resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock.

(6) Prohibited areas. Cutting or welding shall not be permitted in the following situations:

(a) In areas not authorized by management.

(b) In sprinklered buildings while such protection is impaired.

(c) In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts.

(d) In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulphur, baled paper, or cotton.

(7) Relocation of combustibles. Where practicable, all combustibles shall be relocated at least 35 feet from the work site. Where relocation is impracticable, combustibles shall be protected with flameproofed covers or otherwise shielded with metal or asbestos guards or curtains. Edges of covers at the floor should be tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile.

(8) Ducts. Ducts and conveyor systems that might carry sparks to distant combustibles shall be suitably protected or shut down.

(9) Combustible walls. Where cutting or welding is done near walls, partitions, ceiling or roof of combustible construction, fire–resistant shields or guards shall be provided to prevent ignition.

(10) Noncombustible walls. If welding is to be done on a metal wall, partition, ceiling or roof, precautions shall be taken to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, a fire watch on the opposite side from the work shall be provided.

(11) Combustible cover. Welding shall not be attempted on a metal partition, wall, ceiling or roof having a combustible covering nor on walls or partitions of combustible sandwich–type panel construction.

(12) Pipes. Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs shall not be undertaken if the work is close enough to cause ignition by conduction.

(13) Management. Management shall recognize its responsibility for the safe usage of cutting and welding equipment on its property and:

(a) Based on fire potentials of plant facilities, establish areas for cutting and welding, and establish procedures for cutting and welding, in other areas.

(b) Designate an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes.

(c) Insist that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and the safe use of the process.

(d) Advise all contractors about flammable materials or hazardous conditions of which they may not be aware.

(14) Supervisor. The supervisor:

(a) Shall be responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process.

(b) Shall determine the combustible materials and hazardous areas present or likely to be present in the work location.

(c) Shall protect combustibles from ignition by the following:

(i) Have the work moved to a location free from dangerous combustibles.

(ii) If the work cannot be moved, have the combustibles moved to a safe distance from the work or have the combustibles properly shielded against ignition.

(iii) See that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding.

(d) Shall secure authorization for the cutting or welding operations from the designated management representative.

(i) Shall determine that the cutter or welder secures his approval that conditions are safe before going ahead.

(ii) Shall determine that fire protection and extinguishing equipment are properly located at the site.

(iii) Where fire watches are required, he shall see that they are available at the site.

(15) Fire prevention precautions. Cutting or welding shall be permitted only in areas that are or have been made fire safe. Within the confines of an operating plant or building, cutting and welding should preferably be done in a specific area designed for such work, such as a maintenance shop or a detached outside location. Such areas should be of noncombustible or fire–resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. When work cannot be moved practically, as in most construction work, the area shall be made safe by removing combustibles or protecting combustibles from ignition sources.

[Order 73–5, § 296–24–69503, filed 5/9/73 and Order 73–4, § 296–24–69503, filed 5/7/73.]

WAC 296–24–69505 Welding or cutting containers. (1) Used containers. No welding, cutting, or other hot work shall be performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat, might produce flammable or toxic vapors. Any pipe lines or connections to the drum or vessel shall be disconnected or blanked.

(2) Venting and purging. All hollow spaces, cavities or containers shall be vented to permit the escape of air or gases before preheating, cutting or welding. Purging with inert gas is recommended.

[Order 73–5, § 296–24–69505, filed 5/9/73 and Order 73–4, § 296–24–69505, filed 5/7/73.]

WAC 296–24–69507 Confined spaces. (1) Accidental contact. When arc welding is to be suspended for any substantial period of time such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine be disconnected from the power source.

(2) Torch valve. In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the gas supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable, the torch and hose shall also be removed from the confined space.

[Order 73–5, § 296–24–69507, filed 5/9/73 and Order 73–4, § 296–24–69507, filed 5/7/73.]

WAC 296–24–700 Protection of employees.

[Order 73–5, § 296–24–700, filed 5/9/73 and Order 73–4, § 296–24–700, filed 5/7/73.]

WAC 296–24–70001 General. (1) Railing. A welder or helper working on platforms, scaffolds, or runways shall be protected against falling. This may be accomplished by the use of railings, safety belts, life lines, or some other equally effective safeguards.

(2) Welding cable. Welders shall place welding cable and other equipment so that it is clear of passageways, ladders, and stairways.

[Order 73–5, § 296–24–70001, filed 5/9/73 and Order 73–4, § 296–24–70001, filed 5/7/73.]

WAC 296–24–70003 Eye protection. (1) Selection.

(a) Helmets or hand shields shall be used during all arc welding or arc cutting operations, excluding submerged arc welding. Goggles should also be worn during arc welding or cutting operations to provide protection from injurious rays from adjacent work, and from flying objects. The goggles may have either clear or colored glass, depending upon the amount of exposure to adjacent welding operations. Helpers or attendants shall be provided with proper eye protection.

(b) Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations. Spectacles without side shields, with suitable filter lenses are permitted for use during gas welding operations on light work, for torch brazing or for inspection.

(c) All operators and attendants of resistance welding or resistance brazing equipment shall use transparent face shields or goggles, depending on the particular job, to protect their faces or eyes, as required.

(d) Eye protection in the form of suitable goggles shall be provided where needed for brazing operations not covered in (1)(a), (b) and (c) of this section.

(2) Specifications for protectors.

(a) Helmets and hand shields shall be made of a material which is an insulator for heat and electricity. Helmets, shields and goggles shall be not readily flammable and shall be capable of understanding sterilization.

(b) Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc.

(c) Helmets shall be provided with filter plates and cover plates designed for easy removal.

(d) All parts shall be constructed of a material which will not readily corrode or discolor the skin.

(e) Goggles shall be ventilated to prevent fogging of the lenses as much as practicable.

(f) Cover lenses or plates should be provided to protect each helmet, hand shield or goggle filter lens or plate.

(g) All glass for lenses shall be tempered, substantially free from striae, air bubbles, waves and other flaws. Except when a lens is ground to provide proper optical correction for defective vision, the front and rear surfaces of lenses and windows shall be smooth and parallel.

(h) Lenses shall bear some permanent distinctive marking by which the source and shade may be readily identified.

(i) The following is a guide for the selection of the proper shade numbers. These recommendations may be varied to suit the individual's needs.

Welding Operation	Shade No.
Shielded metal-arc welding—1/16-, 3/32-, 1/8-, 5/32-inch electrodes	10
Gas-shielded arc welding (nonferrous)—1/16-, 3/32-, 1/8-, 5/32-inch electrodes	11
Gas-shielded arc welding (ferrous)—1/16-, 3/32-, 1/8-, 5/32-inch electrodes	12
Shielded metal-arc welding: 3/16-, 7/32-, 1/4-inch electrodes	12
5/16-, 3/8-inch electrodes	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/8 inch	4 or 5
Gas welding (medium) 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy) 1/2 inch and over	6 or 8

Note: In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.

(j) All filter lenses and plates shall meet the test for transmission of radiant energy prescribed in ANSI Z 87.1-1968—American National Standard Practice for Occupational and Educational Eye and Face Protection.

(3) Protection from arc welding rays. Where the work permits, the welder should be enclosed in an individual booth painted with a finish of low-reflectivity such as zinc oxide (an important factor for absorbing ultraviolet radiations) and lamp black, or shall be enclosed with noncombustible screens similarly painted. Booths and screens shall permit circulation of air at floor level. Workers or other persons adjacent to the welding areas shall be protected from the rays by noncombustible or flameproof screens or shields or shall be required to wear appropriate goggles.

[Order 73-5, § 296-24-70003, filed 5/9/73 and Order 73-4, § 296-24-70003, filed 5/7/73.]

WAC 296-24-70005 Protective clothing. (1) General requirements. Employees exposed to the hazards created by welding, cutting, or brazing operations shall be protected by personal protective equipment in accordance with the requirements of WAC 296-24-07501. Appropriate protective clothing required for any welding operation will vary with the size, nature and location of the work to be performed.

(2) Specified protective clothing. Protective means which may be employed are as follows:

(a) Except when engaged in light work, all welders should wear flameproof gauntlet gloves.

(b) Flameproof aprons made of leather, asbestos, or other suitable material may also be desirable as protection against radiated heat and sparks.

(c) Woolen clothing preferable to cotton because it is not so readily ignited and helps protect the welder from changes in temperature. Cotton clothing, if used, should be chemically treated to reduce its combustibility. All outer clothing such as jumpers or overalls should be reasonably free from oil or grease.

(d) Sparks may lodge in rolled-up sleeves or pockets of clothing, or cuffs of overalls or trousers. It is therefore recommended that sleeves and collars be kept buttoned and pockets be eliminated from the front of overalls and aprons. Trousers or overalls should not be turned up on the outside.

Note: For heavy work, fire-resistant leggings, high boots, or other equivalent means should be used.

(e) In production work a sheet metal screen in front of the worker's legs can provide further protection against sparks and molten metal in cutting operations.

(f) Capes or shoulder covers made of leather or other suitable materials should be worn during overhead welding or cutting operations. Leather skull caps may be worn under helmets to prevent head burns.

(g) For overhead welding and cutting, or welding and cutting in extremely confined spaces, ear protection is sometimes desirable.

(h) Where there is exposure to sharp or heavy falling objects, or a hazard of bumping in confined spaces, hard hats or head protectors shall be used.

[Order 73-5, § 296-24-70005, filed 5/9/73 and Order 73-4, § 296-24-70005, filed 5/7/73.]

WAC 296-24-70007 Work in confined spaces. (1) General. As used herein confined space is intended to mean a relatively small or restricted space such as a tank, boiler, pressure vessel, or small compartment of a ship.

(2) Ventilation. Ventilation is a prerequisite to work in confined spaces. For ventilation requirements see WAC 296-24-71501 through 296-24-71525.

(3) Securing cylinders and machinery. When welding or cutting is being performed in any confined spaces the gas cylinders and welding machines shall be left on the outside. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.

(4) Lifelines. Where a welder must enter a confined space through a manhole or other small opening, means shall be provided for quickly removing him in case of emergency. When safety belts and lifelines are used for

this purpose they shall be so attached to the welder's body that his body cannot be jammed in a small exit opening. An attendant with a preplanned rescue procedure shall be stationed outside to observe the welder at all times and be capable of putting rescue operations into effect.

(5) Electrode removal. When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine disconnected from the power source.

(6) Gas cylinder shutoff. In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the fuel-gas and oxygen supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable the torch and hose shall also be removed from the confined space.

(7) Warning sign. After welding operations are completed, the welder shall mark the hot metal or provide some other means of warning other workers.

[Order 73-5, § 296-24-70007, filed 5/9/73 and Order 73-4, § 296-24-70007, filed 5/7/73.]

WAC 296-24-715 Health protection and ventilation.

[Order 73-5, § 296-24-715, filed 5/9/73 and Order 73-4, § 296-24-715, filed 5/7/73.]

WAC 296-24-71501 General. (1) Contamination. The requirements in this section have been established on the basis of the following three factors in arc and gas welding which govern the amount of contamination to which welders may be exposed:

(a) Dimensions of space in which welding is to be done (with special regard to height of ceiling).

(b) Number of welders.

(c) Possible evolution of hazardous fumes, gases, or dust according to the metals involved.

(2) Ventilation. It is recognized that in individual instances other factors may be involved in which case ventilation or respiratory protective devices should be provided as needed to meet the equivalent requirements of this section. Such factors would include:

(a) Atmospheric conditions.

(b) Heat generated.

(c) Presence of volatile solvents.

(3) Screens. When welding must be performed in a space entirely screened on all sides, the screens shall be so arranged that no serious restriction of ventilation exists. It is desirable to have the screens so mounted that they are about 2 feet above the floor unless the work is performed at so low a level that the screen must be extended nearer to the floor to protect nearby workers from the glare of welding.

(4) Maximum allowable concentration. Local exhaust or general ventilating systems shall be provided and arranged to keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration as specified in chapter 296-62 WAC.

Note: A number of potentially hazardous materials are employed in fluxes, coatings, coverings, and filler metals used in welding and cutting or are released to the atmosphere during welding and cutting. These include but are not limited to the materials itemized in WAC 296-24-71509 through 296-24-71523.

(5) Precautionary labels. The employer shall ascertain the potentially hazardous materials, associated with welding, cutting, etc., and inform the employee of same wither through signs, labels or other appropriate means.

(a) All filler metals and fusible granular materials shall carry the following notice, as a minimum, on tags, boxes, or other containers:

CAUTION

Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. Use adequate ventilation. See ANSI Z 49.1-1967 Safety in Welding and Cutting published by the American Welding Society.

(b) Brazing (welding) filler metals containing cadmium in significant amounts shall carry the following notice on tags, boxes, or other containers:

WARNING
CONTAINS CADMIUM—POISONOUS FUMES MAY BE FORMED ON HEATING

Do not breathe fumes. Use only with adequate ventilation such as fume collectors, exhaust ventilators, or air-supplied respirators. See ANSI Z 49.1-1967.

If chest pain, cough, or fever develops after use call physician immediately.

Keep children away when using.

(c) Brazing and gas welding fluxes containing fluorine compounds shall have a cautionary wording to indicate that they contain fluorine compounds. One such cautionary wording recommended by the American Welding Society for brazing and gas welding fluxes reads as follows:

CAUTION
CONTAINS FLUORIDES

This flux when heated gives off fumes that may irritate eyes, nose and throat.

(i) Avoid fumes-use only in well-ventilated spaces.

(ii) Avoid contact of flux with eyes or skin.

(iii) Do not take internally.

[Order 73-5, § 296-24-71501, filed 5/9/73 and Order 73-4, § 296-24-71501, filed 5/7/73.]

WAC 296-24-71503 Ventilation for general welding and cutting. (1) General. Mechanical ventilation shall be provided when welding or cutting is done on metals not covered in WAC 296-24-71509 through 296-24-71523. (For specific material, see the ventilation requirements of WAC 296-24-71509 through 296-24-71523.)

(a) In a space of less than 10,000 cubic feet per welder.

(b) In a room having a ceiling height of less than 16 feet.

(c) In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.

(2) Minimum rate. Such ventilation shall be at the minimum rate of 2,000 cubic feet per minute per welder, except where local exhaust hoods and booths as per WAC 296-24-71505, or airline respirators approved by the U.S. Bureau of Mines for such purposes are provided. Natural ventilation is considered sufficient for welding or cutting operations where the restrictions in WAC 296-24-71503(1) are not present.

[Order 73-5, § 296-24-71503, filed 5/9/73 and Order 73-4, § 296-24-71503, filed 5/7/73.]

WAC 296-24-71505 Local exhaust hoods and booths. Mechanical local exhaust ventilation may be by means of either of the following:

(1) Hoods. Freely movable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of airflow sufficient to maintain a velocity in the direction of the hood of 100 linear feet per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this control velocity using a 3-inch wide flanged suction opening are shown in the following table:

Welding zone	Minimum air flow[1] cubic feet/minutes	Duct diameter inches[2]
4 to 6 inches from arc or torch—	150	3
6 to 8 inches from arc or torch—	275	3 1/2
8 to 10 inches from arc or torch—	425	4 1/2
10 to 12 inches from arc or torch—	600	5 1/2

[1]When brazing with cadmium bearing materials or when cutting on such materials increased rates of ventilation may be required.

[2]Nearest half-inch duct diameter based on 4,000 feet per minute velocity in pipe.

(2) Fixed enclosure. A fixed enclosure with a top and not less than two sides which surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet per minute.

[Order 73-5, § 296-24-71505, filed 5/9/73 and Order 73-4, § 296-24-71505, filed 5/7/73.]

WAC 296-24-71507 Ventilation in confined spaces. (1) Air replacement. All welding and cutting operations carried on in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This applies not only to the welder but also to helpers and other personnel in the immediate vicinity. All air replacing that withdrawn shall be clean and respirable.

(2) Airline respirators. In such circumstances where it is impossible to provide such ventilation, airline respirators or hose masks approved by the U.S. Bureau of Mines for this purpose shall be used.

(3) Self-contained units. In areas immediately hazardous to life, hose masks with blowers or self-contained breathing equipment shall be used. The breathing equipment shall be approved by the U.S. Bureau of Mines.

(4) Outside helper. Where welding operations are carried on in confined spaces and where welders and helpers are provided with hose masks, hose masks with blowers or self-contained breathing equipment approved by the U.S. Bureau of Mines, a worker shall be stationed on the outside of such confined spaces to insure the safety of those working within.

(5) Oxygen for ventilation. Oxygen shall not be used for ventilation.

[Order 73-5, § 296-24-71507, filed 5/9/73 and Order 73-4, § 296-24-71507, filed 5/7/73.]

WAC 296-24-71509 Fluorine compounds. (1) General. In confined spaces, welding or cutting involving fluxes, coverings, or other materials which contain fluorine compounds shall be done in accordance with WAC 296-24-71507 (1) through (5). A fluorine compound is one that contains fluorine, as an element in chemical combination, not as a free gas.

Note: Maximum allowable concentration. The need for local exhaust ventilation or airline respirators for welding or cutting in other than confined spaces will depend upon the individual circumstances. However, experience has shown such protection to be desirable for fixed-location production welding and for all production welding on stainless steels. Where air samples taken at the welding location indicate that the fluorides liberated are below the maximum allowable concentration, such protection is not necessary.

[Order 73-5, § 296-24-71509, filed 5/9/73 and Order 73-4, § 296-24-71509, filed 5/7/73.]

WAC 296-24-71511 Zinc. (1) Confined spaces. In confined spaces welding or cutting involving zinc-bearing base or filler metals or metals coated with zinc-bearing materials shall be done in accordance with WAC 296-24-71507 (1) through (5).

(2) Indoors. Indoors, welding or cutting involving zinc-bearing base or filler metals coated with zinc-bearing materials shall be done in accordance with WAC 296-24-71505 (1) and (2).

[Order 73-5, § 296-24-71511, filed 5/9/73 and Order 73-4, § 296-24-71511, filed 5/7/73.]

WAC 296-24-71513 Lead. (1) Confined spaces. In confined spaces, welding involving lead-base metals (erroneously called lead-burning) shall be done in accordance with WAC 296-24-71507 (1) through (5).

(2) Indoors. Indoors, welding involving lead-base metals shall be done in accordance with WAC 296-24-71505 (1) and (2).

(3) Local ventilation. In confined spaces or indoors, welding or cutting involving metals containing lead, other than as an impurity, or involving metals coated with lead-bearing materials, including paint shall be

done using local exhaust ventilation or airline respirators. Outdoors such operations shall be done using respiratory protective equipment approved by the U.S. Bureau of Mines for such purposes. In all cases, workers in the immediate vicinity of the cutting operation shall be protected as necessary by local exhaust ventilation or airline respirators.

[Order 73-5, § 296-24-71513, filed 5/9/73 and Order 73-4, § 296-24-71513, filed 5/7/73.]

WAC 296-24-71515 Beryllium. Welding or cutting indoors, outdoors, or in confined spaces involving beryllium-containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by chapter 296-62 WAC. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.

[Order 73-5, § 296-24-71515, filed 5/9/73 and Order 73-4, § 296-24-71515, filed 5/7/73.]

WAC 296-24-71517 Cadmium. (1) General. Welding or cutting indoors or in confined spaces involving cadmium-bearing or cadmium-coated base metals shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by chapter 296-62 WAC. Outdoors such operations shall be done using respiratory protective equipment such as fume respirators approved by the U.S. Bureau of Mines for such purposes.

(2) Confined space. Welding (brazing) involving cadmium-bearing filler metals shall be done using ventilation as prescribed in WAC 296-24-71505 or 296-24-71507 if the work is to be done in a confined space.

[Order 73-5, § 296-24-71517, filed 5/9/73 and Order 73-4, § 296-24-71517, filed 5/7/73.]

WAC 296-24-71519 Mercury. Welding or cutting indoors or in a confined space involving metals coated with mercury-bearing materials including paint, shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by chapter 296-62 WAC. Outdoors such operations shall be done using respiratory protective equipment approved by the U.S. Bureau of Mines for such purposes.

[Order 73-5, § 296-24-71519, filed 5/9/73 and Order 73-4, § 296-24-71519, filed 5/7/73.]

WAC 296-24-71521 Cleaning compounds. (1) Manufacturer's instructions. In the use of cleaning materials, because of their possible toxicity of flammability, appropriate precautions such as manufacturer's instructions shall be followed.

(2) Degreasing. Degreasing or other cleaning operations involving chlorinated hydrocarbons shall be so located that no vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation. In addition, trichloroethylene and perchlorethylene should be kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations.

[Order 73-5, § 296-24-71521, filed 5/9/73 and Order 73-4, § 296-24-71521, filed 5/7/73.]

WAC 296-24-71523 Cutting of stainless steels. Oxygen cutting, using either a chemical flux or iron powder or gas-shielded arc cutting of stainless steel, shall be done using mechanical ventilation adequate to remove the fumes generated.

[Order 73-5, § 296-24-71523, filed 5/9/73 and Order 73-4, § 296-24-71523, filed 5/7/73.]

WAC 296-24-71525 First-aid equipment. First-aid equipment shall be available at all times. On every shift of welding operations there should be present employees trained to render first aid. All injuries shall be reported as soon as possible for medical attention. First aid shall be rendered until medical attention can be provided.

[Order 73-5, § 296-24-71525, filed 5/9/73 and Order 73-4, § 296-24-71525, filed 5/7/73.]

WAC 296-24-720 Industrial applications.

[Order 73-5, § 296-24-720, filed 5/9/73 and Order 73-4, § 296-24-720, filed 5/7/73.]

WAC 296-24-72001 Transmission pipeline. (1) General. The requirements of WAC 296-24-68501 through 296-24-68507, 296-24-70001 through 296-24-70007, and 296-24-71501 through 296-24-71525, shall be observed.

(2) Field shop operations. Where field shop operations are involved for fabrication of fittings, river crossings, road crossings, and pumping and compressor stations the requirements of WAC 296-24-68001, 296-24-68501 through 296-24-68507, 296-24-69501 through 296-24-69507, 296-24-70001 through 296-24-70007 and 296-24-71501 through 296-24-71525 shall be observed.

(3) Electric shock. When arc welding is performed in wet conditions, or under conditions of high humidity, special protection against electric shock shall be supplied.

(4) Pressure testing. In pressure testing of pipelines, the workers and the public shall be protected against injury by the blowing out of closures or other pressures restraining devices. Also, protection shall be provided against expulsion of loose dirt that may have become trapped in the pipe.

(5) Construction standards. The welded construction of transmission pipelines shall be conducted in accordance with the Standard for Welding Pipe Lines and Related Facilities, API Std. 1104-1968.

(6) Flammable substance lines. The connection, by welding, of branches to pipelines carrying flammable

substances shall be performed in accordance with Welding or Hot Tapping on Equipment Containing Flammables, API Std. PSD No. 2201–1963.

(7) X–ray inspection. The use of x–rays and radioactive isotopes for the inspection of welded pipeline joints shall be carried out in conformance with the American National Standard Safety Standard for Nonmedical X–ray and Sealed Gamma–Ray Sources, ANSI Z 54.1–1963.

[Order 73–5, § 296–24–72001, filed 5/9/73 and Order 73–4, § 296–24–72001, filed 5/7/73.]

WAC 296-24-72003 Mechanical piping systems. (1) General. The requirements of WAC 296–24–68001, 296–24–68501 through 296–24–68507, 296–24–69501 through 296–24–69507, 296–24–70001 through 296–24–70007 and 296–24–71501 through 296–24–71525 shall be observed.

(2) X–ray inspection. The use of x–rays and radioactive isotopes for the inspection of welded piping joints shall be in conformance with the American National Standard Safety Standard for Nonmedical X–ray and Sealed Gamma–Ray Sources, ANSI Z 54.1–1963.

[Order 73–5, § 296–24–72003, filed 5/9/73 and Order 73–4, § 296–24–72003, filed 5/7/73.]

WAC 296-24-722 Welding, cutting, and heating in way of preservative coatings. (1) Before welding, cutting, or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made by a competent person to determine its flammability. Preservative coatings shall be considered to be highly flammable when scrapings burn with extreme rapidity.

(2) Precautions shall be taken to prevent ignition of highly flammable hardened preservative coatings. When coatings are determined to be highly flammable, they shall be stripped from the area to be heated to prevent ignition.

(3) Protection against toxic preservative coatings:

(a) In enclosed spaces, all surfaces covered with toxic preservatives shall be stripped of all toxic coatings for a distance of at least 4 inches from the area of heat application, or the employees shall be protected by air line respirators, meeting the requirements specified in these rules for this type of work.

(b) In the open air, employees shall be protected by a respirator, suitable for the type of work being done.

(4) The preservative coatings shall be removed a sufficient distance from the area to be heated to ensure that the temperature of the unstripped metal will not be appreciably raised. Artificial cooling of the metal surrounding the heating area may be used to limit the size of the area required to be cleaned.

[Order 73–5, § 296–24–722, filed 5/9/73 and Order 73–4, § 296–24–722, filed 5/7/73.]

Part J–1

WORKING SURFACES, GUARDING FLOORS AND WALL OPENINGS, LADDERS, SCAFFOLDS

WAC

WAC 296-24-735 Walking-working surfaces.

[Order 73-5, § 296-24-735, filed 5/9/73 and Order 73-4, § 296-24-735, filed 5/7/73.]

WAC 296-24-73501 General requirements. This section applies to all permanent places of employment, except where domestic, mining, or agricultural work only is performed. Construction work is not to be deemed as a permanent place of employment. Measures for the control of toxic materials are considered to be outside the scope of this section.

[Order 73-5, § 296-24-73501, filed 5/9/73 and Order 73-4, § 296-24-73501, filed 5/7/73.]

WAC 296-24-73503 Housekeeping. (1) All places of employment, passageways, storerooms, and service rooms shall be kept clean, orderly and in a sanitary condition.

(2) The floor of every workroom shall be maintained in a clean, and so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained, and false floors, platforms, mats, or other dry standing places shall be provided where practicable.

(3) To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.

(4) All materials stored in tiers shall be stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling or collapse.

[Order 74-27, § 296-24-73503, filed 5/7/74; Order 73-5, § 296-24-73503, filed 5/9/73 and Order 73-4, § 296-24-73503, filed 5/7/73.]

WAC 296-24-73505 Aisles and passageways. (1) Where mechanical handling equipment is used, sufficient safe clearances shall be allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made. Aisles and passageways shall be kept clear and in good repairs, with no obstruction across or in aisles that could create a hazard.

(2) Permanent aisles and passageways shall be appropriately marked. "Appropriate" does not limit the marking to printed lines on the floor only. Other appropriate methods may be marked pillars, powder stripping, flags, traffic cones, or barrels, provided they are maintained in good repair and the recognition of such markings are included in the training programs for vehicle operators and employees.

(3) All trestles in connection with industrial plants on which cars run, which are also used as walkways for workmen, shall be equipped with a walkway on the outer edge, so located as to give safe minimum clearance of three feet to cars. Such walkways shall be equipped with standard rails. Where a trestle crosses a driveway or passageway the trestle over such points shall be solidly boarded over.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-24-73505, filed 5/15/89, effective 6/30/89; Order 73-5, § 296-24-73505, filed 5/9/73 and Order 73-4, § 296-24-73505, filed 5/7/73.]

WAC 296-24-73507 Covers and guardrails. (1) All open vats and tanks into which workers may fall shall be guarded with railings or screen guards.

(2) All open vats and tanks where workers are employed shall have a platform or walkway 36 to 42 inches below the top of vat or tank or where walkway is flush with top of vat or tank, a standard safeguard of 36 to 42 inches high shall be constructed.

(3) Every tank over 5 feet deep, excepting where agitators are used or where products may be damaged by ladders, shall have a ladder fixed on the inside so placed as to connect with means of access from the outside. Rungs shall have a clearance of at least 6 inches measured between the rung and the side of the tank.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-73507, filed 7/31/79; Order 74-27, § 296-24-73507, filed 5/7/74; Order 73-5, § 296-24-73507, filed 5/9/73 and Order 73-4, § 296-24-73507, filed 5/7/73.]

WAC 296-24-73509 Floor loading protection. (1) In every building or other structure, or part thereof, used for mercantile, business, industrial, or storage purposes, the loads approved by the building official shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building, or his duly authorized agent, in a conspicuous place in each space to which they relate. Such plates shall not be removed or defaced but, if lost, removed, or defaced, shall be replaced by the owner or his agent.

(2) It shall be unlawful to place, or cause, or permit to be placed, on any floor or roof of a building or other structure a load greater than that for which such floor or roof is approved by the building official.

[Order 73-5, § 296-24-73509, filed 5/9/73 and Order 73-4, § 296-24-73509, filed 5/7/73.]

WAC 296-24-73511 Steam pipes. (1) All steam pipes or pipes heated by any other means to a sufficient temperature to burn a person (other than coil pipes, radiators, for heating rooms or buildings, or pipes on portable steam engines and boilers) and which are within seven feet of a floor or platform, if exposed to contact, shall be guarded with a standard safeguard.

(2) Protection from hot pipes. All exposed hot pipes within seven feet of the floor or working platform, or within 15 inches measured horizontally from stairways, ramps or fixed ladders, shall be covered with an insulating material or be guarded in such a manner as to prevent contact.

[Order 74-27, § 296-24-73511, filed 5/7/74.]

WAC 296-24-73513 Buildings--Floors. (1) All buildings, docks, tramways, walkways, log dumps and other structures shall be so designed, constructed, and maintained as to provide a safety factor of 4. This means that all members shall be capable of supporting four times the maximum strain to be imposed. This provision refers to buildings, docks, etc. 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.

(2) The floors of all buildings, platforms, walks and driveways, storage yards, docks, etc., and all parts thereof, and all supporting members shall be of substantial construction and kept in good repair and free from accumulations of debris. Floors which are maintained in a polished condition shall be polished with a nonslip preparation of an approved type.

(3) Flooring of buildings, ramps, docks, trestles and other structures required to support motive equipment shall be of not less than full two and one-half inch material. However, where flooring is covered by steel floor plates, 2 inch material may be used.

[Order 74-27, § 296-24-73513, filed 5/7/74.]

WAC 296-24-750 Guarding floor and wall openings and holes.

[Order 73-5, § 296-24-750, filed 5/9/73 and Order 73-4, § 296-24-750, filed 5/7/73.]

WAC 296-24-75001 Terms. The following terms shall have the meaning ascribed in this section, when referred to in WAC 296-24-75003 through 296-24-75011, unless the context requires otherwise.

(1) Floor hole. An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement, or yard, through which materials but not persons may fall; such as a belt hole, pipe opening, or slot opening.

(2) Floor opening. An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard, through which persons may fall; such as a hatchway, stair or ladder opening, pit, or large manhole. Floor openings occupied by elevators, dumb waiters, conveyors, machinery, or containers are excluded from this subpart.

(3) Handrail. A single bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish persons with a handhold in case of tripping.

(4) Platform. A working space for persons, elevated above the surrounding floor or ground; such as a balcony or platform for the operation of machinery and equipment.

(5) Runway. A passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings.

(6) Standard railing. A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of person.

(7) Standard strength and construction. Any construction of railings, covers, or other guards that meets the requirements of WAC 296-24-750 through 296-24-75011.

(8) Stair railing. A vertical barrier erected along exposed sides of a stairway to prevent falls of persons.

(9) Toeboard. A vertical barrier at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent falls of materials.

(10) Wall hole. An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition; such as a ventilation hole or drainage scupper.

(11) Wall opening. An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall; such as a yard-arm doorway or chute opening.

[Order 73-5, § 296-24-75001, filed 5/9/73 and Order 73-4, § 296-24-75001, filed 5/7/73.]

WAC 296-24-75003 Protection for floor openings. (1) Every stairway floor opening shall be guarded by a standard railing constructed in accordance with WAC 296-24-75011. The railing shall be provided on all exposed sides (except at entrance to stairway). For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing (as when located in aisle spaces, etc.), the guard shall consist of a hinged floor opening cover of standard strength and construction and removable standard railings on all exposed sides (except at entrance to stairway).

(2) Every ladderway floor opening or platform shall be guarded by a standard railing with standard toeboard on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

(3) Every hatchway and chute floor opening shall be guarded by one of the following:

(a) Hinged floor opening cover of standard strength and construction equipped with standard railings or permanently attached thereto so as to leave only one exposed side. When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate positions by removable standard railings.

(b) A removable railing with toeboard on not more than two sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railings shall be kept in place when the opening is not in use and should preferably be hinged or otherwise mounted so as to be conveniently replaceable.

Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.

(c) 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 telltales shall be installed to hang within five and one-half feet of ground or floor level.

(d) Where floor openings are used to drop materials from one level to another, audible warning systems shall be installed and used to indicate to employees on the lower level that material is to be dropped.

(4) Every skylight opening and hole shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides.

(5) Every pit and trapdoor floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength and construction which should be hinged in place. While the cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings.

(6) Every manhole floor opening shall be guarded by a standard manhole cover which need not be hinged in place. While the cover is not in place, the manhole opening shall be constantly attended by someone or shall be protected by removable standard railings.

(7) Every temporary floor opening shall have standard railings, or shall be constantly attended by someone.

(8) Every floor hole into which persons can accidentally walk shall be guarded by either:

(a) A standard railing with standard toeboard on all exposed sides, or

(b) A floor hole cover of standard strength and construction that should be hinged in place. While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing.

(9) Every floor hole into which persons cannot accidentally walk (on account of fixed machinery, equipment, or walls) shall be protected by a cover that leaves no openings more than 1 inch wide. The cover shall be securely held in place to prevent tools or materials from falling through.

(10) Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width to less than 20 inches.

[Order 74-27, § 296-24-75003, filed 5/7/74; Order 73-5, § 296-24-75003, filed 5/9/73 and Order 73-4, § 296-24-75003, filed 5/7/73.]

WAC 296-24-75005 Protection for wall openings and holes. (1) Every wall opening from which there is a drop of more than 4 feet shall be guarded by one of the following:

(a) Rail, roller, picket fence, half door, or equivalent barrier.

The guard may be removable but should preferably be hinged or otherwise mounted so as to be conveniently replaceable. Where there is exposure below to falling materials, a removable toeboard or the equivalent shall also be provided. When the opening is not in use for handling materials, the guard shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening with its center approximately 4 feet above floor level and of standard strength and mounting.

(b) Extension platform onto which materials can be hoisted for handling, and which shall have side rails or equivalent guards of standard specifications.

(2) Every chute wall opening from which there is a drop of more than 4 feet shall be guarded by one or more of the barriers specified in WAC 296-24-75005 (1)(a) and (b), or as required by the conditions.

(3) Every window wall opening at a stairway landing, floor, platform, or balcony, from which there is a drop of more than 4 feet, and where the bottom of the opening is less than 3 feet above the platform or landing, shall be guarded by standard slats, standard grill work (as specified in WAC 296-24-75011(11)), or standard railing.

Where the window opening is below the landing, or platform, a standard toeboard shall be provided.

(4) Every temporary wall opening shall have adequate guards but these need not be of standard construction.

(5) Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than 4 inches above the floor, and the far side of the hole more than 5 feet above the next lower level, the hole shall be protected by a standard toeboard, or an enclosing screen either of sold construction, or as specified in WAC 296-24-75011(11).

[Order 73-5, § 296-24-75005, filed 5/9/73 and Order 73-4, § 296-24-75005, filed 5/7/73.]

WAC 296-24-75007 Protection of open-sided floors, platforms and runways. (1) Every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing (or the equivalent as specified in WAC 296-24-75011(3)) on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toeboard wherever, beneath the open sides,

(a) Person can pass,

(b) There is moving machinery, or

(c) There is equipment with which falling materials could create a hazard.

(2) Every runway shall be guarded by a standard railing (or the equivalent as specified in WAC 296-24-75011(3) on all open sides 4 feet or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard shall also be provided on each exposed side.

Runways used exclusively for special purposes (such as oiling, shafting, or filling tank cars) may have the railing on one side omitted where operating conditions necessitate such omission, providing the falling hazard is minimized by using a runway of not less than 18 inches wide. Where persons entering upon runways become thereby exposed to machinery, electrical equipment, or other danger not a falling hazard, additional guarding than is here specified may be essential for protection.

(3) Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing

units, and similar hazards shall be guarded with a standard railing and toeboard.

(4) Tools and loose materials shall not be left on overhead platforms and scaffolds.

[Order 76-6, § 296-24-75007, filed 3/1/76; Order 73-5, § 296-24-75007, filed 5/9/73 and Order 73-4, § 296-24-75007, filed 5/7/73.]

WAC 296-24-75009 Stairway railings and guards. (1) Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails as specified in (a) through (e) of this rule, the width of the stair to be measured clear of all obstructions except handrails:

(a) On stairways less than 44 inches wide having both sides enclosed, at least one handrail, preferably on the right side descending.

(b) On stairways less than 44 inches wide having one side open, at least one stair railing on open side.

(c) On stairways less than 44 inches wide having both sides open, one stair railing on each side.

(d) On stairways more than 44 inches wide but less than 88 inches wide, one handrail on each enclosed side and one stair railing on each open side.

(e) On stairways 88 or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.

(2) Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than 6 inches.

(3) Nonindustrial and "monumental" steps are excluded as they are not "industrial" stairs; however, when public and private building steps are located at loading or receiving docks, in maintenance areas, etc., or are used exclusively by employees, the requirements of this standard shall apply.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-75009, filed 1/11/90, effective 2/26/90; Order 73-5, § 296-24-75009, filed 5/9/73 and Order 73-4, § 296-24-75009, filed 5/7/73.]

WAC 296-24-75011 Railing, toeboards, and cover specifications. (1) A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of from thirty-six to forty-two inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

(2) A stair railing shall be of construction similar to a standard railing but the vertical height shall be not more than thirty-four inches nor less than thirty inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

(3) Minimum requirements for standard railings under various types of construction are specified in this subsection. Dimensions specified are based on the U.S. Department of Agriculture Wood Handbook, No. 72, 1955 (No. 1 (S4S) Southern Yellow Pine (Modulus of Rupture 7,400 p.s.i.)) for wood; ANSI G 41.5-1970, American National Standard Specifications for Structural Steel, for structural steel; and ANSI B 125.1-1970, American National Standard Specifications for Welded and Steamless Steel Pipe, for pipe.

(a) For wood railings, the posts shall be of at least two-inch by four-inch nominal stock spaced not to exceed six feet; the top and intermediate rails shall be of at least two-inch by four-inch nominal stock. If top rail is made of two right-angle pieces of one-inch by four-inch stock, posts may be spaced on eight-foot centers, with two-inch by four-inch intermediate rail.

(b) For pipe railings, posts and top and intermediate railings shall be at least one and one-half inches nominal diameter (outside diameter) with posts spaced not more than eight feet on centers.

(c) For structural steel railings, posts and top and intermediate rails shall be of two-inch by two-inch by three-eighths-inch angles or other metal shapes of equivalent bending strength with posts spaced not more than eight feet on centers.

(d) The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least two hundred pounds applied in any direction at any point on the top rail.

(e) Other types, sizes, and arrangements of railing construction are acceptable provided they meet the following conditions:

(i) A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level of from thirty-six to forty-two inches nominal;

(ii) A strength to withstand at least the minimum requirement of two hundred pounds top rail pressure;

(iii) Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail;

(iv) Elimination of overhang of rail ends unless such overhang does not constitute a hazard; such as, baluster railings, scrollwork railings, paneled railings.

(4) A standard toeboard shall be a minimum of four inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than one-quarter-inch clearance above floor level. It may be made of any substantial material either solid or with openings not over one inch in greatest dimension.

Where material is piled to such height that a standard toeboard does not provide protection, paneling from floor to intermediate rail, or to top rail shall be provided.

(5) A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail so as to offer no obstruction to a smooth surface along the top and both sides of the handrail. The handrail shall be of rounded or other section that will furnish an adequate handhold for anyone grasping it to avoid falling. The

ends of the handrail should be turned in to the supporting wall or otherwise arranged so as not to constitute a projection hazard.

(a) The height of handrails shall be not more than thirty-four inches nor less than thirty inches from upper surface of handrail to surface of tread in line with face of riser or to surface of ramp.

(b) The size of handrails shall be: When of hardwood, at least two inches in diameter; when of metal pipe, at least one and one-half inches in diameter. The length of brackets shall be such as will give a clearance between handrail and wall or any projection thereon of at least one and one-half inches. The spacing of brackets shall not exceed eight feet.

(c) The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least two hundred pounds applied in any direction at any point on the rail.

(6) All handrails and railings shall be provided with a clearance of not less than one and one-half inches between the handrail or railing and any other object.

(7) Floor opening covers may be of any material that meets the following strength requirements:

(a) Trench or conduit covers and their supports, when located in plant roadways, shall be designed to carry a truck rear-axle load of at least twenty thousand pounds.

(b) Manhole covers and their supports, when located in plant roadways, shall comply with local standard highway requirements if any; otherwise, they shall be designed to carry a truck rear-axle of at least twenty thousand pounds.

(c) The construction of floor opening covers may be of any material that meets the strength requirements. Covers projecting not more than one inch above the floor level may be used providing all edges are chamfered to an angle with the horizontal of not over thirty degrees. All hinges, handles, bolts, or other parts shall set flush with the floor or cover surface.

(8) Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least two hundred pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than four inches long or of slatwork with openings not more than two inches wide with length unrestricted.

(9) Wall opening barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least two hundred pounds applied in any direction (except upward) at any point on the top rail or corresponding member.

(10) Wall opening grab handles shall be not less than twelve inches in length and shall be so mounted as to give one and one-half inches clearance from the side framing of the wall opening. The size, material, and anchoring of the grab handle shall be such that the completed structure is capable of withstanding a load of at least two hundred pounds applied in any direction at any point of the handle.

(11) Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least two hundred pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grillwork with openings not more than eight inches long, or of slatwork with openings not more than four inches wide with length unrestricted.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-24-75011, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-75011, filed 7/31/79; Order 73-5, § 296-24-75011, filed 5/9/73 and Order 73-4, § 296-24-75011, filed 5/7/73.]

WAC 296-24-765 Fixed industrial stairs.

[Order 73-5, § 296-24-765, filed 5/9/73 and Order 73-4, § 296-24-765, filed 5/7/73.]

WAC 296-24-76501 Terms. The following terms shall have the meaning ascribed in this section when referred to in WAC 296-24-76503 through 296-24-76523 unless the context requires otherwise. (1) Handrail. A single bar or pipe supported on brackets from a wall or partition to provide a continuous handhold for persons using a stair.

(2) Nose, nosing. That portion of a tread projecting beyond the face of the riser immediately below.

(3) Open riser. The air space between the treads of stairways without upright members (risers).

(4) Platform. An extended step or landing breaking a continuous run of stairs.

(5) Railing. A vertical barrier erected along exposed sides of stairways and platforms to prevent falls of persons. The top member of railing usually serves as a handrail.

(6) Rise. The vertical distance from the top of a tread to the top of the next higher tread.

(7) Riser. The upright member of a step situated at the back of a lower tread and near the leading edge of the next higher tread.

(8) Stairs, stairway. A series of steps leading from one level or floor to another, or leading to platforms, pits, boiler rooms, crossovers, or around machinery, tanks, and other equipment that are used more or less continuously or routinely by employees, or only occasionally by specific individuals. A series of steps and landings having three or more risers constitutes stairs or stairway.

(9) Tread. The horizontal member of a step.

(10) Tread run. The horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread.

(11) Tread width. The horizontal distance from front to back of tread including nosing when used.

[Order 73-5, § 296-24-76501, filed 5/9/73 and Order 73-4, § 296-24-76501, filed 5/7/73.]

WAC 296-24-76503 Application of requirements. This section contains specifications for the safe design and construction of fixed general industrial stairs. This classification includes interior and exterior stairs around

machinery, tanks, and other equipment, and stairs leading to or from floors, platforms, or pits. This section does not apply to stairs used for fire exit purposes, to construction operations, to private buildings or residences, or to articulated stairs, such as may be installed on floating roof tanks or on dock facilities, the angle of which changes with the rise and fall of the base support.

When stairs of public and private buildings are located at loading or receiving docks, in maintenance areas, etc., or are used exclusively by employees, the term "fixed industrial steps" will apply and be evaluated accordingly.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-76503, filed 1/11/90, effective 2/26/90; Order 73-5, § 296-24-76503, filed 5/9/73 and Order 73-4, § 296-24-76503, filed 5/7/73.]

WAC 296-24-76505 Where fixed stairs are required. Fixed stairs shall be provided for access from one structure level to another where operations necessitate regular travel between levels, and for access to operating platforms at any equipment which requires attention routinely during operations. Fixed stairs shall also be provided where access to elevations is daily or at each shift for such purposes as gauging, inspection, regular maintenance, etc., where such work may expose employees to acids, caustics, gases, or other harmful substances, or for which purposes the carrying of tools or equipment by hand is normally required. (It is not the intent of this section to preclude the use of fixed ladders for access to elevated tanks, towers, and similar structures, overhead traveling cranes, etc., where the use of fixed ladders is common practice.) Spiral stairways shall not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway. Winding stairways may be installed on tanks and similar round structures where the diameter of the structure is not less than five feet.

[Order 73-5, § 296-24-76505, filed 5/9/73 and Order 73-4, § 296-24-76505, filed 5/7/73.]

WAC 296-24-76507 Stair strength. Fixed stairways shall be designed and constructed to carry a load of five times the normal live load anticipated but never of less strength than to carry safely a moving concentrated load of 1,000 pounds.

[Order 73-5, § 296-24-76507, filed 5/9/73 and Order 73-4, § 296-24-76507, filed 5/7/73.]

WAC 296-24-76509 Stair width. Fixed stairways shall have a minimum width of 22 inches.

[Order 73-5, § 296-24-76509, filed 5/9/73 and Order 73-4, § 296-24-76509, filed 5/7/73.]

WAC 296-24-76511 Angle of stairway rise. (1) Fixed stairs shall be installed at angles to the horizontal of between thirty degrees and fifty degrees. Any uniform combination of rise/tread dimensions may be used that will result in a stairway at any angle to the horizontal within the permissible range. Table D-1 gives rise/tread dimensions which will produce a stairway within the permissible range, stating the angle to the horizontal produced by each combination. However, the rise/tread combinations are not limited to those given in Table D-1.

(2) Because of space limitations a permanent stairway sometimes has to be installed at an angle above the fifty degree critical angle. Such installations are commonly called inclined ladders or ship's ladders, which shall have handrails on both sides and open risers. They shall be capable of sustaining a live load of one hundred pounds per square foot with a safety factor of four. The following preferred and critical angles from the horizontal shall be considered for inclined ladders and ship's ladders:

(a) Thirty-five to sixty degrees – Preferred angle from horizontal.

(b) Sixty to seventy degrees – Critical angle from horizontal.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-24-76511, filed 5/15/89, effective 6/30/89; Order 73-5, § 296-24-76511, filed 5/9/73 and Order 73-4, § 296-24-76511, filed 5/7/73.]

WAC 296-24-76513 Stair treads. Each tread and the top landing of a stairway, where risers are used, should have a nose which extends one-half inch to 1 inch beyond the face of the lower riser. Noses should have an even leading edge. All treads shall be reasonably slip-resistant and the nosings shall be of nonslip finish. Welded bar grating treads without nosings are acceptable providing the leading edge can be readily identified by personnel descending the stairway and provided the tread is serrated or is of definite nonslip design. Rise height and tread width shall be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs.

TABLE D-1

Angle to horizontal	Rise (in inches)	Tread run (in inches)
30°35'	6 1/2	11
32°08'	6 3/4	10 3/4
33°41'	7	10 1/2
35°16'	7 1/4	10 1/4
36°52'	7 1/2	10
38°29'	7 3/4	9 3/4
40°08'	8	9 1/2
41°44'	8 1/4	9 1/4
43°22'	8 1/2	9
45°00'	8 3/4	8 3/4
46°38'	9	8 1/2
48°16'	9 1/4	8 1/4
49°54'	9 1/2	8

[Order 73-5, § 296-24-76513, filed 5/9/73 and Order 73-4, § 296-24-76513, filed 5/7/73.]

WAC 296-24-76515 Length of stairways. Long flights of stairs, unbroken by landings or intermediate

platforms, should be avoided. Consideration should be given to providing intermediate platforms where practical and where such stairways are in frequent use. Stairway platforms shall be no less than the width of a stairway and a minimum of 30 inches in length measured in the direction of travel.

[Order 73-5, § 296-24-76515, filed 5/9/73 and Order 73-4, § 296-24-76515, filed 5/7/73.]

WAC 296-24-76517 Railings and handrails. Standard railings shall be provided on the open sides of all exposed stairways and stair platforms. Handrails shall be provided on at least one side of closed stairways, preferably on the right side descending. Stair railings and handrails shall be installed in accordance with the provisions of WAC 296-24-75001 through 296-24-75011.

[Order 73-5, § 296-24-76517, filed 5/9/73 and Order 73-4, § 296-24-76517, filed 5/7/73.]

WAC 296-24-76519 Vertical clearance. Vertical clearance above any stair tread to an overhead obstruction shall be at least 7 feet measured from the leading edge of the tread.

[Order 73-5, § 296-24-76519, filed 5/9/73 and Order 73-4, § 296-24-76519, filed 5/7/73.]

WAC 296-24-76521 Open risers. Stairs having treads of less than 9-inch width should have open risers.

[Order 73-5, § 296-24-76521, filed 5/9/73 and Order 73-4, § 296-24-76521, filed 5/7/73.]

WAC 296-24-76523 General. Open grating type treads are desirable for outside stairs.

[Order 73-5, § 296-24-76523, filed 5/9/73 and Order 73-4, § 296-24-76523, filed 5/7/73.]

WAC 296-24-780 Portable wood ladders. The following terms shall have the meaning ascribed in this section when referred to in WAC 296-24-78003 through 296-24-78009 unless the context requires otherwise. (1) Ladders. A ladder is an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) Stepladder. A stepladder is a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

(3) Single ladder. A single ladder is a nonself-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designated by the overall length of the side rail.

(4) Extension ladder. An extension ladder is a nonself-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

(5) Sectional ladder. A sectional ladder is a nonself-supporting portable ladder, nonadjustable in length consisting of two or more sections of ladder so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections.

(6) Trestle ladder. A trestle ladder is a self-supporting portable ladder, nonadjustable in length, consisting of two sections hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge.

(7) Extension trestle ladder. An extension trestle ladder is a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base.

(8) Special-purpose ladder. A special-purpose ladder is a portable ladder which represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders previously defined, in order to adapt the ladder to special or specific uses.

(9) Trolley ladder. A trolley ladder is a semifixed ladder, nonadjustable in length, supported by attachments to an overhead track, the plane of the ladder being at right angles to the plane of motion.

(10) Side-rolling ladder. A side-rolling ladder is a semifixed ladder, nonadjustable in length, supported by attachments to a guide rail, which is generally fastened to shelving, the plane of the ladder being also its plane of motion.

(11) Wood characteristics. Wood characteristics are distinguishing features which by their extent and number determine the quality of a piece of wood.

(12) Wood irregularities. Wood irregularities are natural characteristics in or on wood that may lower its durability, strength, or utility.

(13) Cross grain. Cross grain (slope of grain) is a deviation of the fiber direction from a line parallel to the sides of the piece.

(14) Knot. A knot is a branch or limb, imbedded in the tree and cut through in the process of lumber manufacture, classified according to size, quality, and occurrence. The size of the knot is determined as the average diameter on the surface of the piece.

(15) Pitch and bark pockets. A pitch pocket is an opening extending parallel to the annual growth rings containing, or that has contained, pitch, either solid or liquid. A bark pocket is an opening between annual growth rings that contains bark.

(16) Shake. A shake is a separation along the grain, most of which occurs between the rings of annual growth.

(17) Check. A check is a lengthwise separation of the wood, most of which occurs across the rings of annual growth.

(18) Wane. Wane is bark, or the lack of wood from any cause, on the corner of a piece.

(19) Decay. Decay is disintegration of wood substance due to action of wood-destroying fungi. It is also known as dote and rot.

(20) Compression failure. A compression failure is a deformation (buckling) of the fibers due to excessive compression along the grain.

(21) Compression wood. Compression wood is an aberrant (abnormal) and highly variable type of wood structure occurring in softwood species. The wood commonly has density somewhat higher than does normal wood, but somewhat lower stiffness and tensile strength for its weight in addition to high longitudinal shrinkage.

(22) Low density. Low-density wood is that which is exceptionally light in weight and usually deficient in strength properties for the species.

[Order 73-5, § 296-24-780, filed 5/9/73 and Order 73-4, § 296-24-780, filed 5/7/73.]

WAC 296-24-78003 Application of requirements. This section is intended to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of portable wood ladders, in order to insure safety under normal conditions of usage. Other types of special ladders, fruit-picker's ladders, industrial tripod ladders, combination step and extension ladders, stockroom step ladders, aisle-way step ladders, shelf ladders, and library ladders are not specifically covered by this section.

[Order 73-5, § 296-24-78003, filed 5/9/73 and Order 73-4, § 296-24-78003, filed 5/7/73.]

WAC 296-24-78005 Materials. (1) Requirements applicable to all wood parts.

(a) All wood parts shall be of the species specified in Table D-5, seasoned to a moisture content of not more than 15 percent; smoothly machined and dressed on all sides; free from sharp edges and splinters; sound and free by accepted visual inspection from shake, wane, compression failures, decay, or other irregularities except as hereinafter provided. Low-density wood shall not be used.

(b) Black streaks in western hemlock shall not be considered an irregularity, except that chambers associated with black streaks when present in the part, shall be limited as specified for pitch and bark pockets.

(2) Permissible irregularities in side rails and back rails.

(a) The general slope of grain in side rails of minimum dimension shall not be steeper than 1 in 12, except that for ladders under 10 feet in length and having flat steps for treads, the general slope of grain shall not be steeper than 1 in 10. The slope of grain in areas of local grain deviation shall not be steeper than 1 in 12 or 1 in 10 as specified above when occurring on the edges or in the outer one-fourth of the width of the wide face. Local areas of grain deviation within the center half of the width of the wide face may contain grain slope as steep as 1 in 8. Local deviations of grain associated with otherwise permissible irregularities are permitted.

(b) Knots shall not appear in narrow faces of side rails. Knots, if tight and sound and less than one-half inch in diameter, are permitted on the wide face provided they are at least one-half inch back from either edge and not more frequent than 1 to any 3 feet of ladder length.

(c) Pitch and bark pockets are permitted provided they are not more than one-eighth inch in width, or more than 2 inches in length, or more than one-half inch in depth, and then only if they are not more frequent than 1 to any 3 feet of ladder length.

(d) Checks are permitted on side rails provided they are not more than 6 inches in length or more than one-half inch in depth.

(e) Occurrences of compression wood in relatively small amounts and positively identified by competent and conscientious visual inspection of side rails are permitted provided no single streak shall exceed one-half inch in width nor shall the aggregate of streaks exceed one-fourth of the face of the side rail. Borderline forms of compression wood not positively identified by competent and conscientious visual inspection are permitted. Ladder parts containing bow or crook which would interfere with the operation of the ladder shall not be used.

(3) Permissible irregularities in flat steps, rungs, and cleats.

(a) The general slope of grain in flat steps of minimum dimension shall not be steeper than 1 in 12, except that for ladders under 10 feet in length the slope of grain shall not be steeper than 1 in 10. The slope of grain in areas of local deviation shall not be steeper than 1 in 12 or 1 in 10 as specified above. For all ladders, cross grain not steeper than 1 in 10 are permitted in lieu of 1 in 12, provided the size is increased to afford at least 15 percent greater calculated strength than for ladders built to minimum dimensions. Local deviations of grain associated with otherwise permissible irregularities are permitted.

(b) The general slope of grain and that in areas of local deviations of grain shall not be steeper than 1 in 15 in rungs and cleats. For all ladders cross grain not steeper than 1 in 12 are permitted in lieu of 1 in 15, provided the size is increased to afford at least 15 percent greater calculated strength for ladders built to minimum dimensions. Local deviations of grain associated with otherwise permissible irregularities are permitted.

(c) Knots over one-eighth inch in diameter shall not appear in rungs. Knots shall not appear in the narrow faces of flat steps and cleats. Knots appearing in the wide faces of flat steps and cleats shall not exceed a diameter of one-fourth inch.

(4) Classification of species of wood. Table D-5 gives a list of native woods, divided into four groups on the basis of mechanical properties considered from the standpoint of use for ladder construction.

(a) All minimum dimensions and specifications set forth in (b)(ii) for side rails and flat steps are based on the species of wood listed in Group 3 in Table D-5 except where otherwise provided. The species of all other groups may be substituted for those of Group 3 when used in sizes that provide at least equivalent strength. (See Table D-5 for suggested methods of size adjustment.)

(b) All minimum dimensions and specifications set forth in the following "factor for increase in" for rungs and cleats are based on the species of wood listed in Group 1 in Table D–5. The cross–sectional dimensions specified for Group 1 species are increased by the factors shown in this subsection (based on the percentages of Table D–5) for the species group of which the cleats are to be made.

FACTOR FOR INCREASE IN

Species group	Each dimension	Width only (thickness unchanged)
1	1.00	1.00
2	1.03	1.05
3	1.11	1.19
4	1.17	1.26

(5) Metal parts. All metal parts shall be made of aluminum, steel, wrought iron, malleable iron, or other material, adequate in strength for the purpose intended, and shall be properly coated and protected so as to be rust resistant.

[Order 73–5, § 296–24–78005, filed 5/9/73 and Order 73–4, § 296–24–78005, filed 5/7/73.]

WAC 296–24–78007 Construction requirements. (1) Basis of requirements.

(a) Dimensions specified hereinafter for wood ladders are the minimum dressed cross–sectional dimensions for the types of ladders herein designated, based on the species of woods specified in WAC 296–24–78005(4), at a moisture content of 15 percent. The dimensions for side rails are based on a mortise or gain as specified for the various types of ladders for step or rung attachments. Where the strength of the side rails or back legs is reduced by a greater mortise or gain than shown, or where it is desired to use a cross section for any wood part either dimension of which is less than that specified, the required dimensions may be found as indicated in (1)(b) of this section.

(b) For the side rails of single extension and sectional ladders, the proposed section shall develop an actual stress per square inch not greater than 2,150 pounds for Group 1 woods, 2,000 pounds for Group 2 woods, 1,600 pounds for Group 3 woods, or 1,375 pounds for Group 4 woods when computed by the following formula applying to rectangular sections, with a maximum tolerance of 5 percent over these stresses:

$$S = \frac{3\ LD\ (P+W/16)}{2B\ (D^3-d^3)} = \frac{1.5\ LD\ (25+W/16)}{B\ (D^3-0.67)}$$

P = 25 pounds, which is the normal component on each rail of a load of 200 pounds at the center of the ladder, equally distributed between the rails, when the foot of the ladder is moved out of the perpendicular by one–quarter of its length.

S = Stress in extreme fiber in pounds per square inch.

W = Weight of ladder in pounds.

L = Maximum working length of ladder in inches.

B = Net thickness of each side rail in inches.

D = Depth of side rail in inches.

d = Diameter of hole board for rung (d^3 shall be taken as not less than 0.67).

(c) Adjustment of sizes for wood parts of stepladders and other ladder types covered by this section may be made as follows:

(i) The dimensions specified in later sections for parts having rectangular cross sections generally represent only one of a number of possible combinations of thickness and width which could satisfy the requirements for strength and stiffness. Depending upon the material sizes available, manufacturing practices, and like factors, parts produced by a particular manufacturer may or may not agree exactly with the sizes given later. The following provisions provide means for determining equality of load–carrying capacity of parts of different sizes or of determining sizes needed to provide equality.

(ii) Any changes in dimensions shall result in a change in the width–thickness ratio for side rails of back legs not greater than 25 percent from the ratio for a corresponding ladder as now covered in this section.

(iii) Where both dimensions are different from those specified, the load–carrying capacity in bending of a part will be equal to or greater than that of a part of specified dimensions if the ratio P_2/P_1 is not less than 1, where

$$\frac{P_2}{P_1} = \frac{B_2D_2^2}{B_1D_1^2}$$

and

B = Dimension of the part at right angles to the direction of load (width of a step, thickness of a side rail or back leg).

D = Dimension of the part parallel to the direction of load (thickness of a step, width of a side rail or back leg).

B_1D_1 = Dimensions as specified.

B_2D_2 = Dimensions of part being considered.

(iv) The dimensions to be used in the computations are net dimensions. For example, in the case of a stepladder side rail, the dimension B is to be taken as the gross thickness of the rail minus the depth of the gain for the steps. Where there is a rung hole at the center of depth of a rail, a somewhat more accurate comparison may be made by the use of the formula

$$\frac{P_2}{P_1} = \frac{B_2D_1\ (D_2^3-d^3)}{B_1D_2\ (D_1^3-d^3)}$$

where the symbols have the same meanings as before and d is the diameter of the hole for the rung tenon. In most instances the difference in results calculated by this and by the earlier formula will be slight.

(2) Portable stepladders. Stepladders longer than 20 feet shall not be supplied. Stepladders as hereinafter specified shall be of three types:

Type I—Industrial stepladder, 3 to 20 feet for heavy duty, such as utilities, contractors, and industrial use.

Type II—Commercial stepladder, 3 to 12 feet for medium duty, such as painters, offices, and light industrial use.

Type III—Household stepladder, 3 to 6 feet for light duty, such as light household use.

(a) General requirements.

(i) Slope is the inclination of side rails or back legs with respect to the vertical and is expressed as a deviation from the vertical per unit length of the member. Stepladders shall be so constructed, that when in the open position, the slope of the front section shall not be less than 3 1/2 inches and the slope of the back section not less than 2 inches, for each 12-inch length of side rail.

(ii) A uniform step spacing shall be employed which shall be not more than 12 inches. Steps shall be parallel and level when the ladder is in position for use.

(iii) The minimum width between side rails at the top, inside to inside, shall be not less than 11 1/2 inches. From top to bottom, the side rails shall spread at least 1 inch for each foot of length of stepladder.

(iv) When minimum thickness of side rails is used, steps shall be closely fitted into the grooves in the side rails one-eighth inch in depth with a tolerance of one thirty-second inch, and shall be firmly secured as hereinafter described; or they shall be closely fitted into metal brackets of an equivalent strength, which in turn shall be firmly secured to the side rails. The depth of groove herein provided may be increased in proportion to the thickness of side rails as provided in WAC 296-24-78007 (2)(b), (c) and (d).

(v) All stepladders shall have a top with wood or metal brackets or fittings tightly secured to the top, side rails, and back legs, to allow free swinging of the back section without excessive play or wear at the joints.

(vi) A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions shall be a component of each stepladder. The spreader shall have all sharp points covered or removed to protect the user. For Type III ladder, the pail shelf and spreader may be combined in one unit (the so-called shelf-lock ladder).

(vii) When measured along the front edge of the side rails, all stepladders shall measure within 3 inches of the specified length.

(viii) Where bucket shelves are provided, they shall be constructed to support a load of 25 pounds and shall be so fastened that they can be folded up when the ladder is closed.

(ix) All metal parts and fittings shall be securely attached by means of rivets, bolts, screws, or equivalent fasteners.

(b) Type I industrial stepladder.

(i) The minimum dimensions of the parts of the Type I stepladder shall be as shown in Table D-2 when made of Group 2 or Group 3 woods.

(A) The minimum thickness of side rails provides for the cutting of a groove of one-eighth inch in depth with the tolerance indicated in WAC 296-24-78007 (2)(a)(iv), and shall be increased when grooves of greater depth are used.

(ii) Steps shall be secured with at least two 6-d nails at each end, or the equivalent thereof. Each step shall be reinforced by a steel rod not less than 3/16 inch in diameter with standard commercial tolerances, which shall pass through metal washers of sufficient thickness and diameter on each end to prevent pressing—into the side rails, and a truss block which shall be fitted between the rod and the center of each step, or by a metal angle brace on each end firmly secured to the steps and side rails, or by construction of equivalent strength and safety. Where the rod reinforcement construction is used, the bottom step shall be provided further with a metal angle brace on each end which shall be securely attached to the bottom step and side rails. In addition, all steps 3 5/8 inches wide and 27 inches or more in overall length and all steps 4 1/4 inches wide and 32 inches or more in overall length shall be provided with a metal angle brace at each end securely attached to the step and side rail.

(iii) The back section shall be braced by one of the following methods:

(A) The back legs shall be braced with 1 1/8-inch diameter rungs of Group 1 woods (see Table D-5), or material of equivalent strength, having 7/8-inch diameter tenons or oval wood rungs, or rectangular wood rungs of equivalent strength, spaced not more than 12 inches apart. The back legs shall be bored with holes either extending through the legs or to within three-sixteenths inch of the outside face of the legs, the size of the hole to be such as to insure a tight fit for the rung. The shoulder of the rung shall be forced firmly against the leg, and the tenon secured in place with a nail, or the equivalent thereof, to prevent turning of the rungs. The back legs shall be braced by a metal angle brace on each side, securely fastened to the rung and the back legs, one rung to be braced for each 4 feet of length or fraction thereof, on ladders 4 feet or more in length, with braces required only on the bottom rung for ladders that are 4 feet or shorter. Where rungs are more than 28 inches in length between the back legs they shall be provided with center bearing consisting of a wood bar not less than 3/4 by 2 inches in a cross-section securely nailed to each rung passing through it and long enough to include each rung longer than 28 inches.

(B) The back leg shall be braced with horizontal wood bars of Group 1, 2, or 3 woods in Table D-5 and not less than 3/4 by 2 1/2 inches in cross-section, spaced not more than 12 inches apart. The ends of the bars shall fit into metal sockets of not less than 20-gauge (manufacturers standard) steel, or other material of equivalent strength, or into mortises of not less than one-eighth inch (tolerance of ± one-thirty-second inch) in depth in

the back legs. A steel rod not less than 3/16 inch in diameter with standard commercial tolerance shall pass through the back legs, the bar, and at each end through metal washers of sufficient diameter and thickness to prevent passing into the back legs. The back legs shall also be braced by a metal angle brace on each side, securely fastened to the bar and to the legs, one bar to be so braced for at least each 4 feet of length or fraction thereof, with braces required only on bottom bar for ladders that are 4 feet or shorter. Metal sockets when used shall be attached to the back legs by rivets or by means of a rod running through the socket or equivalent thereof.

(iv) The back legs shall be reinforced by a rivet through the depth of the leg above the hinge point, by metal plates or collars at the hinge point, or by other means suitable for preventing splitting of the back leg from the hinge pin to the top.

(c) Type II commercial stepladder.

(i) The minimum dimensions of the parts of the Type II stepladder shall be as given in Table D–3 when made of Group 2 or Group 3 woods.

(A) The minimum thickness of side rails provides for the cutting of a groove of one–eighth inch in depth with the tolerance indicated in (2)(a)(iv), and shall be increased when grooves of greater depth are used.

(ii) Steps shall be secured with at least two 6–d nails at each end, or the equivalent thereof. Each step shall be reinforced by a steel rod not less than 3/16 inch in diameter with standard commercial tolerances which shall pass through metal washers of sufficient thickness and diameter on each end to prevent pressing into the side rails, and a truss block shall be fitted between the truss rod and center of each step; or by a metal angle brace on each end firmly secured to the steps and side rails; or by construction of equivalent strength and safety. Where the rod reinforcement construction is used, the bottom step shall be provided further with a metal angle brace on each end which shall be securely attached to the bottom step and side rails. In addition all steps 27 inches or more in overall length shall be provided with a metal angle brace at each end securely attached to the step and side rails.

(iii) The back legs shall be braced by one of the three following methods:

(A) With 7/8–inch diameter wood dowels of Group 1 woods (see Table D–5) or material of equivalent strength having not less than 5/8–inch tenons firmly secured in the back legs and spaced not more than 12 inches apart. The back legs shall be bored with holes either extending through the legs or to within three–sixteenths inch of the outside face of the legs, the size of the hole to be such as to insure a tight fit for the dowel. The shoulder of the dowel shall be forced firmly against the leg and the tenon secured in place with a nail, or the equivalent thereof, to prevent turning of the dowel.

(aa) A bar connecting two or more of the dowels shall be provided on all ladders of 6 feet or more. The cross–sectional dimensions of the bar shall be the same as the cross–sectional dimensions of the back legs, and the dowels shall pass through holes at the centerline of the bar. The bar shall be attached at the center of the length of the lower two dowels on a 6–foot ladder and shall extend upward one dowel for each 2 feet of added length.

(B) With wood dowels as set forth in (2)(c)(iii)(A) of this section, plus an inverted V bracing of 3/4–inch by 1 1/2–inch material through which the dowels extend, the length of the V to extend two–thirds of the way up the back.

(C) With horizontal bracing of Group 1, 2, 3, or 4 woods (see Table D–5) not less than 3/4 by 2 inches in cross–section, the ends of which shall fit into metal sockets of not less than 20–gauge (manufacturing standard), steel, or other material of equivalent strength or into mortises not less than one–eighth inch in depth in back legs. The bars shall be reinforced by steel rods not less than 3/16 inch in diameter with standard commercial tolerances which shall pass through the back legs, the bar, and, at each end, through metal washers of sufficient diameter and thickness to prevent pressing into the back legs. The spacing of such braces shall not exceed 3 feet, and there shall be one brace on 3– and 4–foot ladders, two braces on 5– and 6–foot ladders, three braces on 7– and 8–foot ladders, and four braces on 10– and 12–foot ladders. The bottom bar shall not be more than 18 inches from the bottom of the ladder, and, where only one bar is used, it shall be braced by a metal angle brace on each end securely attached to the bar and the back leg.

(d) Type III household stepladder.

(i) The minimum dimensions of the parts of the Type III stepladder shall be as follows when made of Group 2 or Group 3 woods.

	Length, 3 to 6 feet	
	Thickness (inch)	Depth (inches)
Side rails	3/4	2 1/2
Back legs	3/4	1 5/16
Steps	3/4	3
Top	3/4	5

The minimum thicknesses of side rails provide for the cutting of a groove one–eighth inch in depth with the tolerance indicated in WAC 296–24–78007 (2)(a)(iv), and shall be increased when grooves of greater depth are used.

(ii) Steps shall be secured with at least one 6–d nail at each end, or the equivalent thereof. Each step shall be reinforced by a steel rod not less than 3/16 inch in diameter with standard commercial tolerance which shall pass through metal washers of sufficient thickness and diameter to prevent pressing into the side rails, or by a metal brace at each end firmly secured to steps and side rails or by construction of equivalent strength and safety. Where the rod reinforcement construction is used, the bottom step shall be provided further with a metal angle brace on each end which shall be securely attached to the bottom step and side rail.

(iii) Back legs shall be braced by one of the two following methods or by construction of equivalent strength and safety:

(A) By diagonal slates of groups 1, 2, 3, or 4 wood (see Table D–5) not less than 5/16 by 1 1/4 inches securely fastened to the back legs by nails, screws, or the equivalent thereof.

(B) With horizontal bracing of Groups 1, 2, 3, or 4 wood (see Table D–5) not less than 5/8 by 1 5/8 inches in cross section, the ends of which shall fit into metal sockets of not less than 20–gauge (manufacturing standard) steel or other material of equivalent strength or into mortises not less than one–eighth inch in depth in back legs. The bars shall be reinforced by steel rods not less than 3/16 inch in diameter with standard commercial tolerances which shall pass through the back leg, the bar, and at each end through metal washers of sufficient diameter and thickness to prevent pressing into each leg. The spacing of such bars shall not exceed 3 feet, and there shall be one brace on 3– and 4–foot ladders, two braces on 5– and 6–foot ladders. The bottom bar shall be not more than 18 inches from the bottom of the ladder.

(3) Portable rung ladders. Portable rung ladders as herein specified shall be of four types, as follows: Single ladder; two–section extension ladder; section ladder; trestle and extension trestle ladder.

(a) General requirements.

(i) The base or lower portion of a ladder may have either parallel sides or flared sides in accordance with commercial practice.

(ii) Rungs shall be parallel, level, and uniformly spaced. The spacing shall be not more than 12 inches, except as hereinafter specified.

TABLE D–2

DIMENSIONS FOR TYPE I STEP LADDER

	Length, 12 feet and less		Length, 14 and 16 feet		Length, 18 and 20 feet	
	Thickness (inch)	Depth (inches)	Thickness (inch)	Depth (inches)	Thickness (inch)	Depth (inches)
Side rails —	3/4	3 1/4	3/4	3 1/2	1 1/16	3 1/2
Back legs —	3/4	2 1/4	3/4	2 5/8	1 1/16	2 1/4
Steps —	3/4	3 5/8	3/4	4 1/4	3/4	4 1/4
Tops —	3/4	5 1/2	3/4	5 1/2	3/4	5 1/2

TABLE D–3

DIMENSIONS FOR TYPE II STEP LADDER

	Length, 3 to 8 feet		Length, 10 feet		Length, 12 feet	
	Thickness (inch)	Depth (inches)	Thickness (inch)	Depth (inches)	Thickness (inch)	Depth (inches)
Side rails —	3/4	2 5/8	3/4	2 5/8	3/4	3
Back legs —	3/4	1 5/8	3/4	1 3/4	3/4	2
Steps —	3/4	3 1/2	3/4	3 1/2	3/4	3 5/8
Tops —	3/4	5	3/4	5	3/4	5

(iii) All holes for wood rungs shall either extend through the side rails or be bored so as to give at least a thirteen–sixteenths–inch length of bearing to the rung tenon. In throughbored construction, the rungs shall extend at least flush with the outside rail surface. All holes shall be located on the center line of the wide face of the side rails and shall be of such size as to insure a tight fit for the rung. The shoulder of the rung shall be forced firmly against the side rails and the tenon secured in place with a nail or the equivalent thereof, for the sole purpose of preventing the turning of the rung and maintaining the rung position in the side rail. Ladders used with ladder jacks shall be a 3/16 inch metal tie rod immediately under each rung.

(iv) Round rungs shall be of Group 1 woods (see Table D–5), shall be not less than 1 1/8 inches in diameter for lengths over 36 inches between side rails and 1 1/4 inches in diameter for lengths over 36 up to and including 72 inches, and shall have not less than seven–eighths–inch–diameter tenons, or rungs of equivalent strength and bearing shall be provided. When rungs are 28 inches or more in length between side rails, they shall, in addition, be provided with center bearing.

(v) Oval rungs or rungs of any other cross section may be used provided they are secured by a nail at each end or the equivalent thereof, and have at least the same strength and bearing as round rungs of the same length.

(vi) All metal parts and fittings shall be securely attached by means of rivets, bolts, screws, or equivalent fasteners.

(vii) The construction and assembly of the movable parts shall be such that they shall operate freely and securely without binding or unnecessary play.

(viii) When measured along the side rails, no rung ladder or section thereof shall be more than 4 inches shorter than the specified length.

(ix) Nonslip bases shall be securely bolted, riveted, or attached by equivalent construction to the side rails.

(x) Hooks shall be securely bolted or riveted to the side rails or equivalent construction and shall be of such dimensions as to withstand the loads imposed upon them.

(b) Single ladder.

(i) Single ladders longer than 30 feet shall not be supplied.

(ii) The minimum dimensions of the side rails of the single ladder shall be as follows when made of Group 2 or Group 3 woods:

Length of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 16	1 1/8	2 1/2
Over 16 up to and including 22	1 1/4	2 3/4
Over 22 up to and including 30	1 1/4	3

(iii) Smaller side rails will be acceptable in all ladders of this type when reinforced by a steel wire, rod, or strap

running the length of the side rails and adequately secured thereto. Where such reinforcement is used, the reinforced rails shall be equivalent in strength to the side rails specified in this WAC 296-24-78007 (3)(b)(ii).

(iv) The width between the side rails at the base, inside to inside, shall be at least 11 1/2 inches for all ladders up to and including 10 feet. Such minimum widths shall be increased at least one-fourth inch for each additional 2 feet of length.

(c) Two-section ladder.

(i) Two-section extension ladders longer than 60 feet shall not be supplied. All ladders of this type shall consist of two sections, one to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered.

(ii) The minimum dimensions of the side rails of the two-section extension ladder shall be not less than specified in Table D-4.

(iii) The minimum dimensions of side rails set forth in Table D-4 are based on the maximum working length, which is the size of ladder less the minimum overlap, which shall be as follows:

Size of ladder (feet):	Overlap (feet)
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

(iv) Smaller side rails will be acceptable in all ladders of this type when reinforced by a steel wire, rod, or strap running the length of the side rails and adequately secured thereto. Where such reinforcement is used, the reinforced rails shall be equivalent in strength to the side rails specified in Table D-4.

(v) The minimum distance between side rails of the bottom section, inside to inside, shall be 14 1/2 inches on ladders up to and including 28 feet; 16 inches on all ladders over 28 feet up to and including 40 feet; 18 inches on all ladders over 40 feet.

(vi) Rungs. Rungs shall be of white oak, ash, hickory, or wood of equivalent strength not less than 1 1/8 inches in diameter with at least a 7/8 inch diameter tenon. Where the distance between side rails is more than 28 inches rungs shall be supported in the center. Holes for wood rungs shall either extend through the side rails or be bored to give at least a 13/16 inch length of bearing to the rung tenon. In throughbored construction the rungs shall extend at least flush with the outside rail surface. Holes shall be located on the center line of the wide face of the side rails and shall be of such size as to be a tight fit for the rung. The shoulder of the rung shall be forced firmly against the side rails and the tenon secured in place with a nail, or the equivalent thereof, to prevent turning. A 3/16 inch diameter tie rod shall be placed under each rung.

(vii) All locks and guide irons shall be of metal and shall be of such construction and strength as to develop the full strength of the side rails. All locks shall be positive in their action. The guide irons shall be securely attached and so placed as to prevent the upper section from tipping or falling out while raising, lowering, or in use.

(viii) Ladders of this type may be equipped with a rope and pulley, which shall be securely attached to the ladder in such manner as not to weaken either the rungs or the side rails. The pulley shall be not less than 1 1/4 inches in diameter.

(A) The rope used with the pulley shall be not less than five-sixteenths inch in diameter having a minimum breaking strength of 560 pounds, and shall be sufficient length for the purpose intended.

(d) Sectional ladder.

(i) Assembled combinations of sectional ladders longer than lengths specified in (3)(d)(ii) shall not be used.

(ii) The minimum dimensions of side rails shall be as follows for Group 2 or Group 3 woods:

Assembled length of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 21	1 1/8	2 3/4
Over 21 up to and including 31	1 1/8	3 1/8

TABLE D-4

DIMENSIONS OF SIDE RAILS FOR TWO-SECTION LADDER

Size of ladder, overall length (feet)	Rail		
	Thickness (inches)		Depth (inches)
For group 2 woods			
16	1 1/16	X	2
20	1 1/16	X	2 1/4
24	1 1/16	X	2 1/2
28	1 1/16	X	2 3/4
32	1 1/8	X	2 3/4
36	1 5/16	X	2 3/4
40	1 5/16	X	2 3/4
44	1 5/16	X	3
For group 3 woods			
16	1 1/8	X	2
20	1 1/8	X	2 1/4
24	1 1/8	X	2 1/2
28	1 1/8	X	2 3/4
32	1 5/16	X	2 3/4
36	1 5/16	X	3
40	1 3/8	X	3
44	1 3/8	X	3 1/4
48-52	1 3/8	X	3 3/4
56-60	1 5/8	X	3 3/4

(iii) Ladders of this type shall have either straight sides slightly converging toward the top of each section, or shall have flaring sides at the bottom of the first (or

bottom) section, with the top section having converging side rails to a width that shall be not less than 4 inches. Except for the top section, the minimum width between side rails shall be 11 inches.

(A) Adjacent sections shall be jointed by means of a groove in the bottom end of each rail of the upper of the two sections setting firmly over extensions outside the side rails, of the topmost rung of the next lower section and, at the same time, a groove in the top end of each rail of the lower of the two sections setting firmly over the bottom rung, inside the side rails, of the section next above.

(B) The distance between the two rungs (top–most rung of one section, bottom rung of the section next above) mentioned in WAC 296–24–78007 (3)(d)(iii)(A) shall not be less than 1 foot.

(C) The fit between rail grooves and rungs mentioned in WAC 296–24–78007 (3)(d)(iii)(A) shall be such as to provide a good fit without binding or unnecessary play.

(D) The grooved ends of the sections shall be reinforced with a metal plate of not less than 18–gauge (manufacturing standard) material properly secured thereto, and a rivet adjacent to the groove, extending through the depth of the rail, or the equivalent thereof.

(e) Trestle and extension trestle ladder.

(i) Trestle ladders, or extension sections or base sections of extension trestle ladders longer than 20 feet shall not be supplied.

(ii) The minimum dimensions of the side rails of the trestle ladder, or the base sections of the extension trestle ladder, shall be as follows for Group 2 or Group 3 woods.

Size of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 16	1 5/16	2 3/4
Over 16 up to and including 20	1 5/16	3

The minimum dimensions of the side rails of the extension section of the extension trestle ladder, which shall have parallel sides, shall be as follows for Group 2 or Group 3 woods.

Size of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 12	1 5/16	2 1/4
Over 12 up to and including 16	1 5/16	2 1/2
Over 16 up to and including 20	1 5/16	2 3/4

(iii) Trestle ladders and base sections of extension trestle ladders shall be so spread that when in an open position the spread of the trestle at the bottom, inside to inside, shall be at least 5 1/2 inches per foot of the length of the ladder.

(iv) The width between the side rails at the base of the trestle ladder and the base sections of the extension trestle ladder shall be at least 21 inches for all ladders and sections up to and including 6 feet. Longer lengths shall be increased at least 1 inch for each additional foot of length. The width between the side rails of the extension sections of the trestle ladder shall be not less than 12 inches.

(v) The tops of the side rails of the trestle ladder and of the base section of the extension trestle ladder shall be beveled or equivalent construction, and shall be provided further with a metal hinge to prevent spreading.

(vi) A metal spreader or locking device to hold the front and back sections in an open position, and to hold the extension section securely in the elevated position, shall be a component of all extension trestle ladders and all trestle ladders over 12 feet in length.

(vii) Rungs shall be parallel and level. On the trestle ladder, or on the base sections of the extension trestle ladder, rungs shall be spaced not less than 8 inches or more than 18 inches apart; on the extension section of the extension trestle ladder, rungs shall be spaced not less than 6 inches or more than 12 inches apart.

(viii) Rungs. Rungs shall be of white oak, ash, hickory, or wood of equivalent strength not less than 1 1/8 inches in diameter with at least a 7/8 inch diameter tenon. Where the distance between side rails is more than 28 inches rungs shall be supported in the center. Holes for wood rungs shall either extend through the side rails or be bored to give at least a 13/16 inch length of bearing to the rung tenon. In throughbored construction the rungs shall extend at least flush with the outside rail surface. Holes shall be located on the center line of the wide face of the side rails and shall be of such size as to be a tight fit for the rung. The shoulder of the rung shall be forced firmly against the side rails and the tenon secured in place with a nail, or the equivalent thereof, to prevent turning. A 3/16 inch diameter tie rod shall be placed under each rung.

(4) Special–purpose ladders. All special–purpose ladders shall comply with the appropriate requirements of WAC 296–24–78007 (1), (2) and (3), except as hereinafter modified in this subsection.

(a) Platform stepladder. A platform stepladder is a modification of a portable stepladder with a working platform provided near the top.

(i) Platform stepladders shall be made in accordance with the requirements of Type I stepladders or in accordance with the requirements for Type II stepladders.

(ii) The slope of the back section shall be such that a vertical from the back edge of the platform will strike the floor at a distance measured toward the front section of not less than 3 inches from the base of the back section.

(iii) The minimum width between side rails at the platform shall be not less than 15 inches.

(iv) The back legs and side rails shall extend at least 24 inches above the platform and shall be connected

with a top member to form a three–sided rail, or equivalent construction shall be provided.

(v) Platforms shall be so constructed as to be capable of supporting a load of 200 pounds placed at any point on the platform.

(vi) A separate spreader may be omitted from platform ladders in which the height to the platform is 6 feet or less. If the spreader is omitted, the platform shall be so designed as to function as a spreader or locking device to hold the front and back sections securely in an open position, with the connection between side rails and back legs being through the metal parts of the platform. The wood parts of a combined wood and metal platform functioning as a spreader shall not be depended upon to contribute to the spreading or locking action.

(b) Painter's stepladder.

(i) Painter's stepladders longer than 12 feet shall not be supplied.

(ii) Painter's stepladders shall be made in accordance with the requirements of Type II stepladders except for the following:

(A) The top may be omitted.

(B) A rope spreader may be substituted for the metal spreader required in WAC 296–24–78007 (2)(a)(vi). The rope shall not be less than No. 6 sash cord or its equivalent.

(c) Mason's ladder. A mason's ladder is a special type of single ladder intended for use in heavy construction work.

(i) Mason's ladders longer than 40 feet shall not be supplied.

(ii) The minimum dimensions of the side rails when made of Group 2 or Group 3 woods and rungs (Group 1 woods) of the mason's ladder shall be as follows:

Length of ladder (feet)	Side rails		Diameter	
	Thickness (inches	Depth (inches)	Rung (inches)	Tenon (inches)
Up to and including 22 —	1 5/8	3 5/8	1 3/8	1
Over 22 up to and including 40 ————	1 5/8	4 1/2	1 3/8	1

(iii) The width between the side rails at the bottom rung, inside to inside, shall be not less than 12 inches for all ladders up to and including 10 feet. Such minimum widths shall be increased by at least one–fourth inch for each additional 2 feet of length.

(iv) Rungs shall be parallel and level and shall be spaced not less than 8 inches or more than 12 inches apart.

(5) Trolley and side–rolling ladders.

(a) Length. Trolley ladders and side–rolling ladders longer than 20 feet should not be supplied.

(b) Dimensions. The dimensions of the side rails shall not be less than the following for Group 2 or Group 3 woods.

Length of side rails (feet)	Thickness (inch)	Depth (inches)
Up to and including 10	3/4	3
Over 10 up to and including 20 ————	3/4	3 3/4

The minimum thicknesses of side rails provide for the cutting of a groove not over one–eighth inch in depth and shall be increased when grooves of greater depth are used. Flat steps shall have the following minimum dimensions for Group 2 or Group 3 woods.

Length of side rails (feet)	Thickness (inch)	Depth (inches)
Up to and including 16	3/4	3
Over 16 up to and including 20 ————	3/4	3 1/4
Over 20 up to and including 24 ————	3/4	3 1/2
Over 24 up to and including 28 ————	3/4	4

(c) Width. The width between the side rails, inside to inside, shall be at least 12 inches.

(d) Step attachment. Flat steps shall be inset in the side rails one–eighth inch and secured with at least two 6–d nails at each end or the equivalent thereof. They shall be reinforced with angle braces or a 3/16–inch steel rod.

(e) Locking device. Locking devices should be provided on all trolley ladders.

(f) Tracks.

(i) Tracks shall be wood, or metal (excluding cast iron), or a combination of these materials.

(ii) Tracks for the top end of ladders shall be fastened securely and shall be so constructed that the wheels will not jump the track. Tracks shall be so designed as to provide for all probable loads to which they will be subjected.

(iii) The supports shall be securely fastened by the lag screws, machine, hook, or toggle bolts, or their equivalent.

(iv) Track for side–rolling ladders shall be supported by metal or wood brackets securely screwed or bolted to shelving or other permanent structure at not over 3 feet.

(g) Wheel carriages.

(i) Wheel carriages shall be so designed as to provide for all loads to which they will be subjected. Two–point suspension should be used.

(ii) The wheel carriage for the top end of the ladder shall be securely fastened to the top of the ladder with metal brackets bolted either to the side rails or to the top step. When bolted to the top step, this step shall be secured to the side rails with metal braces in addition to those otherwise provided. The wheel carriage shall be so designed that a loose or broken wheel will not allow the ladder to drop or become detached from the track.

(iii) The wheel carriage for the bottom end of the ladder shall be securely fastened to the bottom of the ladder.

(iv) The wheels at the upper end of the ladder shall have minimum wheel base of 8 inches.

(v) When wheels are used at the bottom of the ladder, there shall be at least one wheel supporting each side rail.

(vi) Running gear for bottoms of both trolley and side-rolling ladders shall be so designed and constructed as to provide for any load to which they will be subjected.

(6) Jacob's ladders. Portable type ladders fabricated with side rails of rope, wire, chain, etc., and having rigid rungs. Care and use shall be as follows:

(a) Jacob's ladders shall not be used in lengths longer than 30 feet.

(b) Side rails shall be fabricated from rope, metal bars, wire, chain, or material of substantial construction.

(c) Rungs shall be evenly spaced from 12 to 16 inches apart and not less than 16 inches in length.

(d) Rungs shall be fabricated from wood, metal, or other substantial construction and be securely fastened to the side rails.

(e) The assembled ladder and its means of suspension shall be capable of supporting a minimum of 500 pounds with a safety factor of 5 to 1, unless the side rails are of manila rope which requires a safety factor of 10 to 1.

(f) Care and use of Jacob's ladders shall be in accordance with the applicable portions of WAC 296-24-78009.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-78007, filed 1/11/90, effective 2/26/90; Order 73-5, § 296-24-78007, filed 5/9/73 and Order 73-4, § 296-24-78007, filed 5/7/73.]

WAC 296-24-78009 Care and use of ladders. (1) Care. To insure safety and serviceability the following precautions on the care of ladders shall be observed:

(a) Ladders shall be maintained in good condition at all times, the joint between the steps and side rails shall be tight, all hardware and fittings securely attached, and the moveable parts shall operate freely without binding or undue play.

(b) Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated.

(c) Frayed or badly worn rope shall be replaced.

(d) Safety feet and other auxiliary equipment shall be kept in good condition to insure proper performance.

(e) Ladders should be stored in such a manner as to provide ease of access or inspection, and to prevent danger of accident when withdrawing a ladder for use.

(f) Wood ladders, when not in use, should be stored at a location where they will not be exposed to the elements, but where there is good ventilation. They shall not be stored near radiators, stoves, steam pipes, or other places subjected to excessive heat or dampness.

(g) Ladders stored in a horizontal position should be supported at a sufficient number of points to avoid sagging and permanent set.

(h) Ladders carried on vehicles should be adequately supported to avoid sagging and securely fastened in position to minimize chafing and the effects of road shocks.

(i) Ladders should be kept coated with a suitable protective material. The painting of ladders is satisfactory providing the ladders are carefully inspected prior to painting by competent and experienced inspectors acting for, and responsible to, the purchaser, and providing the ladders are not for resale.

(j) Ladders shall be inspected frequently and those which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as "dangerous, do not use."

(k) Rungs should be kept free of grease and oil.

(2) Use. The following safety precautions shall be observed in connection with the use of ladders:

(a) Portable rung and cleat ladders shall, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder (the length along the ladder between the foot and the top support). The ladder shall be so placed as to prevent slipping, or it shall be lashed, or held in position. Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds.

(b) Ladders for which dimensions are specified should not be used by more than one man at a time nor with ladder jacks and scaffold planks where use by more than one man is anticipated. In such cases, specially designed ladders with larger dimensions of the parts should be procured.

(c) Portable ladders shall be so placed that the side rails have a secure footing. The top rest for portable rung and cleat ladders shall be reasonably rigid and shall have ample strength to support the applied load.

(d) Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded.

(e) Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height.

(f) To support the top of the ladder at a window opening, a board should be attached across the back of the ladder, extending across the window and providing firm support against the building walls or window frames.

(g) When ascending or descending, the user should face the ladder.

(h) Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment shall not be used; improvised repairs shall not be made.

(i) Short ladders shall not be spliced together to provide long sections.

(j) Ladders made by fastening cleats across a single rail shall not be used.

(k) Ladders shall not be used as guys, braces, or skids, or for other than their intended purposes.

(l) Tops of the ordinary types of stepladders shall not be used as steps.

(m) On two-section extension ladders the minimum overlap for the two sections in use shall be as follows:

Size of ladder (feet):	Overlap (feet)
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

(n) Portable rung ladders with reinforced rails (see WAC 296-24-78007 (3)(b)(iii) and (iv)) shall be used only with the metal reinforcement on the under side. Ladders of this type should be used with great care near electrical conductors, since the reinforcing itself is a good conductor.

(o) No ladder should be used to gain access to a roof unless the top of the ladder shall extend at least three feet above the point of support, at eave, gutter, or roof line.

(p) Adjustment of extension ladders should only be made by the user when standing at the base of the ladder, so that the user may observe when the locks are properly engaged. Adjustment of extension ladders from the top of the ladder (or any level over the locking device) is a dangerous practice and should not be attempted. Adjustment should not be made while the user is standing on the ladder.

(q) Middle and top sections of sectional or window cleaner's ladders should not be used for bottom section unless the user equips them with safety shoes.

(r) Extension ladders should always be erected so that the upper section is resting on the bottom section.

(s) The user should equip all portable rung ladders with nonslip bases when there is a hazard of slipping. Nonslip bases are not intended as a substitute for care in safety placing, lashing, or holding a ladder that is being used upon oily metal, concrete, or slippery surfaces.

(t) The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing.

(u) When service conditions warrant, hooks may be attached at or near the top of portable ladders to give added security.

(v) Stepladders shall not be used as single ladders.

(w) Separate ladders for ascending and descending shall be provided in building construction of more than two stories in height, or where traffic is heavy.

(x) Where one broad ladder is used, a center rail shall be provided, and each side plainly marked "up" and "down."

(y) Ladder rungs shall not be used to support more than one section of plank, and not more than two men shall work on such section of planking at one and the same time. When two men are working on the same section of plank, their work should be so arranged that their weight is equally distributed between two ladders as nearly as possible.

(z) When ladders are used of a length sufficient to possess a tendency to spring when weight is applied, they shall be provided with bracing to overcome same. This applies particularly to extension ladders.

(aa) Before climbing ladders, workmen shall see that their shoes are free and clean of greasy or slippery substances.

(bb) When working from a stepladder over five feet high a workman shall not stand on a step higher than the third step from the top of the stepladder.

(cc) Ladders shall not be placed or used in elevator shafts or hoistways except where used by workmen engaged in work within such shafts or hoistways, and then they shall be protected from objects falling from operations at higher elevations in or adjoining the shaft.

(dd) Workmen shall not ascend or descend ladders while carrying tools or materials which will interfere with the free use of both hands.

(ee) Ladders shall pass the following test:

When tested as a simple beam with a support under each end and the center rung loaded with a two hundred pound load, the ladder must support this load for ten minutes without permanent set and without showing any sign of failure. The maximum deflection shall not be greater than shown in the enclosed table.

Lengths of extended ladder in feet	Distance of supports from ends, in inches	Total deflection, in inches
12	3	2 3/4
16	3	6 3/4
20	3	11 1/2
24	3	16 1/2
28	3	21 1/2
30	3	23 1/2
34	6	26
36	6	29
40	6	37
44	9	41

(ff) When working from a ladder over twenty-five feet from the ground or floor, the ladder shall be secured at both top and bottom.

(gg) No type of work shall be performed on a ladder over twenty-five feet from the ground or floor that requires the use of both hands to perform the work, unless a safety belt is worn and the safety lanyard is secured to the ladder.

(hh) Work such as sandblasting or spray painting, that requires wearing eye protection, respirators, and handling of pressure equipment, shall be limited to not over thirty feet from the ground or floor while working on a ladder.

TABLE D-5

CLASSIFICATION OF VARIOUS SPECIES OF WOOD ACCEPTABLE FOR USE IN LADDER

The species are listed alphabetically within each group. The position of any species within a group therefore bears no relation to its strength or acceptability.

Where ladders are desired for use under conditions favorable to decay, it is recommended that the heartwood of decay-resistant species be used, or that the wood be given a treatment with a wood preservative. The species having the most durable heartwood are marked

with an asterisk (*), and these should be preferred where resistance to decay is required.

GROUP 1

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed two thousand one hundred fifty pounds per square inch. These species may be substituted for Group 3 woods on the following basis: The dimensions may be not more than ten percent smaller for each cross-section dimension, or the thickness may remain unchanged, in which case the width may not be more than fifteen percent smaller if used edgewise (as in a rail) or twenty-five percent smaller if used flatwise (as in a tread).

White ash	Fraxinus americana, pennsylvanica, quadrangulata
Beech	Fagus grandifolia
Birch	Betula lenta, alleghaniensis, nigra (2)
Rock elm	Ulmus themasii
Hickory	Carya ovata, laciniosa, tomentosa, glabra
Locust*	Robinia pseudoacacia, Gleditsia triacanthos
Hard maple	Acer nigrum, saccharum
Red maple	Acer rubrum (3)
Red oak	Quercus velutina, marilandica, kelloggii, falcata var. pagodaefolia, laurifolia, ellipsoidalis, rubra, nuttallii, palustris, coccinea, shumardii, falcata, laevis, phellos
White oak	Quercus arizonica, douglasii, macrocarpa, lobata, prinus, muehlenbergii, emoryi, gambelii, oblonifolia, virginiana, garryana, lyrata, stellata, michauxii, bicolor, alba
Pecan	Carya illinoensis, cordiformis, myristicaeformis (4), aquatica (4)
Persimmon	Diospryros virginiana

GROUP 2

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed two thousand pounds per square inch. These species may be substituted for Group 3 woods on the following basis: The dimensions may be not more than seven and one-half percent smaller for each cross-section dimension, or the thickness may remain unchanged, in which case the width may be not more than eleven percent smaller if used edgewise (as in a rail) or twenty percent smaller if used flatwise (as in a tread).

Douglas fir (coast region)	Pseudotsuga menziesii
Western larch	Larix occidentalis
Southern yellow pine	Pinus taeda, palustris, echinata, elliotii, rigida, virginiana

GROUP 3

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed one thousand six hundred pounds per square inch.

Red alder	Alnus ruba, rhombifolia (2)
Oregon ash	Fraxinus latifolia
Pumpkin ash	Fraxinus profunda
Alaska cedar*	Chamaecyparis nootkatensis
Port Orford cedar*	Chamaecyparis lawsoniana
Cucumber	Magnolia acuminata
Cypress*	Taxodium distichum
Soft elm	Ulmus americana, rubra
Douglas fir (Rocky Mountain type)	Pseudotsuga menziesii var. glauca
Noble fir	Abies procera
Gum	Liquidambar styraciflua
West coast hemlock	Tsuga heterophylla
Magnolia	Magnolia grandiflora
Oregon maple	Acer macrophyllum
Norway pine	Pinus resinosa
Poplar	Liriodendron tulipifera
Redwood*	Sequoia sempervirens
Eastern spruce	Picea glauca, rubens
Sitka spruce	Picea sitchensis
Sycamore	Platanus occidentalis
Tamarack	Larix laricina
Tupelo	Nyssa aquatica, sylvatica

GROUP 4

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed one thousand three hundred seventy-five pounds per square inch. These species may be substituted for Group 3 woods on the following basis: The dimensions shall be at least five percent greater for each cross-section dimension, or the thickness may remain unchanged, in which case the width shall be at least seven and one-half percent greater if used edgewise (as in a rail) or fifteen percent greater if used flatwise (as in a tread).

Aspen	Populus tremuloides, grandidentata
Basswood	Tilia americana, heterophylla (2)
Buckeye	Aesculus octandra, glabra (2)
Butternut	Juglanscinerea
Incense cedar*	Libocedrus decurrens
Western red cedar*	Thuja plicata
Cottonwood	Populus balsamifera, deltiodes, sargentii, heterophylla
White fir	Abies concolor, grandis, amabilis, lasiocarpa, magnifica
Hackberry	Celtis occidentalis, laevigata (2)
Eastern hemlock	Tsuga canadensis
Holly	Ilex opaca
Soft maple	Acer saccharinum
Lodgepole pine	Pinus contorta
Idaho white pine	Pinus monticola
Northern white pine	Pinus strobus
Ponderosa pine	Pinus ponderosa, pinus jeffreyi (Jeffrey pine)
Sugar pine	Pinus lambertiana
Engelmann spruce	Picea engelmannii

Note 1: The common and scientific names of species used conform to the American Lumber Standards nomenclature and in most cases to U.S. Department of Agriculture Handbook No. 41, "Check List of Native and Naturalized Trees of the United States (including Alaska)," by Elbert L. Little. These publications can be obtained from the Superintendent of Documents, Washington D.C. 20225.

Note 2: This species is commonly associated with others of the same genus under American Lumber Standards nomenclature, but no strength tests have been made on it at the Forest Products Laboratory.

Note 3: Included under soft maple in American Lumber Standards nomenclature.

Note 4: This species is not included under this common name in American Lumber Standards nomenclature, but strength data are available and it is accordingly included in this classification.

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-24-78009, filed 5/11/88. Statutory Authority: RCW 49-.17.040, 49.17.150 and 49.17.240. 79-08-115 (Order 79-9), § 296-24-78009, filed 7/31/79; Order 76-6, § 296-24-78009, filed 3/1/76; Order 73-5, § 296-24-78009, filed 5/9/73 and Order 73-4, § 296-24-78009, filed 5/7/73.]

WAC 296-24-795 Portable metal ladders.

[Order 73-5, § 296-24-795, filed 5/9/73 and Order 73-4, § 296-24-795, filed 5/7/73.]

WAC 296-24-79501 Terms. The following terms shall have the meaning ascribed in this section when referred to in WAC 296-24-79503 through 296-24-79507 unless the context requires otherwise.

(1) Ladder. A ladder is an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) Step ladder. A step ladder is a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

(3) Single ladder. A single ladder is a nonself-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designated by the overall length of the side rail.

(4) Extension ladder. An extension ladder is a nonself-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

(5) Platform ladder. A self-supporting ladder of fixed size with a platform provided at the working level. The size is determined by the distance along the front rail from the platform to the base of the ladder.

(6) Sectional ladder. A sectional ladder is a nonself-supporting portable ladder, nonadjustable in length, consisting of two or more sections so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections.

(7) Trestle ladder. A trestle ladder is a self-supporting portable ladder, nonadjustable in length, consisting of two sections, hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge.

(8) Extension trestle ladder. An extension trestle ladder is a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base.

(9) Special-purpose ladder. A special-purpose ladder is a portable ladder which represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders previously defined, in order to adapt the ladder to special or specific uses.

[Order 73-5, § 296-24-79501, filed 5/9/73 and Order 73-4, § 296-24-79501, filed 5/7/73.]

WAC 296-24-79503 Requirements. (1) General. Specific design and construction requirements are not part of this section because of the wide variety of metals and design possibilities. However, the design shall be such as to produce a ladder without structural defects or accident hazards such as sharp edges, burrs, etc. The metal selected shall be of sufficient strength to meet the test requirements, and shall be protected against corrosion unless inherently corrosion-resistant.

(a) Because of the varied conditions, and the wide variety of ladder uses, ladders may be designed with parallel side rails, with side rails varying uniformly in separation along the length (tapered), or with side rails flaring at the base to increase stability.

(b) The design of the side rails shall be such as to insure a product which will conform to the requirements of this section.

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

(d) Rungs or steps to side rail connections should be so constructed as to insure rigidity as well as strength.

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

(f) Hardware shall meet strength requirements of 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.

(2) General specifications—Straight and extension ladders.

(a) The minimum width between side rails of a straight ladder or any section of an extension ladder shall be 12 inches.

(b) The length of single ladders or individual sections of ladders shall not exceed 30 feet. Two-section ladders shall not exceed 48 feet in length and over two-section ladders shall not exceed 60 feet in length.

(c) Based on the nominal length of the ladder, each section of a multisection ladder shall overlap the adjacent section by at least the number of feet stated in the following:

Nominal length of ladder (feet):	Overlap (feet)
Up to and including 36	3
Over 36, up to and including 48	4
Over 48, up to 60	5

(d) Extension ladders shall be equipped with positive stops which will insure the overlap specified in the table above.

(e) Extension ladders may be equipped with a rope and pulley which shall be securely attached to the ladder in such a manner as not to weaken either the rungs or the side rails. The pulley shall be not less than 1 1/4 inches in diameter.

(i) The rope used with the pulley shall be not less than five-sixteenths inch in diameter, having a minimum breaking strength of 560 pounds, and shall be of sufficient length for the purpose intended.

(3) General specifications—Step ladders.

(a) Step ladders shall be designed and constructed to give a minimum slope of 3 1/2 inches per foot of length of the front section, and a minimum slope of 2 inches per foot of length of the back section, except that special ladders designed for straight-in-wall work shall maintain at least 1 1/4-inch back slope per foot of length.

(b) The minimum width between the side rails at the top step shall be 12 inches. The width spread of the side rails shall increase a minimum of 1 inch per foot of length. The width of the step or tread shall not be less than 3 inches.

(c) The length of a stepladder is measured by the length of the front rail. To be classified as a standard length ladder, the measured length shall be within plus or minus one-half inch of the specified length. Stepladders shall not exceed 20 feet in length.

(d) The pail shelf shall be designed to fold completely within the ladder.

(e) The back section may be designed with either rungs or cross bracing as long as it meets the general and testing requirements.

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

(g) The bottoms of the four rails are to be supplied with insulating nonslip material.

(h) A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each stepladder. The spreader shall have all sharp points or edges covered or removed.

(4) General specifications—Trestles and extension trestle ladders.

(a) Trestle ladders or extension sections or base sections of extension trestle ladders shall be not more than 20 feet in length.

(b) The minimum distance between side rails of the trestle or extension section at the narrowest point shall not be less than 12 1/2 inches. The width spread shall not be less than 1 inch per foot of length of side rail.

(c) Spread of base when section is open shall not be less than 5 1/2 inches per foot of base section side rail.

(d) The extension locking device shall be designed to withstand all load tests.

(e) A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each trestle ladder. The spreader shall have all sharp points or edges covered or removed.

(5) General specifications—Platform ladders.

(a) The length of a platform ladder shall not exceed 20 feet. The length of a platform ladder shall be measured along the front rail from the floor to the platform.

(b) Minimum width between side rails at platform level shall be 14 inches. Width spread shall not be less than 1 inch per foot of rise.

(c) Slope of the front rail when unit is in open position shall not be less than 3 1/2 inches per foot of rise, and the back section shall have a minimum slope of 1 inch per foot of rise.

(d) The platform shall be at least 20 inches from the top of the ladder, and shall have an area of not less than 200 square inches nor more than 400 square inches.

(e) The back legs and side rails of a platform ladder shall extend at least 20 inches above the platform and shall be connected with the top member to form a three-sided top guard rail, or equivalent construction shall be provided.

(f) Spreaders shall be provided where the hinging apparatus is not designed to lock the unit open.

[Order 73-5, § 296-24-79503, filed 5/9/73 and Order 73-4, § 296-24-79503, filed 5/7/73.]

WAC 296-24-79505 Testing. (1) General. The following tests are intended to insure uniform testing methods for metal ladders.

(2) Straight and extension ladders.

(a) Ladder inclined strength is measured by placing the ladder unit in a flat, horizontal position, supported 6 inches from the ends of the side rails. When testing extensions, the unit is opened to the required overlap. A load of 200 pounds is applied equally to the side rails at the center of the unit by means of a beam. The ladder must withstand this test with no permanent deformation or other visible weakening of the structure. This test is based on a 200-pound man using the ladder, set at 75 1/2° to the ground. With the man on the center rung, the component of his 200-pound weight at right angles to the ladder will be 50 pounds. Applying the load factor of 4, the test weight becomes 200 pounds.

(b) Test unit need only be of sufficient length for test purposes and is to consist of the base and fly sections of an extension ladder with all the hardware or fittings attached. The ladder unit is placed in a vertical position and a downward load of 775 pounds equally distributed on the ends of the side rails of the upper portion of the test unit. The unit shall withstand this test with no permanent deformation or other visible weakening of the structure.

(c) A test unit of at least three rungs is to be used from the maximum width portion of the ladder. A load of 800 pounds shall be applied to a 3 1/2-inch wide block resting on the center of the widest rung. A rung of 14 inches or less in length shall withstand this test with no permanent deformation or other visible weakening of the structure. A rung of more than 14 inches in length may have a permanent deflection of not more than one-eighth inch provided the rung cross section is not deformed and there is no other visible weakening of the structure.

(d) With at least a three-rung test unit set in a vertical position, a load of 800 pounds shall be applied to a 3 1/2-inch wide block resting on the center rung as near to the side rail as possible. On removing the load, the unit must show no indication of failure in the fasteners attaching the rungs to the side rail.

(e) The rung shall be so secured to the side rail that a torque load of 360 inch-pounds applied to the rung at a side rail shall cause no visible relative motion between the rung and the side rail.

(f) With the ladder extended to its maximum working length, and resting horizontally on level supports located 6 inches from each end of the ladder, a weight of 50 pounds shall be suspended from one of the side rails midway between supports.

The deflection of the loaded rail, and the difference in deflection between the loaded and unloaded rails shall not exceed the values in Table D-6.

(g) Deflections in Table D-6 are to be determined by measuring, at the midpoint between supports, the distance from the outside edges of both rails to the floor or other reference surface both before and after the test load of 50 pounds is applied to one rail of the ladder. The test is to be repeated loading the other rail of the ladder. The angle (a) between the loaded and unloaded rails and the horizontal is to be calculated from the trigonometric equation:

$$\text{Sine a} = \frac{\text{Difference in deflection}}{\text{Ladder width}}$$

TABLE D-6

TABLE OF DEFLECTIONS

Length of ladder in feet	Maximum deflection of loaded rail in inches	Maximum difference in deflection between loaded and unloaded rails in degrees from horizontal
20	3.0	3.6
24	3.8	4.7
28	4.6	5.4
32	5.5	5.7
36	6.4	6.1
40	7.2	6.5
44	8.0	6.5
48	8.8	6.5

(3) Step, trestle, extension trestle, and platform ladders.

(a) Load test of the entire ladder is made with the ladder in an open position, and an 800-pound load applied to the center of the top. Resistance to side rail bending is tested by placing an 800-pound load on the center of the middle step. The strength of the step section is tested by applying an 800-pound load to a 3 1/2-inch-wide block resting on the center of the longest or bottom step. The pail shelf shall be so constructed as to support a distributed load of 50 pounds.

(i) In each test case, the unit must withstand the load without failure or permanent deformation.

(b) Set ladder in open position on a level floor. Place a 200-pound distributed load on the top step. The ladder is then subjected to a horizontal pulling load, applied at the top step, of 12-pound force to the side; 58-pound force to the front; 33-pound force to the back. In each test, all side rails must remain on the floor.

[Order 73-5, § 296-24-79505, filed 5/9/73 and Order 73-4, § 296-24-79505, filed 5/7/73.]

WAC 296-24-79507 Care and maintenance and use of ladders. (1) General. To get maximum serviceability, safety, and to eliminate unnecessary damage of equipment, good safe practices in the use and care of ladder equipment shall be employed by the users.

The following rules and regulations are essential to the life of the equipment and the safety of the user.

(2) Care of ladders.

(a) Ladders, shall be handled with care and not subject to unnecessary dropping, jarring, or misuse. (They are designed for a specific purpose or use; therefore, any variation from this use constitutes a mishandling of the equipment.)

(b) Ladders shall be stored on racks designed to protect the ladder when not in use. The racks shall have sufficient supporting points to prevent any possibility of excessive sagging.

(c) Ladders transported on vehicles shall be properly supported. Supporting points shall be of a softer material, such as hardwood or rubber-covered iron pipe, to minimize the chafing and effects of road shock. (Tying the ladder to each support point will greatly reduce damage due to road shock.)

(d) Ladders shall be maintained in good usable condition at all times. Hardware fittings and accessories shall be checked frequently and kept in good working condition.

(e) Ropes or cables shall be inspected frequently and replaced if defective.

(f) Complete ladder inspection shall be periodical. If a ladder is involved in any of the following, immediate inspection is necessary:

(i) If ladders tip over, inspect ladder for side rails dents or bends, or excessively dented rungs; check all rung-to-side-rail connections; check hardware connections; check rivets for shear.

(ii) If ladders are exposed to excessive heat as in the case of fire, the ladder should be inspected visually for damage and tested for deflection and strength characteristics. In doubtful cases, refer to manufacturer.

(iii) If ladders are to be subjected to certain acids or alkali solutions, a protective coating such as asphalt and varnish should be applied to the equipment.

(iv) If ladders are exposed to oil and grease, equipment should be cleaned of oil, grease, or slippery materials. This can easily be done with a solvent or steam cleaning.

(g) Ladders having defects are to be marked and taken out of service until repaired by either maintenance department or the manufacturer.

(3) Use of ladders.

(a) Portable nonself-supporting ladders shall be erected at a pitch of 75 1/2 degrees for maximum balance and strength. (A simple rule for setting up a ladder at the proper angle is to place the base a distance from the vertical wall equal to one-fourth the working length of the ladder.)

Note: Portable ladders are designed as a one-man working ladder based on a 200-pound load.

(b) Workmen shall not ascend or descend ladders while carrying tools or materials which will interfere with the free use of both hands.

(c) The ladder base section must be placed with a secure footing. Safety shoes of good substantial design should be installed on all ladders. Where ladders with no safety shoes or spikes are used on hard, slick surfaces, a foot–ladder board should be employed.

(d) The top of the ladder must be placed with the two rails supported, unless equipped with a single support attachment. Such an attachment should be substantial and large enough to support the ladder under load.

(e) When ascending or descending, the climber must face the ladder.

(f) Ladders must not be tied or fastened together to provide longer sections. They must be equipped with the hardware fittings necessary if the manufacturer endorses extended uses.

(g) Ladders should not be used as a brace, skid, guy or gin pole, gangway, or for other uses than that for which they were intended, unless specifically recommended for use by the manufacturer.

(h) Users are cautioned to take proper safety measures when metal ladders are used in areas containing electric circuits to prevent short circuits or electrical shock. The ordinary precautions should be employed as would be used when using any other metal tool.

[Order 76-6, § 296-24-79507, filed 3/1/76; Order 73-5, § 296-24-79507, filed 5/9/73 and Order 73-4, § 296-24-79507, filed 5/7/73.]

WAC 296-24-810 Fixed ladders.

[Order 73-5, § 296-24-810, filed 5/9/73 and Order 73-4, § 296-24-810, filed 5/7/73.]

WAC 296-24-81001 Definitions. The following terms shall have the meaning ascribed in this section when referred to in WAC 296-24-81003 through 296-24-81007 unless the context requires otherwise.

(1) Ladder. A ladder is an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) Fixed ladder. A fixed ladder is a ladder permanently attached to a structure, building, or equipment.

(3) Individual–rung ladder. An individual–rung ladder is a fixed ladder each rung of which is individually attached to a structure, building, or equipment.

(4) Rail ladder. A rail ladder is a fixed ladder consisting of side rails joined at regular intervals by rungs or cleats and fastened in full length or in sections to a building, structure, or equipment.

(5) Railings. A railing is any one or a combination of those railings constructed in accordance with WAC 296-24-75003 through 296-24-75011. A standard railing is a vertical barrier erected along exposed edges of floor openings, wall openings, ramps, platforms, and runways to prevent falls of persons.

(6) Pitch. Pitch is the included angle between the horizontal and the ladder, measured on the opposite side of the ladder from the climbing side.

(7) Fastenings. A fastening is a device to attach a ladder to a structure, building, or equipment.

(8) Rungs. Rungs are ladder crosspieces of circular or oval cross–section on which a person may step in ascending or descending.

(9) Cleats. Cleats are ladder crosspieces of rectangular cross–section placed on edge on which a person may step in ascending or descending.

(10) Steps. Steps are the flat crosspieces of a ladder on which a person may step in ascending or descending.

(11) Cage. A cage is a guard that may be referred to as a cage or basket guard which is an enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder.

(12) Well. A well is a permanent complete enclosure around a fixed ladder, which is attached to the walls of the well. Proper clearances for a well will give the person who must climb the ladder the same protection as a cage.

(13) Ladder safety device. A ladder safety device is any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and which may incorporate such features as life belts, friction brakes, and sliding attachments.

(14) Grab bars. Grab bars are individual handholds placed adjacent to or as an extension above ladders for the purpose of providing access beyond the limits of the ladder.

(15) Through ladder. A through ladder is one from which a man getting off at the top must step through the ladder in order to reach the landing.

(16) Side–step ladder. A side–step ladder is one from which a man getting off at the top must step sideways from the ladder in order to reach the landing.

[Order 73-5, § 296-24-81001, filed 5/9/73 and Order 73-4, § 296-24-81001, filed 5/7/73.]

WAC 296-24-81003 Design requirements. (1) Design considerations. All ladders, appurtenances, and fastenings shall be designed to meet the following load requirements:

(a) The minimum design live load shall be a single concentrated load of 200 pounds.

(b) The number and position of additional concentrated live–load units of 200 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.

(2) Design stresses.

(a) Design stresses for wood components of ladders shall not exceed those specified in WAC 296-24-78001 through 296-24-79507. All wood parts of fixed ladders shall meet the requirements of WAC 296-24-78005.

(b) For fixed ladders consisting of wood side rails and wood rungs or cleats, used at a pitch in the range 75 degrees to 90 degrees, and intended for use by no more than one person per section, single ladders as described in WAC 296-24-78007 (3)(b) are acceptable.

(3) Fixed embedded steps. Individual fixed steps used for access or egress, embedded in the walls of risers or the conical top sections of manholes shall be safe, well constructed, and installed in accordance with good engineering practices. Appurtenances penetrating the manhole walls are prohibited.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-81003, filed 1/11/90, effective 2/26/90; Order 73-5, § 296-24-81003, filed 5/9/73 and Order 73-4, § 296-24-81003, filed 5/7/73.]

WAC 296-24-81005 Specific features. (1) Rungs and cleats.

(a) All rungs shall have a minimum diameter of three-fourths inch for metal ladders, except as covered in subsection (7)(a) of this section, and a minimum diameter of 1 1/8 inches for wood ladders.

(b) The distance between rungs, cleats, and steps shall not exceed 12 inches and shall be uniform throughout the length of the ladder.

(c) The minimum clear length of rungs or cleats shall be 16 inches.

(d) Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard.

(e) 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) or be treated with anti-slip type paint or treatment.

(f) Such rungs or steps installed in the walls of risers or conical top sections of manholes shall be uniformly spaced from 12 inches to 16 1/2 inches apart and be a minimum of 10 inches in length.

(i) The manhole rungs or steps shall have a minimum of 4 inches of clearance between the rung or step and the wall.

(ii) The manhole rung or step shall be capable of sustaining a single concentrated load of 300 pounds.

(2) Side rails. 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, splinters, or burrs.

(3) Fastenings. Fastenings shall be an integral part of fixed ladder design.

(4) Splices. All splices made by whatever means shall meet design requirements as noted in WAC 296-24-81003(1). All splices and connections shall have smooth transition with original members and with no sharp or extensive projections.

(a) When fixed ladders are spliced the splice plates shall be the same depth as side rails.

(b) The length of the splice plates shall be four times the depth of the side rail. They shall be of metal not less than one-fourth of an inch in thickness and chamfered on all exposed edges.

(c) Splice plates shall be secured by bolts or rivets with the heads countersunk or of the button type.

(d) The heads shall be on the outside of the rail.

(e) The bolts or rivets shall be not less than one-half inch nor more than five-eighths inch in diameter.

(f) The bolt ends shall be chamfered with only the chamfered end extending beyond the nut.

(g) Both ends of the rivet shall be button shape.

(h) Washers shall be placed under the nuts and rivet ends on wood side rails.

(i) There shall be a minimum of three bolts or rivets on each side of the joint for metal side rails and a minimum of four bolts or rivets for wood side rails.

(j) Bolts and rivets in both metal and wood side rails shall be staggered in position.

(5) Electrolytic action. Adequate means shall be employed to protect disimilar metals from electrolytic action when such metals are joined.

(6) Welding. All welding shall be in accordance with the "Code for Welding in Building Construction" (AWS D1.0-1966).

(7) Protection from deterioration.

(a) Metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands. Ladders formed by individual metal rungs imbedded in concrete, which serve as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting. To increase rung life in such atmosphere, individual metal rungs shall have a minimum diameter of 1 inch or shall be painted or otherwise treated to resist corrosion and rusting.

(b) Wood ladders, when used under conditions where decay may occur, shall be treated with a nonirritating preservative, and the details shall be such as to prevent or minimize the accumulation of water on wood parts.

(c) When different types of materials are used in the construction of a ladder, the materials used shall be so treated as to have no deleterious effect one upon the other.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-81005, filed 1/11/90, effective 2/26/90; Order 73-5, § 296-24-81005, filed 5/9/73 and Order 73-4, § 296-24-81005, filed 5/7/73.]

WAC 296-24-81007 Clearance. (1) Climbing side. On fixed ladders, the perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be 36 inches for a pitch of 76 degrees, and 30 inches for a pitch of 90 degrees (Fig. D-2 of this section), with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope, except as provided in (3) and (5) of this section.

(2) Ladders without cages or wells. A clear width of at least 15 inches shall be provided each way from the centerline of the ladder in the climbing space, except when cages or wells are necessary.

(3) Ladders with cages or baskets. Ladders equipped with cage or basket are excepted from the provisions of

(1) and (2) of this section, but shall conform to the provisions of WAC 296-24-81009 (1)(e). Fixed ladders in smooth-walled wells are excepted from the provisions of (1) of this section, but shall conform to the provisions of WAC 296-24-81009 (1)(f).

(4) 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 7 inches, except that when unavoidable obstructions are encountered, minimum clearances as shown in Figure D-3 shall be provided.

(5) 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 4 inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve.

(6) Step-across distance. The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure shall be not more than 12 inches, or less than 2 1/2 inches (Fig. D-4).

(7) Hatch cover. Counterweighted hatch covers shall open a minimum of 60 degrees from the horizontal. The distance from the centerline of rungs or cleats to the edge of the hatch opening on the climbing side shall be not less than 24 inches for offset wells or 30 inches for straight wells. There shall be no protruding potential hazards within 24 inches of the centerline of rungs or cleats; any such hazards within 30 inches of the centerline of the rungs or cleats shall be fitted with deflector plates placed at an angle of 60 degrees from the horizontal as indicated in Figure D-5. The relationship of a fixed ladder to an acceptable counterweighted hatch cover is illustrated in Figure D-6.

[Order 73-5, § 296-24-81007, filed 5/9/73 and Order 73-4, § 296-24-81007, filed 5/7/73.]

WAC 296-24-81009 Special requirements. (1) Cages or wells.

(a) Cages or wells (except on chimney ladders) shall be built, as shown on the applicable drawings, covered in detail in Figures D-7, D-8, and D-9, or of equivalent construction.

(b) Cages or wells (except as provided in (5) of this section) conforming to the dimensions shown in Figures D-7, D-8, and D-9 shall be provided on ladders of more than 20 feet to a maximum unbroken length of 30 feet.

(c) Cages shall extend a minimum of 42 inches above the top of landing, unless other acceptable protection is provided.

(d) Cages shall extend down the ladder to a point not less than 7 feet nor more than 8 feet above the base of the ladder, with bottom flared not less than 4 inches, or portion of cage opposite ladder shall be carried to the base.

(e) Cages shall not extend less than 27 nor more than 28 inches from the centerline of the rungs of the ladder. Cage shall not be less than 27 inches in width. The inside shall be clear of projections. Vertical bars shall be located at a maximum spacing of 40 degrees around the circumference of the cage; this will give a maximum spacing of approximately 9 1/2 inches, center to center.

(f) Ladder wells shall have a clear width of at least 15 inches measured each way from the centerline of the ladder. Smooth-walled wells shall be a minimum of 27 inches from the centerline of rungs to the well wall on the climbing side of the ladder. Where other obstructions on the climbing side of the ladder exist, there shall be a minimum of 30 inches from the centerline of the rungs.

(2) Landing platforms. When ladders are used to ascend to heights exceeding 20 feet (except on chimneys), landing platforms shall be provided for each 30 feet of height or fraction thereof, except that, where no cage, well, or ladder safety device is provided, landing platforms shall be provided for each 20 feet of height or fraction thereof. Each ladder section shall be offset from adjacent sections. Where installation conditions (even for a short, unbroken length) require that adjacent sections be offset, landing platforms shall be provided at each offset.

(a) Where a man has to step a distance greater than 12 inches from the centerline of the rung of a ladder to the nearest edge of structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2 1/2 inches.

(b) All landing platforms shall be equipped with standard railings and toeboards, so arranged as to give safe access to the ladder. Platforms shall be not less than 24 inches in width and 30 inches in length.

(c) One rung of any section of ladder shall be located at the level of the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be used from the landing platform to the first rung below the landing.

(3) Ladder extensions. The side rails of through or side-step ladder extensions shall extend 3 1/2 feet above parapets and landings. For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than 18 nor more than 24 inches clearance between rails. 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 3 1/2 feet minimum (Fig. D-10).

(4) Grab bars. 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.

(5) Ladder safety devices. Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform is required in these cases. All ladder safety devices such as those that incorporate lifebelts, friction brakes, and sliding attachments shall meet the design requirements of the ladders which they serve.

[Order 73-5, § 296-24-81009, filed 5/9/73 and Order 73-4, § 296-24-81009, filed 5/7/73.]

WAC 296-24-81011 Pitch. Preferred pitch.

(1) The preferred pitch of fixed ladders shall be considered to come in the range of 75 degrees and 90 degrees with the horizontal (Fig. D-11).

(2) Substandard pitch. Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60 and 75 degrees with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range shall be considered as a critical range to be avoided, if possible.

(3) Scope of coverage in this section. This section covers only fixed ladders within the pitch range of 60 degrees and 90 degrees with the horizontal.

(4) Pitch greater than 90 degrees. Ladders having a pitch in excess of 90 degrees with the horizontal are prohibited.

[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), § 296-24-81011, filed 11/13/80; Order 73-5, § 296-24-81011, filed 5/9/73 and Order 73-4, § 296-24-81011, filed 5/7/73.]

WAC 296-24-81013 Maintenance and use. (1) 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.

Note: For illustrations, see Figs. D-1 through D-11.

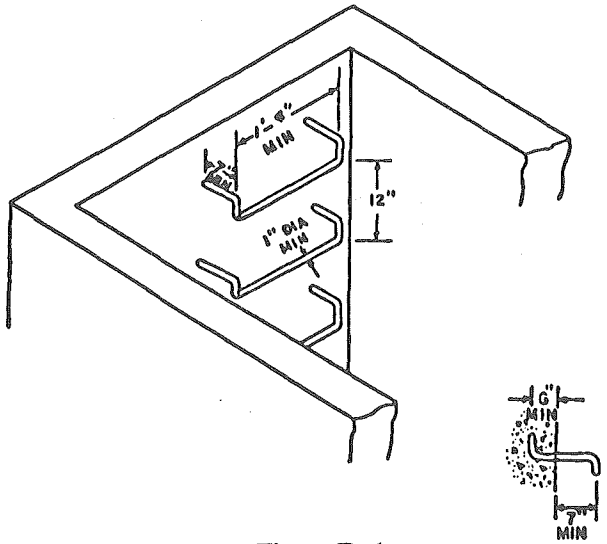
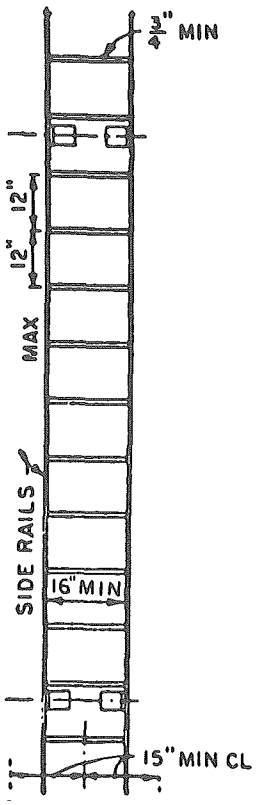
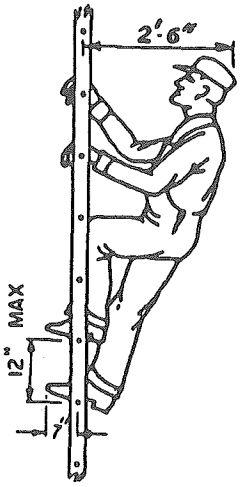


Figure D-1

Suggested design for rungs on individual-rung ladders





RAIL LADDER WITH BAR STEEL RAILS AND ROUND STEEL RUNGS

Figure D-2

Minimum Ladder Clearances

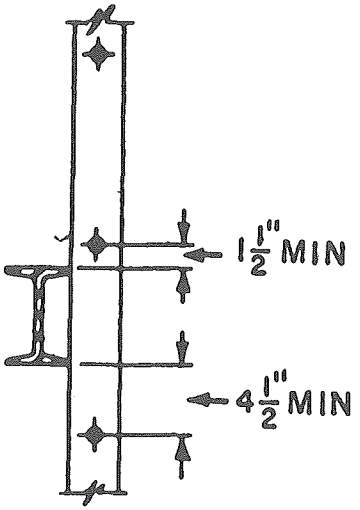


Figure D-3

Clearance for Unavoidable Obstruction at Rear of Fixed Ladder

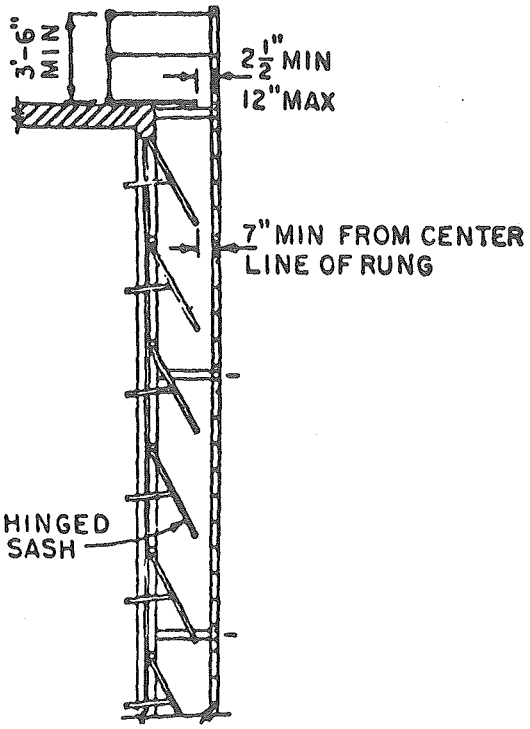


Figure D–4

Ladder Far from Wall

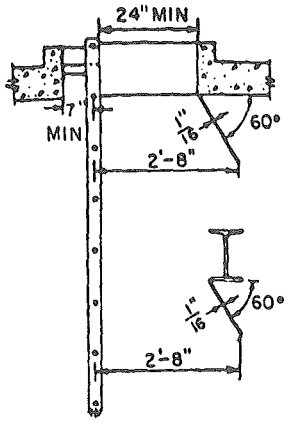
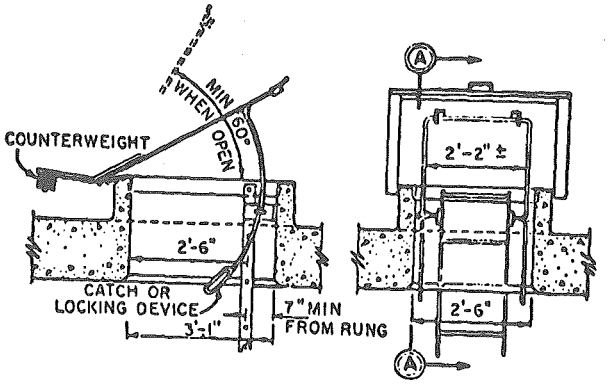


Figure D–5

Deflector Plates for Head Hazards



SECTION A–A SECTIONAL ELEVATION

Figure D–6

Relationship of Fixed Ladder to a Safe Access Hatch

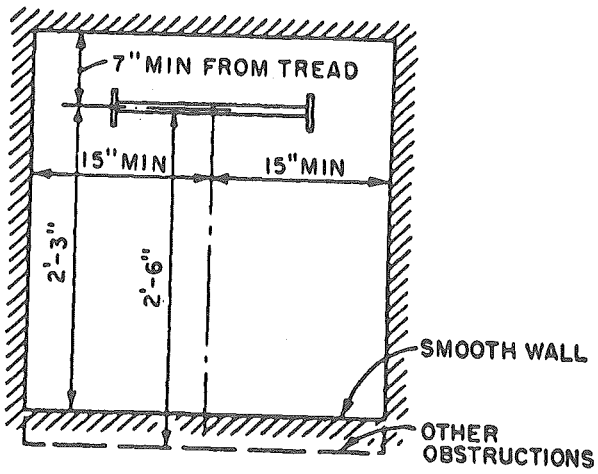
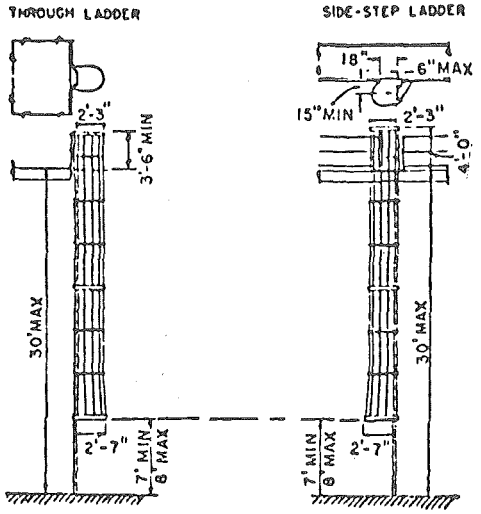


Figure D–7

Clearance Diagram for Fixed Ladder in Well



ACCESS TO LANDING PLATFORM THROUGH LADDER

ACCESS LATERALLY FROM LADDER

Figure D–8 (Part 1)

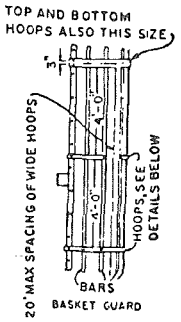
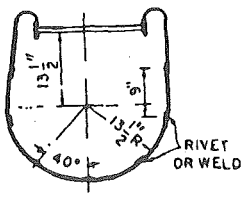
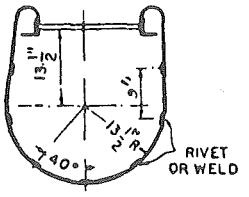


Figure D–8 (Part 2)



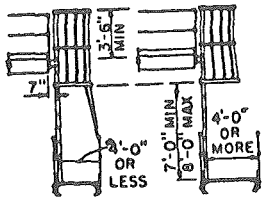
BASKET GUARD HOOP BAR LADDER



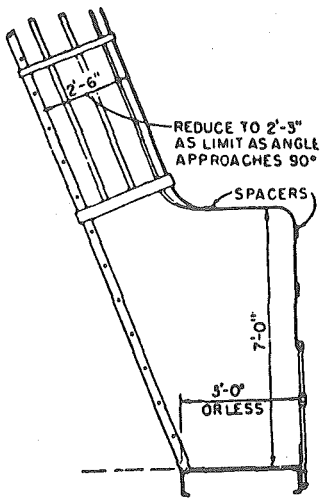
BASKET GUARD HOOP ANGLE IRON LADDER

Figure D–8 (Part 3)

Cages for ladders More Than 20 Feet High



SHORT LADDERS AT ELEVATED LOCATIONS



INCLINED LADDER AT ELEVATED LOCATION (For Special Hazard Only)

Figure D–9

Cages—Special applications

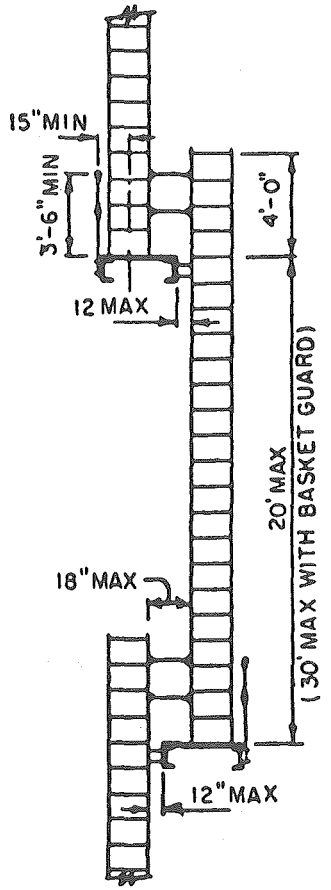


Figure D–10

Offset Fixed Ladder Sections

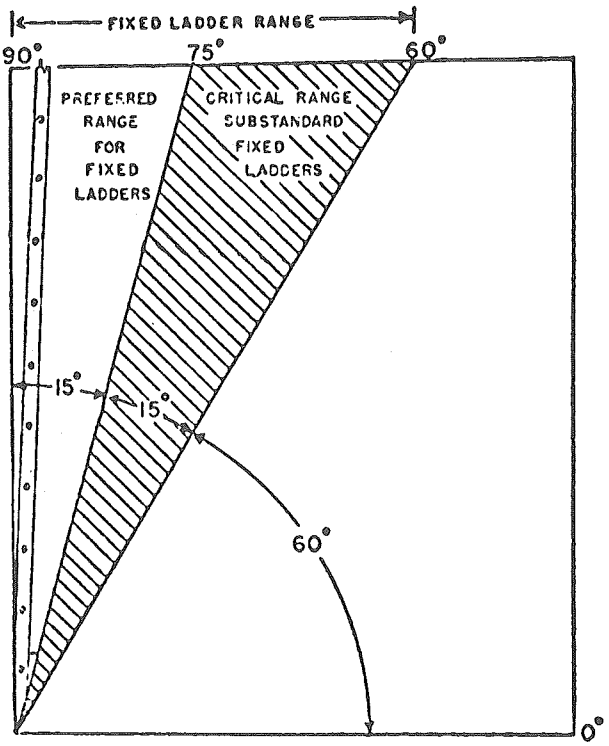


Figure D-11

Pitch of Fixed Ladders

(2) When ascending or descending, the climber must face the ladder.

(3) Workmen shall not ascend or descend ladders while carrying tools or materials which will interfere with the free use of both hands.

[Order 76-6, § 296-24-81013, filed 3/1/76; Order 73-5, § 296-24-81013, filed 5/9/73 and Order 73-4, § 296-24-81013, filed 5/7/73.]

WAC 296-24-825 Safety requirements for scaffolding.

[Order 73-5, § 296-24-825, filed 5/9/73 and Order 73-4, § 296-24-825, filed 5/7/73.]

WAC 296-24-82501 Definitions. The following terms shall have the meaning ascribed in this section when referred to in WAC 296-24-82503 through 296-24-82545 unless the context requires otherwise.

(1) Bearer. A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

(2) Boatswain's chair. A seat supported by slings attached to a suspended rope, designed to accommodate one workman in a sitting position.

(3) Brace. A tie that holds one scaffold member in a fixed position with respect to another member.

(4) Bricklayer's square scaffold. A scaffold composed of framed wood squares which support a platform limited to light and medium duty.

(5) Carpenters' bracket scaffold. A scaffold consisting of wood or metal brackets supporting a platform.

(6) Coupler. A device for locking together the component parts of a tubular metal scaffold. The material used for the couplers shall be of a structural type, such as a drop-forged steel, malleable iron, or structural grade aluminum. The use of gray cast iron is prohibited.

(7) Crawling board or chicken ladder. A plank with cleats spaced and secured at equal intervals, for use by a worker on roofs, not designed to carry any material.

(8) Double pole or independent pole scaffold. A scaffold supported from the base by a double row of uprights, independent of support from the walls and constructed of uprights, ledgers, horizontal platform bearers, and diagonal bracing.

(9) Float or ship scaffold. A scaffold hung from overhead supports by means of ropes and consisting of a substantial platform having diagonal bracing underneath, resting upon and securely fastened to two parallel plank bearers at right angles to the span.

(10) Guardrail. A rail secured to uprights and erected along the exposed sides and ends of platforms.

(11) Heavy duty scaffold. A scaffold designed and constructed to carry a working load not to exceed 75 pounds per square foot.

(12) Horse scaffold. A scaffold for light or medium duty, composed of horses supporting a work platform.

(13) Interior hung scaffold. A scaffold suspended from the ceiling or roof structure.

(14) Ladder jack scaffold. A light duty scaffold supported by brackets attached to ladders.

(15) Ledger (stringer). A horizontal scaffold member which extends from post to post and which supports the putlogs or bearer forming a tie between the posts.

(16) Light duty scaffold. A scaffold designed and constructed to carry a working load not to exceed 25 pounds per square foot.

(17) Manually propelled mobile scaffold. A portable rolling scaffold supported by casters.

(18) Mason's adjustable multiple-point suspension scaffold. A scaffold having a continuous platform supported by bearers suspended by wire rope from overhead supports, so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

(19) Maximum intended load. The total of all loads including the working load, the weight of the scaffold, and such other loads as may be reasonably anticipated.

(20) Medium duty scaffold. A scaffold designed and constructed to carry a working load not to exceed 50 pounds per square foot.

(21) Mid-rail. A rail approximately midway between the guardrail and platform, used when required, and secured to the uprights erected along the exposed sides and ends of platforms.

(22) Needle beam scaffold. A light duty scaffold consisting of needle beams supporting a platform.

(23) Outrigger scaffold. A scaffold supported by outriggers or thrustouts projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside of such a building or structure.

(24) Putlog. A scaffold member upon which the platform rests.

(25) Roofing bracket. A bracket used in sloped roof construction, having provisions for fastening to the roof

or supported by ropes fastened over the ridge and secured to some suitable object.

(26) Runner. The lengthwise horizontal bracing or bearing members or both.

(27) Scaffold. Any temporary elevated platform and its supporting structure used for supporting workmen or materials or both.

(28) Single-point adjustable suspension scaffold. A manually or power-operated unit designed for light duty use, supported by a single wire rope from an overhead support so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

(29) Single pole scaffold. Platforms resting on putlogs or crossbeams, the outside ends of which are supported on ledgers secured to a single row of posts or uprights and the inner ends of which are supported on or in a wall.

(30) Stone setters' adjustable multiple-point suspension scaffold. A swinging-type scaffold having a platform supported by hangers suspended at four points so as to permit the raising or lowering of the platform to the desired working position by the use of hoisting machines.

(31) Toeboard. A barrier secured along the sides and ends of a platform, to guard against the falling of material.

(32) Tube and coupler scaffold. An assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and special couplers which serve to connect the uprights and to join the various members.

(33) Tubular welded frame scaffold. A sectional, panel, or frame metal scaffold substantially built up of prefabricated welded sections which consist of posts and horizontal bearer with intermediate members. Panels or frames shall be braced with diagonal or cross braces.

(34) Two-point suspension scaffold (swinging scaffold). A scaffold, the platform of which is supported by hangers (stirrups) at two points, suspended from overhead supports so as to permit the raising or lowering of the platform to the desired working position by tackle or hoisting machines.

(35) Window jack scaffold. A scaffold, the platform of which is supported by a bracket or jack which projects through a window opening.

(36) Working load. Load imposed by men, materials, and equipment.

[Order 73-5, § 296-24-82501, filed 5/9/73 and Order 73-4, § 296-24-82501, filed 5/7/73.]

WAC 296-24-82503 General requirements for all scaffolds. (1) Scaffolds shall be furnished and erected in accordance with this standard for persons engaged in work that cannot be done safely from the ground or from solid construction, except that ladders used for such work shall conform to WAC 296-24-780 through 296-24-78009 and 296-24-795 through 296-24-79507.

(2) The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load with-out settling or displacement. Unstable objects such as barrels, boxes, loose brick, or concrete blocks shall not be used to support scaffolds or planks.

(3) Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 8 feet above the ground or floor except:

(a) Scaffolding wholly within the interior of a building and covering the entire floor area of any room therein and not having any side exposed to a hoistway, elevator shaft, stairwell, or other floor openings, and

(b) Needle-beam scaffolds and floats in use by structural iron workers.

(4) Guardrails should all be 2 x 4 inches or the equivalent, installed no less than 36 inches or not more than 42 inches high, with a midrail, when required, of 1 x 4 inch nominal lumber or equivalent. Supports should be at intervals not to exceed ten feet. Toeboards shall be a minimum of 4 inches nominal lumber in height.

(5) Factory-built (laminated) scaffold planks meeting the requirements of wood scaffold planks may be substituted for wood scaffold planks.

(6) Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load.

(7) Scaffolds and other devices mentioned or described in these standards shall be maintained in safe condition. Scaffolds shall not be altered or moved horizontally while they are in use or occupied.

(8) Any scaffold damaged or weakened from any cause shall be immediately repaired and shall not be used until repairs have been completed.

(9) Scaffolds shall not be loaded in excess of the working load for which they are intended.

(10) All load-carrying timber members of scaffold framing shall be a minimum of 1,500 f. (stress grade) construction grade lumber. All dimensions are nominal sizes as provided in the American Lumber Standards, except that where rough sizes are noted, only rough or undressed lumber of the size specified will satisfy minimum requirements. (NOTE: Where nominal sizes of lumber are used in place of rough sizes the nominal size lumber shall be such as to provide equivalent strength to that specified in Tables D-7 through D-12 and D-16.)

(11) All planking shall be Scaffold Grade as recognized by grading rules for the species of wood used. The maximum permissible spans for 2- x 9-inch or wider planks are shown in the following table:

	Material				
	Full thickness undressed lumber				Nominal thickness lumber
Working load (p.s.f.)	25	50	75	25	50
Permissible span (ft.)	10	8	6	8	6

The maximum permissible span for 1 1/4 x 9-inch or wider plank of full thickness is 4 feet with medium loading of 50 p.s.f.

(12) Nails or bolts used in the construction of scaffolds shall be of adequate size and in sufficient numbers at each connection to develop the designed strength of the scaffold. Nails shall not be subjected to a straight pull and shall be driven full length.

(13) All planking or platforms shall be overlapped (minimum 12 inches) or secured from movement.

(14) An access ladder or equivalent safe access shall be provided.

(15) Scaffold planks shall extend over their end supports not less than 6 inches nor more than 18 inches.

(16) The poles, legs, or uprights of scaffolds shall be plumb, and securely and rigidly braced to prevent swaying and displacement.

TABLE D-7

MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS LIGHT DUTY

	Maximum height of scaffold	
	20 feet	60 feet
Uniformly distributed load	Not to exceed 25 pounds per square foot.	
Poles or uprights	2 by 4 in.	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in.	10 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.	5 ft. 0 in.
Bearers or putlogs to 3 ft. 0 in. width	2 by 4 in.	2 by 4 in.
Bearers or putlogs to 5 ft. 0 in. width	2 by 6 in. or 3 by 4 in.	2 by 6 in. or 3 by 4 in. (rough)
Ledgers	1 by 4 in.	1 1/4 by 9 in.
Planking	1 1/4 by 9 in. (rough)	2 by 9 in.
Vertical spacing of horizontal members	7 ft. 0 in.	7 ft. 0 in.
Bracing, horizontal and diagonal	1 by 4 in.	1 by 4 in.
Tie-ins	1 by 4 in.	1 by 4 in.
Toeboards	4 in. high (minimum)	4 in. high (minimum)
Guardrail	2 by 4 in.	2 by 4 in.

All members except planking are used on edge.

TABLE D-8

MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS MEDIUM DUTY

Uniformly distributed load	Not to exceed 50 pounds per square foot.
Maximum height of scaffold	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal)	8 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.
Bearers or putlogs	2 by 9 in. or 3 by 4 in.
Spacing of bearers or putlogs	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members	9 ft. 0 in.
Bracing, horizontal	1 by 6 in. or 1 1/4 by 4 in.
Bracing, diagonal	1 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum)
Guardrail	2 by 4 in.

All members except planking are used on edge.

TABLE D-9

MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS HEAVY DUTY

Uniformly distributed load	Not to exceed 75 pounds per square foot.
Maximum height of scaffold	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.
Bearers or putlogs	2 by 9 in. or 3 by 5 in. (rough).
Spacing of bearers or putlogs	6 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members	6 ft. 6 in.
Bracing, horizontal and diagonal	2 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

All members except planking are used on edge.

TABLE D-10

MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT POLE SCAFFOLDS LIGHT DUTY

	Maximum height of scaffold	
	20 feet	60 feet
Uniformly distributed load	Not to exceed 25 pounds per square foot.	
Poles or uprights	2 by 4 in.	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in.	10 ft. 0 in.
Pole spacing (transverse)	6 ft. 0 in.	10 ft. 0 in.
Ledgers	1 1/4 by 4 in.	1 1/4 by 9 in.
Bearers to 3 ft. 0 in. span	2 by 4 in.	2 by 4 in.
Bearers to 10 ft. 0 in. span	2 by 6 in. or 3 by 4 in.	2 by 9 (rough) or 3 by 8 in.
Planking	1 1/4 by 9 in.	2 by 9 in.
Vertical spacing of horizontal members	7 ft. 0 in.	7 ft. 0 in.
Bracing, horizontal and diagonal	1 by 4 in.	1 by 4 in.
Tie-ins	1 by 4 in.	1 by 4 in.
Toeboards	4 in. high	4 in. high (minimum).
Guardrail	2 by 4 in.	2 by 4 in.

All members except planking are used on edge.

TABLE D-11

MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT POLE SCAFFOLDS MEDIUM DUTY

Uniformly distributed load	Not to exceed 50 pounds per square foot.
Maximum height of scaffold	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal)	8 ft. 0 in.
Pole spacing (transverse)	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members	6 ft. 0 in.
Spacing of bearers	8 ft. 0 in.
Bearers	2 by 9 in. rough or 2 by 10 in.
Bracing, horizontal	1 by 6 in. or 1 1/4 by 4 in.
Bracing, diagonal	1 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

All members except planking are used on edge.

TABLE D-12

MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT POLE SCAFFOLDS HEAVY DUTY

Uniformly distributed load	Not to exceed 75 pounds per square foot.
Maximum height of scaffold	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in.
Pole spacing (transverse)	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members	4 ft. 6 in.
Bearers	2 by 9 in. (rough).
Bracing, horizontal and diagonal	2 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

All members except planking are used on edge.

(17) Materials being hoisted onto a scaffold shall have a tag line.

(18) Overhead protection shall be provided for workmen working on a scaffold when they are exposed to overhead hazards.

(19) Scaffolds shall be provided with a screen between the toe board and the guardrail, extending along the entire opening, consisting of No. 18 gauge U.S. Standard Wire one-half-inch mesh or the equivalent, where persons are required to work or pass under the scaffolds.

(20) Employees shall not work on scaffolds during storms or high winds.

(21) Employees shall not work on scaffolds which are covered with ice or snow.

(22) Tools, materials, and debris shall not be allowed to accumulate in quantities to cause a hazard.

(23) Only treated or protected fiber rope shall be used for or near any work involving the use of corrosive substances or chemicals.

(24) Wire or fiber rope used for scaffold suspension shall be capable of supporting at least six times the intended load.

(25) When acid solutions are used for cleaning buildings over 50 feet in height, wire rope supported scaffolds shall be used.

(26) The use of shore scaffolds or leanto scaffolds is prohibited.

(27) Lumber sizes, when used in WAC 296-24-82505 through 296-24-82545, refer to nominal sizes except where otherwise stated.

(28) Scaffolds shall be secured to permanent structures, through use of anchor bolts, reveal bolts, or other equivalent means. Window cleaners' anchor bolts shall not be used.

(29) Special precautions shall be taken to protect scaffold members, including any wire or fiber ropes, when using a heat-producing process.

(30) When rope falls are used to support swinging scaffolding, the rope falls shall be of sufficient length to reach the ground. Lengthening rope falls by typing on additional lengths shall be prohibited.

(31) When screw shackles are used to support staging, etc., the pin must be wired or pinned so that the shackle will not become unscrewed by strain or stress.

(32) All hooks on blocks used for raising scaffolding shall be provided with a safety latch or be "moused at the throat" to prevent the hook from becoming dislodged.

(33) Lifelines size shall be 3/4 inch manila rope or equivalent with a minimum breaking strength of 5400 pounds. Safety belt lanyards shall be a minimum of 1/2 inch nylon or equivalent with a maximum length to provide for a fall of no greater than 6 feet. This rope shall have a minimum breaking strength of 5400 pounds.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-24-82503, filed 1/11/90, effective 2/26/90; Order 74-27, § 296-24-82503, filed 5/7/74; Order 73-5, § 296-24-82503, filed 5/9/73 and Order 73-4, § 296-24-82503, filed 5/7/73.]

WAC 296-24-82505 General requirements for wood pole scaffolds. (1) Scaffold poles shall bear on a foundation of sufficient size and strength to spread the load from the poles over a sufficient area to prevent settlement. All poles shall be set plumb.

(2) Where wood poles are spliced, the ends shall be squared and the upper section shall rest squarely on the lower section. Wood splice plates shall be provided on at least two adjacent sides and shall not be less than 4 feet 0 inches in length, overlapping the abutted ends equally, and have the same width and not less than the cross-sectional area of the pole. Splice plates of other materials of equivalent strength may be used.

(3) Independent pole scaffolds shall be set as near to the wall of the building as practicable.

(4) All pole scaffolds shall be securely guyed or tied to the building or structure. Where the height or length exceeds 25 feet, the scaffold shall be secured at intervals not greater than 25 feet vertically and horizontally.

(5) Putlogs or bearers shall be set with their greater dimensions vertical, long enough to project over the ledgers of the inner and outer rows of poles at least 3 inches for proper support.

(6) Every wooden putlog on single pole scaffolds shall be reinforced with a 3/16 x 2-inch steel strip or equivalent secured to its lower edge throughout its entire length.

(7) Ledgers shall be long enough to extend over two pole spaces. Ledgers shall not be spliced between the poles. Ledgers shall be reinforced by bearing blocks securely nailed to the side of the pole to form a support for the ledger.

(8) Diagonal bracing shall be provided to prevent the poles from moving in a direction parallel with the wall of the building, or from buckling.

(9) Cross bracing shall be provided between the inner and outer sets of poles in independent pole scaffolds. The free ends of pole scaffolds shall be cross braced.

(10) Full diagonal face bracing shall be erected across the entire face of pole scaffolds in both directions. The braces shall be spliced at the poles.

(11) Platform planks shall be laid with their edges close together so the platform will be tight with no spaces through which tools or fragments of material can fall.

(12) Where planking is lapped, each plank shall lap its end supports at least 12 inches. Where the ends of planks abut each other to form a flush floor, the butt joint shall be at the centerline of a pole. The abutted ends shall rest on separate bearers. Intermediate beams shall be provided where necessary to prevent dislodgement of planks due to deflection, and the ends shall be nailed or cleated to prevent their dislodgement.

(13) When a scaffold turns a corner, the platform planks shall be laid to prevent tipping. The planks that meet the corner putlog at an angle shall be laid first, extending over the diagonally placed putlog far enough to have a good safe bearing, but not far enough to involve any danger from tipping. The planking running in the opposite direction at right angles shall be laid so as to extend over and rest on the first layer of planking.

(14) When moving platforms to the next level, the old platform shall be left undisturbed until the new putlogs or bearers have been set in place, ready to receive the platform planks.

(15) Guardrails not less than 2 x 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1 x 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 8 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with WAC 296-24-82503(17).

(16) All wood pole scaffolds 60 feet or less in height shall be constructed and erected in accordance with Tables D-7 through D-12. If they are over 60 feet in height they shall be designed by a registered professional engineer and constructed and erected in accordance with

such design. A copy of the typical drawings and specifications shall be made available to the employer and for inspection purposes.

(17) Wood–pole scaffolds shall not be erected beyond the reach of effective firefighting apparatus.

[Order 73–5, § 296–24–82505, filed 5/9/73 and Order 73–4, § 296–24–82505, filed 5/7/73.]

WAC 296–24–82507 Tube and coupler scaffolds. (1) A light–duty tube and coupler scaffold shall have all posts, bearers, runners, and bracing of nominal 2–inch O.D. steel tubing. The posts shall be spaced no more than 6 feet apart by 10 feet along the length of the scaffold. Other structural metals when used must be designed to carry an equivalent load.

(2) A medium–duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2–inch O.D. steel tubing. Posts spaced not more than 6 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2 1/2–inch O.D. steel tubing. Posts spaced not more than 5 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2–inch O.D. steel tubing. Other structural metals when used must be designed to carry an equivalent load.

(3) A heavy–duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2–inch O.D. steel tubing, with the posts spaced not more than 6 feet apart by 6 feet 6 inches along the length of the scaffold. Other structural metals when used must be designed to carry an equivalent load.

(4) Tube and coupler scaffolds shall be limited in heights and working levels to those permitted in Tables D–13, 14, and 15. Drawings and specifications of all tube and coupler scaffolds above the limitations in Tables D–13, 14, and 15 shall be designed by a registered professional engineer and copies made available to the employer and for inspection purposes.

(5) All tube and coupler scaffolds shall be constructed and erected to support four times the maximum intended loads as set forth in Tables D–13, 14, and 15, or as set forth in the specifications by a registered professional engineer, copies which shall be made available to the employer and for inspection purposes.

(6) All tube and coupler scaffolds shall be erected by competent and experienced personnel.

(7) Posts shall be accurately spaced, erected on suitable bases, and maintained plumb.

(8) Runners shall be erected along the length of the scaffold located on both the inside and the outside posts at even height. Runners shall be interlocked to form continuous lengths and coupled to each post. The bottom runners shall be located as close to the base as possible. Runners shall be placed not more than 6 feet 6 inches on centers.

(9) Bearers shall be installed transversely between posts and shall be securely coupled to the posts bearing on the runner coupler. When coupled directly to the runners, the coupler must be kept as close to the posts as possible.

(10) Bearers shall be at least 4 inches but not more than 12 inches longer than the post spacing or runner spacing. Bearers may be cantilevered for use as brackets to carry not more than two planks.

(11) Cross bracing shall be installed across the width of the scaffold at least every third set of posts horizontally and every fourth runner vertically. Such bracing shall extend diagonally from the inner and outer runners upward to the next outer and inner runners.

(12) Longitudinal diagonal bracing shall be installed at approximately a 45–degree angle from near the base of the first outer post upward to the extreme top of the scaffold. Where the longitudinal length of the scaffold permits, such bracing shall be duplicated beginning at every fifth post. In a similar manner, longitudinal diagonal bracing shall also be installed from the last post extending back and upward toward the first post. Where conditions preclude the attachment of this bracing to the posts, it may be attached to the runners.

(13) The entire scaffold shall be tied to and securely braced against the building at intervals not to exceed 30 feet horizontally and 26 feet vertically.

(14) Guardrails not less than 2 x 4 inches nominal lumber or the equivalent and not less than 36 inches or more than 42 inches high, with a mid–rail, when required, of 1 x 4–inch nominal lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with WAC 296–24–82503(17). (See Tables D–13, 14 and 15.)

TABLE D–13

TUBE AND COUPLER SCAFFOLDS
LIGHT DUTY

Uniformly distributed load	Not to exceed 25 p.s.f.
Post spacing (longitudinal)	10 ft. 0 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	8	125 ft.
2	4	125 ft.
3	0	91 ft. 0 in.

TABLE D–14

TUBE AND COUPLER SCAFFOLDS
MEDIUM DUTY

Uniformly distributed load	Not to exceed 50 p.s.f.
Post spacing (longitudinal)	8 ft. 0 in.
Post spacing (transverse)	6 ft. 0. in.

TABLE D-14

TUBE AND COUPLER SCAFFOLDS
MEDIUM DUTY

Working levels	Additional planked levels	Maximum height
1	6	125 ft.
2	0	78 ft. 0 in.

TABLE D-15

TUBE AND COUPLER SCAFFOLDS
HEAVY DUTY

Uniformly distributed load ——— Not to exceed 75 p.s.f.
Post spacing (longitudinal) ——— 6 ft. 6 in.
Post spacing (transverse) ——— 6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	6	125 ft.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82507, filed 7/31/79; Order 73-5, § 296-24-82507, filed 5/9/73 and Order 73-4, § 296-24-82507, filed 5/7/73.]

WAC 296-24-82509 Tubular welded frame scaffolds. (1) Metal tubular frame scaffolds, including accessories such as braces, brackets, trusses, screw legs, ladders, etc., shall be designed and proved to safely support four times the maximum intended load.

(2) Spacing of panels or frames shall be consistent with the loads imposed.

(3) Scaffolds shall be properly braced by cross bracing or diagonal braces, or both, for securing vertical members together laterally, and the cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, square, and rigid. All brace connections shall be made secure.

(4) Scaffold legs shall be set on adjustable bases or plain bases placed on mud sills or other foundations adequate to support the maximum intended load.

(5) The frames shall be placed one on top of the other with coupling or stacking pins to provide proper vertical alinement of the legs.

(6) Where uplift may occur, panels shall be locked together vertically by pins or other equivalent suitable means.

(7) Guardrails not less than 2 x 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- x 4-inch nominal lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches nominal lumber in height. Wire mesh shall be installed in accordance with WAC 296-24-82503(17).

(8) All tubular metal scaffolds shall be constructed and erected to support four times the maximum intended loads.

(9) To prevent movement, the scaffold shall be secured to the building or structure at intervals not to exceed 30 feet horizontally and 26 feet vertically.

(10) Maximum permissible spans of planking shall be in conformity with WAC 296-24-82503(9).

(11) Drawings and specifications for all frame scaffolds over 125 feet in height above the base plates shall be designed by a registered professional engineer and copies made available to the employer and for inspection purposes.

(12) All tubular welded frame scaffolds shall be erected by competent and experienced personnel.

(13) Frames and accessories for scaffolds shall be maintained in good repair and every defect, unsafe condition, or noncompliance with this section shall be immediately corrected before further use of the scaffold. Any broken, bent, excessively rusted, altered, or otherwise structurally damaged frames or accessories shall not be used.

(14) Periodic inspections shall be made of all welded frames and accessories, and any maintenance, including painting, or minor corrections authorized by the manufacturer, shall be made before further use.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82509, filed 7/31/79; Order 73-5, § 296-24-82509, filed 5/9/73 and Order 73-4, § 296-24-82509, filed 5/7/73.]

WAC 296-24-82511 Outrigger scaffolds. (1) Outrigger beams shall extend not more than 6 feet beyond the face of the building. The inboard end of the outrigger beams, measured from the fulcrum point to the extreme point of support, shall be not less than one and one-half times the outboard end in length. The beams shall rest on edge, the sides shall be plumb and the edges shall be horizontal. The fulcrum point of the beam shall rest on a secure bearing at least 6 inches in each horizontal dimension. The beam shall be secured in place against movement and shall be securely braced at the fulcrum point against tipping.

(2) The inboard ends of outrigger beams shall be securely supported either by means of struts bearing against sills in contact with the overhead beams or ceiling, or by means of tension members secured to the floor joists underfoot, or by both if necessary. The inboard ends of outrigger beams shall be secured against tipping and the entire supporting structure shall be securely braced in both directions to prevent any horizontal movement.

(3) Unless outrigger scaffolds are designed by a licensed professional engineer, they shall be constructed and erected in accordance with Table D-16. Outrigger scaffolds designed by a registered professional engineer shall be constructed and erected in accordance with such

design. A copy of the detailed drawings and specifications showing the sizes and spacing of members shall be kept on the job.

(4) Planking shall be laid tight and shall extend to within 3 inches of the building wall. Planking shall be nailed or bolted to outriggers.

(5) Where there is danger of material falling from the scaffold, a wire mesh or other enclosure shall be provided between the guardrail and the toeboard.

(6) Where additional working levels are required to be supported by the outrigger method, the plans and specifications of the outrigger and scaffolding structure shall be designed by a registered professional engineer to comply with requirements of this section.

TABLE D-16

MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF OUTRIGGER SCAFFOLDS

	Light duty	Medium duty
Maximum scaffold load	25 p.s.f.	50 p.s.f.
Outrigger size	2 x 10 in.	3 x 10 in.
Maximum outrigger spacing	10 ft. 0 in.	6 ft. 0 in.
Planking	2 x 9 in.	2 x 9 in.
Guardrail	2 x 4 in.	2 x 4 in.
Guardrail uprights	2 x 4 in.	2 x 4 in.
Toeboards	4 in. (minimum).	4 in. (minimum).

[Order 73-5, § 296-24-82511, filed 5/9/73 and Order 73-4, § 296-24-82511, filed 5/7/73.]

WAC 296-24-82513 Masons' adjustable multiple-point suspension scaffolds. (1) The scaffold shall be capable of sustaining a working load of fifty pounds per square foot and shall not be loaded in excess of that figure.

(2) The scaffold shall be provided with hoisting machines that meet the requirements of a nationally recognized testing laboratory. Refer to federal regulation 29 CFR 1910.7 for definition of a nationally recognized testing laboratory.

(3) The platform shall be supported by wire ropes in conformity with WAC 296-24-82503(22), suspended from overhead outrigger beams.

(4) The scaffold outrigger beams shall consist of structural metal securely fastened or anchored to the frame or floor system of the building or structure.

(5) Each outrigger beam shall be equivalent in strength to at least a standard seven-inch, 15.3-pound steel I-beam, be at least fifteen feet long, and shall not project more than six feet six inches beyond the bearing point.

(6) Where the overhang exceeds six feet six inches, outrigger beams shall be composed of stronger beams or multiple beams and be installed in accordance with approved designs and instructions.

(7) If channel iron outrigger beams are used in place of I-beams, they shall be securely fastened together with the flanges turned out.

(8) All outrigger beams shall be set and maintained with their webs in a vertical position.

(9) A stop bolt shall be placed at each end of every outrigger beam.

(10) The outrigger beam shall rest on suitable wood-bearing blocks.

(11) All parts of the scaffold such as bolts, nuts, fittings, clamps, wire rope, and outrigger beams and their fastenings, shall be maintained in sound and good working condition and shall be inspected before each installation and periodically thereafter.

(12) The free end of the suspension wire ropes shall be equipped with proper size thimbles and be secured by splicing or other equivalent means. The running ends shall be securely attached to the hoisting drum and at least four turns of rope shall at all times remain on the drum.

(13) Where a single outrigger beam is used, the steel shackles or clevises with which the wire ropes are attached to the outrigger beams shall be placed directly over the hoisting drums.

(14) The scaffold platform shall be equivalent in strength to at least two-inch planking. (For maximum planking spans see WAC 296-24-82503(22).)

(15) Guardrails not less than two by four inches or the equivalent and not less than thirty-six inches or more than forty-two inches high, with a mid-rail, when required, of one-inch by four-inch nominal lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than eight feet above the ground or floor. Toeboards shall be a minimum of four inches nominal lumber in height. Wire mesh shall be installed in accordance with WAC 296-24-82503(17).

(16) Overhead protection shall be provided on the scaffold, not more than nine feet above the platform, consisting of two-inch planking or material of equivalent strength laid tight, when men are at work on the scaffold and an overhead hazard exists.

(17) Each scaffold shall be installed or relocated in accordance with designs and instructions, of a registered professional engineer, and supervised by a competent, designated person to comply with the requirements of this section.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-82513, filed 11/14/88; Order 73-5, § 296-24-82513, filed 5/9/73 and Order 73-4, § 296-24-82513, filed 5/7/73.]

WAC 296-24-82515 Two-point suspension scaffolds (swinging scaffolds). (1) Two-point suspension scaffold platforms shall be not less than twenty inches nor more than thirty-six inches wide overall. The platform shall be securely fastened to the hangers by U-bolts or by other equivalent means.

(2) The hangers of two-point suspension scaffolds shall be made of wrought iron, mild steel, or other equivalent material having a cross-sectional area capable of sustaining four times the maximum intended load, and shall be designed with a support for guardrail, intermediate rail, and toeboard.

(3) When hoisting machines are used on two-point suspension scaffolds, such machines shall be of a design tested and approved by a nationally recognized testing

laboratory. Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.

(4) The roof irons or hooks shall be of wrought iron, mild steel, or other equivalent material of proper size and design, securely installed and anchored. Tiebacks of three-fourths-inch manila rope or the equivalent shall serve as a secondary means of anchorage, installed at right angles to the face of the building whenever possible and secured to a structurally sound portion of the building.

(5) Guardrails not less than two by four inches or the equivalent and not less than thirty-six inches or more than forty-two inches high, with a mid-rail, when required, of one-inch by four-inch nominal lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than ten feet above the ground or floor. Toeboards shall be a minimum of four inches nominal lumber in height. Wire mesh shall be installed in accordance with WAC 296-24-82503(17).

(6) Two-point suspension scaffolds shall be suspended by wire or fiber ropes. Wire and fiber ropes shall conform to WAC 296-24-82503(22).

(7) The blocks for fiber ropes shall be of standard six-inch size, consisting of at least one double and one single block. The sheaves of all blocks shall fit the size of rope used.

(8) All wire ropes, fiber ropes, slings, hangers, platforms, and other supporting parts shall be inspected before every installation. Periodic inspections shall be made while the scaffold is in use.

(9) On suspension scaffolds designed for a working load of five hundred pounds, no more than two men shall be permitted to work at one time. On suspension scaffolds with a working load of seven hundred fifty pounds, no more than three men shall be permitted to work at one time. Each workman shall be protected by a safety lifebelt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the workman in case of a fall.

(10) Where acid solutions are used, fiber ropes are not permitted unless acid-proof.

(11) Two-point suspension scaffolds shall be securely lashed to the building or structure to prevent them from swaying. Window cleaners' anchors shall not be used for this purpose.

(12) The platform of every two-point suspension scaffold shall be one of the following types:

(a) The side stringer of ladder-type platforms shall be clear straight-grained spruce or materials of equivalent strength and durability. The rungs shall be of straight-grained oak, ash, or hickory, at least one and one-eighths-inch in diameter, with seven-eighths inch tenons mortised into the side stringers at least seven-eighths inch. The stringers shall be tied together with the tie rods not less than one-quarter inch in diameter, passing through the stringers and riveted up tight against washers on both ends. The flooring strips shall be spaced not more than five-eighths inch apart except at the side rails where the space may be one inch. Ladder-type platforms shall be constructed in accordance with Table D-17.

(b) Plank-type platforms shall be composed of not less than nominal two-inch by eight-inch unspliced planks, properly cleated together on the underside starting six inches from each end; intervals in between shall not exceed four feet. The plank-type platform shall not extend beyond the hangers more than eighteen inches. A bar or other effective means shall be securely fastened to the platform at each end to prevent its slipping off the hanger. The span between hangers for plank-type platforms shall not exceed ten feet.

(c) Beam platforms shall have side stringers of lumber not less than two by six inches set on edge. The span between hangers shall not exceed twelve feet when beam platforms are used. The flooring shall be supported on two-inch and six-inch crossbeams, laid flat and set into the upper edge of the stringers with a snug fit, at intervals of not more than four feet, securely nailed in place. The flooring shall be of one-inch by six-inch material properly nailed. Floorboards shall not be spaced more than one-half inch apart. (See Table D-17.)

TABLE D-17

SCHEDULE FOR LADDER-TYPE PLATFORMS

	Length of platform (feet)				
	12	14&16	18&20	22&24	28&30
Side stringers, minimum cross section (finished sizes):					
At ends (in.)	1 3/4 x2 3/4	1 3/4 x2 3/4	1 3/4 x3	1 3/4 x3	1 3/4 x3 1/2
At middle (in.)	1 3/4 x3 3/4	1 3/4 x3 3/4	1 3/4 x4	1 3/4 x4 1/4	1 3/4 x5
Reinforcing strip (minimum)	A 1/8x7/8-in. steel reinforcing strip or its equivalent shall be attached to the side or underside, full length.				
Rungs	Rungs shall be 1 1/8-in. minimum diameter with at least 7/8-in. diameter tenons, and the maximum spacing shall be 12 in. center to center.				
Tie rods:					
Number (minimum)	3	4	4	5	6
Diameter (minimum)	1/4 in.	1/4 in.	1/4 in.	1/4 in.	1/4 in.
Flooring, minimum finished size (in.)	1/2 x2 3/4	1/2 x2 3/4	1/2 x2 3/4	1/2 x2 3/4	1/2 x2 3/4

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-82515, filed 11/14/88. Statutory Authority: RCW 49-.17.040, 49.17.050, and 49.17.240. 80-11-010 (Order 80-14), § 296-24-82515, filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17-.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82515, filed 7/31/79; Order 73-5, § 296-24-82515, filed 5/9/73 and Order 73-4, § 296-24-82515, filed 5/7/73.]

WAC 296-24-82517 Stone setters' adjustable multiple-point suspension scaffolds. (1) The scaffold shall be capable of sustaining a working load of 25 pounds per

square foot and shall not be overloaded. Scaffolds shall not be used for storage of stone or other heavy materials.

(2) The hoisting machine and its supports shall be of a type tested and listed by a nationally recognized testing laboratory. Refer to WAC 296-24-95601(77) for definition of listed, and 29 CFR 1910.7 for nationally recognized testing laboratory.

(3) The platform shall be securely fastened to the hangers by U-bolts or other equivalent means.

(4) The scaffold unit shall be suspended from metal outriggers, iron brackets, wire rope slings, or iron hooks which will safely support the maximum intended load.

(5) Outriggers when used shall be set with their webs in a vertical position, securely anchored to the building or structure and provided with stop bolts at each end.

(6) The scaffold shall be supported by wire rope conforming with WAC 296-24-82503(22), suspended from overhead supports.

(7) The free ends of the suspension wire ropes shall be equipped with proper size thimbles, secured by splicing or other equivalent means. The running ends shall be securely attached to the hoisting drum and at least four turns of rope shall remain on the drum at all times.

(8) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- by 4-inch nominal lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches nominal lumber in height. Wire mesh shall be installed in accordance with WAC 296-24-82503(17).

(9) When two or more scaffolds are used on a building or structure they shall not be bridged one to the other but shall be maintained at even height with platforms butting closely.

(10) Each scaffold shall be installed or relocated in accordance with designs and instructions of a registered professional engineer, and such installation or relocation shall be supervised by a competent designated person to comply with requirements of this section.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-82517, filed 11/14/88. Statutory Authority: RCW 49-.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82517, filed 7/31/79; Order 73-5, § 296-24-82517, filed 5/9/73 and Order 73-4, § 296-24-82517, filed 5/7/73.]

WAC 296-24-82519 Single-point adjustable suspension scaffolds. (1) The scaffolding, including power units or manually operated winches, shall be of a type tested and listed by a nationally recognized testing laboratory. Refer to WAC 296-24-95601(77) for definition of listed, and 29 CFR 1910.7 for nationally recognized testing laboratory.

(2) The power units may be either electrically or air motor driven.

(3) All power-operated gears and brakes shall be enclosed.

(4) In addition to the normal operating brake, all-power driven units must have an emergency brake which engages automatically when the normal speed of descent is exceeded.

(5) Guards, mid-rails, and toeboards shall completely enclose the cage or basket. Guardrails shall be no less than 2 by 4 inches nominal lumber or the equivalent installed no less than 36 inches nor more than 42 inches above the platform. Mid-rails shall be 1 by 6 inches nominal lumber or the equivalent, installed equidistant between the guardrail and the platform. Toeboards shall be a minimum of 4 inches nominal lumber in height.

(6) The hoisting machines, cables, and equipment shall be regularly serviced and inspected after each installation and every 30 days thereafter.

(7) The units may be combined to form a two-point suspension scaffold. Such scaffold shall comply with WAC 296-24-82515.

(8) The supporting cable shall be straight for its entire length, and the operator shall not sway the basket and fix the cable to any intermediate points to change his original path of travel.

(9) Equipment shall be maintained and used in accordance with the manufacturers' instructions.

(10) Suspension methods shall conform to applicable provisions of WAC 296-24-82515 and 296-24-82517.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-82519, filed 11/14/88; Order 73-5, § 296-24-82519, filed 5/9/73 and Order 73-4, § 296-24-82519, filed 5/7/73.]

WAC 296-24-82521 Boatswain's chairs. (1) The chair seat shall be not less than 12 by 24 inches, and of 1-inch thickness. The seat shall be reinforced on the underside to prevent the board from splitting.

(2) The two fiber rope seat slings shall be of 5/8-inch diameter, reeved through the four seat holes so as to cross each other on the underside of the seat.

(3) Seat slings shall be of at least 3/8-inch wire rope when a workman is conducting a heat producing process such as gas or arc welding.

(4) The workman shall be protected by a safety life belt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the worker in case of a fall.

(5) The tackle shall consist of correct size ball bearing or bushed blocks and properly spliced 5/8-inch diameter first-grade manila rope or equivalent strength synthetic-fiber rope.

(6) The roof irons, hooks, or the object to which the tackle is anchored shall be securely installed. Tiebacks when used shall be installed at right angles to the face of the building and securely fastened to a chimney.

[Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 80-11-010 (Order 80-14), § 296-24-82521, filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82521, filed 7/31/79; Order 73-5, § 296-24-82521, filed 5/9/73 and Order 73-4, § 296-24-82521, filed 5/7/73.]

WAC 296-24-82523 Carpenters' bracket scaffolds. (1) The brackets shall consist of a triangular wood frame not less than 2 by 3 inches in cross section, or of metal of equivalent strength. Each member shall be properly fitted and securely joined.

(2) Each bracket shall be attached to the structure by means of one of the following:

(a) A bolt no less than 5/8–inch in diameter which shall extend through the inside of the building wall.

(b) A metal stud attachment device.

(c) Welding to steel tanks.

(d) Hooking over or securing through a well–secured and adequately strong supporting member.

The brackets shall be spaced no more than 10 feet apart.

(3) No more than two persons shall occupy any given 10 feet of a bracket scaffold at any one time. Tools and materials shall not exceed 75 pounds in addition to the occupancy.

(4) The platform shall consist of not less than two 2– by 10–inch nominal size planks extending not more than 10 inches or less than 6 inches beyond each end support.

(5) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid–rail, when required, of 1– by 4–inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with WAC 296–24–82503(17).

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79–08–115 (Order 79–9), § 296–24–82523, filed 7/31/79; Order 76–6, § 296–24–82523, filed 3/1/76; Order 73–5, § 296–24–82523, filed 5/9/73 and Order 73–4, § 296–24–82523, filed 5/7/73.]

WAC 296–24–82525 Bricklayers' square scaffolds. (1) The squares shall not exceed 5 feet in width and 5 feet in height.

(2) Members shall be not less than those specified in Table D–18.

(3) The squares shall be reinforced on both sides of each corner with 1– by 6–inch gusset pieces. They shall also have braces 1 by 8 inches on both sides running from center to center of each member, or other means to secure equivalent strength and rigidity.

(4) The squares shall be set not more than 5 feet apart for medium duty scaffolds, and not more than 8 feet apart for light duty scaffolds. Bracing 1 x 8 inches, extending from the bottom of each square to the top of the next square, shall be provided on both front and rear sides of the scaffold.

TABLE D–18

MINIMUM DIMENSIONS FOR BRICKLAYERS' SQUARE SCAFFOLD MEMBERS

Members:	Dimensions (inches)
Bearers or horizontal members	2 by 6
Legs	2 by 6
Braces at corners	1 by 6
Braces diagonally from center frame	1 by 8

(5) Platform planks shall be at least 2– by 10–inch nominal size. The ends of the planks shall overlap the bearers of the squares and each plank shall be supported by not less than three squares.

(6) Bricklayers' square scaffolds shall not exceed three tiers in height and shall be so constructed and arranged that one square shall rest directly above the other. The upper tiers shall stand on a continuous row of planks laid across the next lower tier and be nailed down or otherwise secured to prevent displacement.

(7) Scaffolds shall be level and set upon a firm foundation.

[Order 73–5, § 296–24–82525, filed 5/9/73 and Order 73–4, § 296–24–82525, filed 5/7/73.]

WAC 296–24–82527 Horse scaffolds. (1) Horse scaffolds shall not be constructed or arranged more than two tiers or 10 feet in height.

(2) The members of the horses shall be not less than those specified in Table D–19.

(3) Horses shall be spaced not more than 5 feet for medium duty and not more than 8 feet for light duty.

(4) When arranged in tiers, each horse shall be placed directly over the horse in the tier below.

(5) On all scaffolds arranged in tiers, the legs shall be nailed down to the planks to prevent displacement or thrust and each tier shall be substantially cross braced.

TABLE D–19

MINIMUM DIMENSIONS FOR HORSE SCAFFOLD MEMBER

Members:	Dimensions (inches)
Horizontal members or bearers	3 by 4
Legs	1 1/4 by 4 1/2
Longitudinal brace between legs	1 by 6
Gusset brace at top of legs	1 by 8
Half diagonal braces	1 1/4 by 4 1/2

(6) Horses or parts which have become weak or defective shall not be used.

(7) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high with a mid–rail, when required, of 1– by 4–inch lumber or equivalent and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with WAC 296–24–82503(17).

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79–08–115 (Order 79–9), § 296–24–82527, filed 7/31/79; Order 73–5, § 296–24–82527, filed 5/9/73 and Order 73–4, § 296–24–82527, filed 5/7/73.]

WAC 296–24–82529 Needle beam scaffold. (1) Wood needle beams shall be in accordance with WAC 296–24–82503 (5) and (9) and shall be not less than 4 by 6 inches in size, with the greater dimension placed in a vertical direction. Metal beams or the equivalent conforming to WAC 296–24–82503 (4) and (8) may be used.

(2) Ropes or hangers shall be provided for supports. The span between supports on the needle beam shall not exceed 10 feet for 4– by 6–inch timbers. Rope supports

shall be equivalent in strength to 1-inch diameter first-grade manila rope.

(3) The ropes shall be attached to the needle beams by a scaffold hitch or a properly made eye splice. The loose end of the rope shall be tied by a bowline knot or by a round turn and one-half hitch.

(4) The platform span between the needle beams shall not exceed 8 feet when using 2-inch scaffold plank. For spans greater than 8 feet, platforms shall be designed based on design requirements for the special span. The overhang of each end of the platform planks shall be not less than 1 foot and not more than 18 inches.

(5) When one needle beam is higher than the other or when the platform is not level the platform shall be secured against slipping.

(6) All unattached tools, bolts, and nuts used on needle beam scaffolds shall be kept in suitable containers.

(7) One end of a needle beam scaffold may be supported by a permanent structural member conforming to WAC 296-24-82503 (4) and (8).

(8) Each man working on a needle beam scaffold 10 feet or more above the ground or floor, shall be protected by a safety life belt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the workman in case of a fall.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82529, filed 7/31/79; Order 73-5, § 296-24-82529, filed 5/9/73 and Order 73-4, § 296-24-82529, filed 5/7/73.]

WAC 296-24-82531 Plasterers', decorators', and large area scaffolds. (1) Plasterers', decorators', lathers', and ceiling workers' inside scaffolds shall be constructed in accordance with the general requirements set forth for independent wood pole scaffolds.

(2) Guardrails not less than 2 by 4 inches nominal lumber or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- by 4-inch nominal lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches nominal lumber in height. Wire mesh shall be installed in accordance with WAC 296-24-82503(17).

(3) All platform planks shall be laid with the edges close together to the point where material cannot fall through.

(4) When independent pole scaffold platforms are erected in sections such sections shall be provided with connecting runways equipped with substantial guardrails.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82531, filed 7/31/79; Order 73-5, § 296-24-82531, filed 5/9/73 and Order 73-4, § 296-24-82531, filed 5/7/73.]

WAC 296-24-82533 Interior hung scaffolds. (1) An interior hung scaffold should be hung or suspended from the roof structure or substantial ceiling beams.

(2) The suspended steel wire rope shall conform to WAC 296-24-82503(22). Wire may be used providing the strength requirements of WAC 296-24-82503(22) are met.

(3) For hanging wood scaffolds, the following minimum nominal size material is recommended:

(a) Supporting bearers 2 by 9 inches on edge.

(b) Planking 2 by 9 inches or 2 by 10 inches, with maximum span 7 feet for heavy duty and 10 feet for light duty or medium duty.

(4) Steel tube and coupler members may be used for hanging scaffolds with both types of scaffold designed to sustain a uniform distributed working load up to heavy duty scaffold loads with a safety factor of four.

(5) When a hanging scaffold is supported by means of wire rope, such wire rope shall be wrapped at least twice around the supporting members and twice around the bearers of the scaffold, with each end of the wire rope secured by at least three standard wire-rope clips.

(6) All overhead supporting members shall be inspected and checked for strength before the scaffold is erected.

(7) Guardrails not less than 2 by 4 inches nominal lumber or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of at least 1- by 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches nominal lumber in height. Wire mesh shall be installed in accordance with WAC 296-24-82503(17).

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-82533, filed 7/31/79; Order 73-5, § 296-24-82533, filed 5/9/73 and Order 73-4, § 296-24-82533, filed 5/7/73.]

WAC 296-24-82535 Ladder-jack scaffolds. (1) All ladder-jack scaffolds shall be limited to light duty and shall not exceed a height of 20 feet above the floor or ground.

(2) All ladders used in connection with ladder-jack scaffolds shall be heavy-duty ladders and shall be designed and constructed in accordance with WAC 296-24-780 through 296-24-78009 and 296-24-795 through 296-24-79507.

(3) The ladder-jack shall be so designed and constructed that it will bear on the side rails in addition to the ladder rungs, or if bearing on rungs only, the bearing area shall be at least 10 inches on each rung.

(4) Ladders used in conjunction with ladder jacks shall be so placed, fastened, held, or equipped with devices so as to prevent slipping.

(5) The wood platform planks shall be not less than 2 inches nominal in thickness. Both metal and wood platform planks shall overlap the bearing surface not less than 12 inches. The span between supports for wood shall not exceed 8 feet. Platform width shall be not less than 18 inches.

(6) Not more than two persons shall occupy any given 8 feet of any ladder-jack scaffold at any one time.

[Order 73-5, § 296-24-82535, filed 5/9/73 and Order 73-4, § 296-24-82535, filed 5/7/73.]

WAC 296-24-82537 Window-jack scaffolds. (1) Window-jack scaffolds shall be used only for the purpose of working at the window opening through which the jack is placed.

(2) Window jacks shall not be used to support planks placed between one window jack and another or for other elements of scaffolding.

(3) Window-jack scaffolds shall be provided with suitable guardrails unless safety belts with lifelines are attached and provided for the workman. Window-jack scaffolds shall be used by one man only.

[Order 73-5, § 296-24-82537, filed 5/9/73 and Order 73-4, § 296-24-82537, filed 5/7/73.]

WAC 296-24-82539 Roofing brackets. (1) Roofing brackets shall be constructed to fit the pitch of the roof.

(2) Brackets shall be secured in place by nailing in addition to the pointed metal projections. The nails shall be driven full length into the roof. When rope supports are used, they shall consist of first-grade manila of at least three-quarter-inch diameter, or equivalent.

(3) A substantial catch platform shall be installed below the working area of roofs more than 20 feet from the ground to eaves with a slope greater than 3 inches in 12 inches without a parapet. In width the platform shall extend 2 feet beyond the projection of the eaves and shall be provided with a safety rail, mid-rail, and toeboard. This provision shall not apply where employees engaged in work upon such roofs are protected by a safety belt attached to a lifeline.

[Order 73-5, § 296-24-82539, filed 5/9/73 and Order 73-4, § 296-24-82539, filed 5/7/73.]

WAC 296-24-82541 Crawling boards or chicken ladders. (1) Crawling boards shall be not less than 10 inches wide and 1 inch thick, having cleats 1 x 1 1/2 inches. The cleats shall be equal in length to the width of the board and spaced at equal intervals not to exceed 24 inches. Nails shall be driven through and clinched on the underside. The crawling board shall extend from the ridge pole to the eaves when used in connection with roof construction, repair, or maintenance.

(2) A firmly fastened lifeline of at least three-quarter-inch rope shall be strung beside each crawling board for a handhold.

(3) Crawling boards shall be secured to the roof by means of adequate ridge hooks or equivalent effective means.

[Order 73-5, § 296-24-82541, filed 5/9/73 and Order 73-4, § 296-24-82541, filed 5/7/73.]

WAC 296-24-82543 Float or ship scaffolds. (1) Float or ship scaffolds shall support not more than three men and a few light tools, such as those needed for riveting, bolting, and welding. They shall be constructed in accordance with WAC 296-24-82543 (2) through (6), unless substitute designs and materials provide equivalent strength, stability, and safety.

(2) The platform shall be not less than 3 feet wide and 6 feet long, made of three-quarter-inch plywood, equivalent to American Plywood Association Grade B-B, Group I, Exterior.

(3) Under the platform, there shall be two supporting bearers made from 2- x 4-inch, or 1- x 10-inch rough, selected lumber, or better. They shall be free of knots or other flaws and project 6 inches beyond the platform on both sides. The ends of the platform shall extend about 6 inches beyond the outer edges of the bearers. Each bearer shall be securely fastened to the platform.

(4) An edging of wood not less than 3/4 x 1 1/2 inches, or equivalent, shall be placed around all sides of the platform to prevent tools from rolling off.

(5) Supporting ropes shall be 1-inch diameter manila rope or equivalent, free from deterioration, chemical damage, flaws, or other imperfections. Rope connections shall be such that the platform cannot shift or slip. If two ropes are used with each float, they should be arranged so as to provide four ends which are to be securely fastened to an overhead support. Each of the two supporting ropes shall be hitched around one end of a bearer and pass under the platforms to the other end of the bearer where it is hitched again, leaving sufficient rope at each end for the supporting ties.

(6) Each workman shall be protected by a safety lifebelt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the workman in case of a fall.

[Order 73-5, § 296-24-82543, filed 5/9/73 and Order 73-4, § 296-24-82543, filed 5/7/73.]

WAC 296-24-82545 Scope. WAC 296-24-82501 through 296-24-82543 establish safety requirements for the construction, operation, maintenance, and use of scaffolds used in the construction, alteration, demolition, and maintenance of buildings and structures.

[Order 73-5, § 296-24-82545, filed 5/9/73 and Order 73-4, § 296-24-82545, filed 5/7/73.]

WAC 296-24-840 Manually propelled mobile ladder stands and scaffolds (towers).

[Order 73-5, § 296-24-840, filed 5/9/73 and Order 73-4, § 296-24-840, filed 5/7/73.]

WAC 296-24-84001 Definitions. The following terms shall have the meaning ascribed in this section when referred to in WAC 296-24-84003 through 296-24-84013 unless the context requires otherwise.

(1) Bearer. A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

(2) Brace. A tie that holds one scaffold member in a fixed position with respect to another member.

(3) Climbing ladder. A separate ladder with equally spaced rungs usually attached to the scaffold structure for climbing and descending.

(4) Coupler. A device for locking together the components of a tubular metal scaffold which shall be designed and used to safely support the maximum intended loads.

(5) Design working load. The maximum intended load, being the total of all loads including the weight of the men, materials, equipment, and platform.

(6) Equivalent. Alternative design or features, which will provide an equal degree or factor of safety.

(7) Guardrail. A barrier secured to uprights and erected along the exposed sides and ends of platforms to prevent falls of persons.

(8) Handrail. A rail connected to a ladder stand running parallel to the slope and/or top step.

(9) Ladder stand. A mobile fixed size self-supporting ladder consisting of a wide flat tread ladder in the form of stairs. The assembly may include handrails.

(10) Ledger (stringer). A horizontal scaffold member which extends from post to post and which supports the bearer forming a tie between the posts.

(11) Mobile scaffold (tower). A light, medium, or heavy duty scaffold mounted on casters or wheels.

(12) Mobile. "Manually propelled."

(13) Mobile work platform. Generally a fixed work level one frame high on casters or wheels, with bracing diagonally from platform to vertical frame.

(14) Runner. The lengthwise horizontal bracing and/or bearing members.

(15) Scaffold. Any temporary elevated platform and its necessary vertical, diagonal, and horizontal members used for supporting workmen and materials. (Also known as a scaffold tower.)

(16) Toeboard. A barrier at platform level erected along the exposed sides and ends of a scaffold platform to prevent falls of materials.

(17) Tube and coupler scaffold. An assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and uprights, and serves to join the various members, usually used in fixed locations.

(18) Tubular welded frame scaffold. A sectional, panel, or frame metal scaffold substantially built up of prefabricated welded sections, which consist of posts and bearers with intermediate connecting members and braced with diagonal or cross braces.

(19) Tubular welded sectional folding scaffold. A sectional, folding metal scaffold either of ladder frame or inside stairway design, substantially built of prefabricated welded sections, which consist of end frames, platform frame, inside inclined stairway frame and braces, or hinged connected diagonal and horizontal braces, capable of being folded into a flat package when the scaffold is not in use.

(20) Work level. The elevated platform, used for supporting workmen and their materials, comprising the necessary vertical, horizontal, and diagonal braces, guardrails, and ladder for access to the work platform.

[Order 73-5, § 296-24-84001, filed 5/9/73 and Order 73-4, § 296-24-84001, filed 5/7/73.]

WAC 296-24-84003 General requirements. (1) Application. This section is intended to prescribe rules and requirements for the design, construction, and use of mobile work platforms (including ladder stands but not including aerial ladders) and rolling (mobile) scaffolds (towers). This standard is promulgated to aid in providing for the safety of life, limb, and property, by establishing minimum standards for structural design requirements and for the use of mobile work platforms and towers.

(2) Working loads.

(a) Work platforms and scaffolds shall be capable of carrying the design load under varying circumstances depending upon the conditions of use. Therefore, all parts and appurtenances necessary for their safe and efficient utilization must be integral parts of the design.

(b) Specific design and construction requirements are not a part of this section because of the wide variety of materials and design possibilities. However, the design shall be such as to produce a mobile ladder stand or scaffold that will safely sustain the specified loads. The material selected shall be of sufficient strength to meet the test requirements and shall be protected against corrosion or deterioration.

(i) The design working load of ladder stands shall be calculated on the basis of one or more 200-pound persons together with 50 pounds of equipment each.

(ii) The design load of all scaffolds shall be calculated on the basis of:

Light—Designed and constructed to carry a working load of 25 pounds per square foot.

Medium—Designed and constructed to carry a working load of 50 pounds per square foot.

Heavy—Designed and constructed to carry a working load of 75 pounds per square foot.

All ladder stands and scaffolds shall be capable of supporting at least four times the design working load.

(c) Materials used in mobile ladder stands and scaffolds shall be of standard manufacture and conform to specifications of this section for strength, dimensions, and weights, and shall be selected to safely support the design working load.

(d) Nails, bolts, or other fasteners used in the construction of ladders, scaffolds, and towers shall be of adequate size and in sufficient numbers at each connection to develop the designed strength of the unit. Nails shall be driven full length. (All nails should be immediately withdrawn from dismantled lumber.)

(e) All exposed surfaces shall be free from sharp edges, burrs or other safety hazards.

(3) Work levels.

(a) The maximum work level height shall not exceed four times the minimum or least base dimension of any mobile ladder stand or scaffold. Where the basic mobile unit does not meet this requirement, suitable outrigger frames shall be employed to achieve this least base dimension, or provisions shall be made to guy or brace the unit against tipping.

(b) The minimum platform width for any work level shall not be less than 20 inches for mobile scaffolds (towers). Ladder stands shall have a minimum step width of 16 inches.

(c) The supporting structure for the work level shall be rigidly braced, using adequate cross bracing or diagonal bracing with rigid platforms at each work level.

(d) The steps of ladder stands shall be fabricated from slip resistant treads.

(e) The work level platform of scaffolds (towers) shall be of wood, aluminum, or plywood planking, steel or expanded metal, for the full width of the scaffold, except for necessary openings. Work platforms shall be secured in place. All planking shall be 2–inch (nominal) scaffold grade minimum 1,500 f. (stress grade) construction grade lumber or equivalent.

(f) All scaffold work levels 10 feet or higher above the ground or floor shall have a standard (4–inch nominal) toeboard.

(g) All work levels 10 feet or higher above the ground or floor shall have a guardrail of 2– by 4–inch nominal lumber or the equivalent installed no less than 36 inches or more than 42 inches high, with a mid–rail, when required, of at least 1– by 4–inch nominal lumber or equivalent.

(h) A climbing ladder, stairway, or equivalent shall be provided for proper access and egress, and shall be affixed or built into the scaffold and so located that its use will not have a tendency to tip the scaffold. A landing platform shall be provided at intervals not to exceed 30 feet.

(4) Wheels or casters.

(a) Wheels or casters shall be properly designed for strength and dimensions to support four times the design working load.

(b) All scaffold casters shall be provided with a positive wheel and/or swivel lock to prevent movement. Ladder stands shall have at least two of the four casters and shall be of the swivel type.

(c) Where leveling of the elevated work platform is required, screw jacks or other suitable means for adjusting the height shall be provided in the base section of each mobile unit.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79–08–115 (Order 79–9), § 296–24–84003, filed 7/31/79; Order 73–5, § 296–24–84003, filed 5/9/73 and Order 73–4, § 296–24–84003, filed 5/7/73.]

WAC 296-24-84005 Mobile tubular welded frame scaffolds. (1) General. Units shall be designed to comply with the requirements of WAC 296–24–84003.

(2) Bracing. Scaffolds shall be properly braced by cross braces and/or diagonal braces for securing vertical members together laterally. The cross braces shall be of a length that will automatically square and align vertical members so the erected scaffold is always plumb, square, and rigid.

(3) Spacing. Spacing of panels or frames shall be consistent with the loads imposed. The frames shall be placed one on top of the other with coupling or stacking pins to provide proper vertical alignment of the legs.

(4) Locking. Where uplift may occur, panels shall be locked together vertically by pins or other equivalent means.

(5) Erection. Only the manufacturer of a scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a registered professional engineer or erected in accordance with instructions furnished by the manufacturer.

[Order 73–5, § 296–24–84005, filed 5/9/73 and Order 73–4, § 296–24–84005, filed 5/7/73.]

WAC 296-24-84007 Mobile tubular welded sectional folding scaffolds. (1) General. Units including sectional stairway and sectional ladder scaffolds shall be designed to comply with the requirements of WAC 296–24–84003.

(2) Stairway. An integral stairway and work platform shall be incorporated into the structure of each sectional folding stairway scaffold.

(3) Bracing. An integral set of pivoting and hinged folding diagonal and horizontal braces and a detachable work platform shall be incorporated into the structure of each sectional folding ladder scaffold.

(4) Sectional folding stairway scaffolds. Sectional folding stairway scaffolds shall be designed as medium duty scaffolds except for high clearance. These special base sections shall be designed as light duty scaffolds. When upper sectional folding stairway scaffolds are used with a special high clearance base, the load capacity of the entire scaffold shall be reduced accordingly. The width of a sectional folding stairway scaffold shall not exceed 4 1/2 feet. The maximum length of a sectional folding stairway scaffold shall not exceed 6 feet.

(5) Sectional folding ladder scaffolds. Sectional folding ladder scaffolds shall be designed as light duty scaffolds including special base (open end) sections which are designed for high clearance. For certain special applications the six–foot folding ladder scaffolds, except for special high clearance base sections, shall be designed for use as medium duty scaffolds. The width of a sectional folding ladder scaffold shall not exceed 4 1/2 feet. The maximum length of a sectional folding ladder scaffold shall not exceed 6 feet 6 inches for a six–foot long unit, 8 feet 6 inches for an eight–foot unit or 10 feet 6 inches for a ten–foot long unit.

(6) End frames. The end frames of sectional ladder and stairway scaffolds shall be designed so that the horizontal bearers provide supports for multiple planking levels.

(7) Erection. Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer to comply with requirements in this section.

[Order 73–5, § 296–24–84007, filed 5/9/73 and Order 73–4, § 296–24–84007, filed 5/7/73.]

WAC 296-24-84009 Mobile tube and coupler scaffolds. (1) Design. Units shall be designed to comply with the applicable requirements of WAC 296–24–84003.

(2) Material. The material used for the couplers shall be of a structural type, such as a drop–forged steel, malleable iron or structural grade aluminum. The use of gray cast iron is prohibited.

(3) Erection. Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer to comply with requirements in this section.

[Order 73-5, § 296-24-84009, filed 5/9/73 and Order 73-4, § 296-24-84009, filed 5/7/73.]

WAC 296-24-84011 Mobile work platforms. (1) Design. Units shall be designed for the use intended and shall comply with the requirements of WAC 296-24-84003.

(2) Base width. The minimum width of the base of mobile work platforms shall not be less than 20 inches.

(3) Bracing. Adequate rigid diagonal bracing to vertical members shall be provided.

[Order 73-5, § 296-24-84011, filed 5/9/73 and Order 73-4, § 296-24-84011, filed 5/7/73.]

WAC 296-24-84013 Mobile ladder stands. (1) Design. Units shall comply with applicable requirements of WAC 296-24-84003.

(2) Base width. The minimum base width shall conform to WAC 296-24-84003 (3) and (a). The maximum length of the base section shall be the total length of combined steps and top assembly, measured horizontally, plus five-eighths inch per step of rise.

(3) Steps. Steps shall be uniformly spaced, and sloped, with a rise of not less than nine inches, nor more than ten inches, and a depth of not less than seven inches. The slope of the steps section shall be a minimum of fifty-five degrees and a maximum of sixty degrees measured from the horizontal.

(4) Handrails.

(a) Units having more than five steps or 60 inches vertical height to the top step shall be equipped with handrails.

(b) Handrails shall be a minimum of 29 inches high. Measurements shall be taken vertically from the center of the step.

(5) Loading. The load (see WAC 296-24-84003 (2)(b)(ii)) shall be applied uniformly to a 3 1/2 inches wide area front to back at the center of the width span with a safety factor of four.

[Order 73-5, § 296-24-84013, filed 5/9/73 and Order 73-4, § 296-24-84013, filed 5/7/73.]

WAC 296-24-855 Other working surfaces.

[Order 73-5, § 296-24-855, filed 5/9/73 and Order 73-4, § 296-24-855, filed 5/7/73.]

WAC 296-24-85501 Dockboards (bridge plates). (1) Portable and powered dockboards shall be strong enough to carry the load imposed on them.

(2) Portable dockboards shall be secured in position, either by being anchored or equipped with devices which will prevent their slipping.

(3) Powered dockboards shall be designed and constructed in accordance with Commercial Standard CS202-56 (1961) "Industrial Lifts and Hinged Loading Ramps" published by the U.S. 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.

[Order 73-5, § 296-24-85501, filed 5/9/73 and Order 73-4, § 296-24-85501, filed 5/7/73.]

WAC 296-24-85503 Forging machine area. (1) Machines shall be so located as to give (a) enough clearance between machines so that the movement of one operator will not interfere with the work of another, (b) ample room for cleaning machines and handling the work, including material and scrap. The arrangement of machines shall be such that operators will not stand in aisles.

(2) Aisles shall be provided of sufficient width to permit the free movement of employees bringing and removing material. This aisle space is to be independent of working and storage space and should be defined by marking.

(3) Wood platforms used on the floor in front of machines shall be substantially constructed with nonslip surfaces.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-24-85503, filed 7/31/79; Order 73-5, § 296-24-85503, filed 5/9/73 and Order 73-4, § 296-24-85503, filed 5/7/73.]

WAC 296-24-85505 Veneer machinery. (1) Sides of steam vats shall extend to a height of not less than 36 inches above the floor, working platform, or ground.

(2) Large steam vats divided into sections shall be provided with substantial walkways between sections. Each walkway shall be provided with a standard handrail on each exposed side. These handrails may be removable, if necessary.

(3) Covers shall be removed only from that portion of steaming vats on which men are working and a portable railing shall be placed at this point to protect the operators.

(4) Workman shall not ride or step on logs in steam vats.

[Order 73-5, § 296-24-85505, filed 5/9/73 and Order 73-4, § 296-24-85505, filed 5/7/73.]

Part J-2
POWERED PLATFORMS, ETC.

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS SUBCHAPTER

296-24-87003 General requirements. [Order 76-6, § 296-24-87003, filed 3/1/76; Order 73-5, § 296-24-87003, filed 5/9/73 and Order 73-4, § 296-24-87003, 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.

296-24-87005 Type F powered platforms. [Order 76-6, § 296-24-87005, filed 3/1/76; Order 73-5, § 296-24-87005, filed 5/9/73 and Order 73-4, § 296-24-87005, 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.

296-24-87007 Type T powered platforms. [Order 73-5, § 296-24-87007, filed 5/9/73 and Order 73-4, § 296-24-87007, 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.

WAC 296-24-870 Power platforms for exterior building maintenance. (1) Scope. This section covers powered platform installations permanently dedicated to interior or exterior building maintenance of a specific structure or group of structures. This section does not apply to suspended scaffolds (swinging scaffolds) used to service buildings on a temporary basis and covered under Part J-1 of this chapter, nor to suspended scaffolds used for construction work and covered under Part J of chapter 296-155 WAC. Building maintenance includes, but is not limited to, such tasks as window cleaning, caulking, metal polishing, and reglazing.

(2) Application.

(a) New installations. This section applies to all permanent installations completed after July 23, 1990. Major modifications to existing installations completed after that date are also considered new installations under this section.

(b) Existing installations.

(i) Permanent installations in existence and/or completed before July 23, 1990, shall comply with WAC 296-24-87009, 296-24-87015, 296-24-87017, 296-24-87019, and 296-24-87035.

(ii) In addition, permanent installations completed after August 27, 1971, and in existence and/or completed before July 23, 1990, shall comply with WAC 296-24-87037.

(3) Assurance.

(a) Building owners of new installations shall inform the employer before each use in writing that the installation meets the requirements of WAC 296-24-87011(1) and 296-24-87013(1) and the additional design criteria contained in other provisions of WAC 296-24-87011 and 296-24-87013 relating to: Required load sustaining capabilities of platforms, building components, hoisting and supporting equipment; stability factors for carriages, platforms and supporting equipment; maximum horizontal force for movement of carriages and davits; design of carriages, hoisting machines, wire rope and stabilization systems; and design criteria for electrical wiring and equipment.

(b) Building owners shall base the information required in (a) of this subsection on the results of a field test of the installation before being placed into service and following any major alteration to an existing installation, as required in WAC 296-24-87009(1). The assurance shall also be based on all other relevant available information, including, but not limited to, test data, equipment specifications and verification by a registered professional engineer.

(c) Building owners of all installations, new and existing, shall inform the employer in writing that the installation has been inspected, tested and maintained in compliance with the requirements of WAC 296-24-87009 and 296-24-87015 and that all protection anchorages meet the requirements of WAC 296-24-87035 (3)(j), Appendix C.

(d) The employer shall not permit employees to use the installation prior to receiving assurance from the building owner that the installation meets the requirements contained in (a) and (c) of this subsection.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-870, filed 4/10/90, effective 5/25/90; Order 73-5, § 296-24-870, filed 5/9/73 and Order 73-4, § 296-24-870, filed 5/7/73.]

WAC 296-24-87001 Definitions. (1) Anemometer. An instrument for measuring wind velocity.

(2) Angulated roping. A system of platform suspension in which the upper wire rope sheaves or suspension points are closer to the plane of the building face than the corresponding attachment points on the platform, thus causing the platform to press against the face of the building during its vertical travel.

(3) ANSI. American National Standards Institute.

(4) Babbitted fastenings. The method of providing wire rope attachments in which the ends of the wire strands are bent back and are held in a tapered socket by means of poured molten babbitt metal.

(5) Brake-disc type. A brake in which the holding effect is obtained by frictional resistance between one or more faces of discs keyed to the rotating member to be held and fixed discs keyed to the stationary or housing member (pressure between the discs being applied axially).

(6) Brake-self-energizing band type. An essentially unidirectional brake in which the holding effect is obtained by the snubbing action of a flexible band wrapped about a cylindrical wheel or drum affixed to the rotating member to be held, the connections and linkages being so arranged that the motion of the brake wheel or drum

will act to increase the tension or holding force of the band.

(7) Brake–shoe type. A brake in which the holding effect is obtained by applying the direct pressure of two or more segmental friction elements held to a stationary member against a cylindrical wheel or drum affixed to the rotating member to be held.

(8) Building face rollers. A specialized form of guide roller designed to contact a portion of the outer face or wall structure of the building, and to assist in stabilizing the operators' platform during vertical travel.

(9) Building maintenance. Operations such as window cleaning, caulking, metal polishing, reglazing, and general maintenance on building surfaces.

(10) Cable. A conductor, or group of conductors, enclosed in a weatherproof sheath, that may be used to supply electrical power and/or control current for equipment or to provide voice communication circuits.

(11) Carriage. A wheeled vehicle used for the horizontal movement and support of other equipment.

(12) Certification. A written, signed, and dated statement confirming the performance of a requirement of this section.

(13) Combination cable. A cable having both steel structural members capable of supporting the platform, and copper or other electrical conductors insulated from each other and the structural members by nonconducive barriers.

(14) Competent person. A person who, because of training and experience, is capable of identifying hazardous or dangerous conditions in powered platform installations and of training employees to identify such conditions.

(15) Continuous pressure. Operation by means of buttons or switches, any one of which may be used to control the movement of the working platform or roof car, only as long as the button or switch is manually maintained in the actuating position.

(16) Control. A system governing starting, stopping, direction, acceleration, speed, and retardation of moving members.

(17) Controller. A device or group of devices, usually contained in a single enclosure, which serves to control in some predetermined manner the apparatus to which it is connected.

(18) Davit. A device, used singly or in pairs, for suspending a powered platform from work, storage and rigging locations on the building being serviced. Unlike outriggers, a davit reacts its operating load into a single roof socket or carriage attachment.

(19) Electrical ground. A conducting connection between an electrical circuit or equipment and the earth, or some conducting body which serves in place of the earth.

(20) Equivalent. Alternative designs, materials or methods which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

(21) Ground rigging. A method of suspending a working platform starting from a safe surface to a point of suspension above the safe surface.

(22) Ground rigged davit. A davit which cannot be used to raise a suspended working platform above the building face being serviced.

(23) Guide button. A building face anchor designed to engage a guide track mounted on a platform.

(24) Guide roller. A rotating, bearing–mounted, generally cylindrical member, operating separately or as part of a guide shoe assembly, attached to the platform, and providing rolling contact with building guideways, or other building contact members.

(25) Guide shoe. An assembly of rollers, slide members, or the equivalent, attached as a unit to the operators' platform, and designed to engage with the building members provided for the vertical guidance of the operators' platform.

(26) Hoisting machine. A device intended to raise and lower a suspended or supported unit.

(27) Hoist rated load. The hoist manufacturer's maximum allowable operating load.

(28) Installation. All the equipment and all affected parts of a building which are associated with the performance of building maintenance using powered platforms.

(29) Interlock. A device actuated by the operation of some other device with which it is directly associated, to govern succeeding operations of the same or allied devices.

(30) Intermittent stabilization. A method of platform stabilization in which the angulated suspension wire rope(s) are secured to regularly spaced building anchors.

(31) Lanyard. A flexible line of rope, wire rope or strap which is used to secure the body harness to a deceleration device, lifeline or anchorage.

(32) Lifeline. A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

(33) Live load. The total static weight of workers, tools, parts, and supplies that the equipment is designed to support.

(34) Obstruction detector. A control that will stop the suspended or supported unit in the direction of travel if an obstruction is encountered, and will allow the unit to move only in a direction away from the obstruction.

(35) Operating control. A mechanism regulating or guiding the operation of equipment that ensures a specific operating mode.

(36) Operating device. A pushbutton, lever, or other manual device used to actuate a control.

(37) Outrigger. A device, used singly or in pairs, for suspending a working platform from work, storage, and rigging locations on the building being serviced. Unlike davits, an outrigger reacts its operating moment load as at least two opposing vertical components acting into two or more distinct roof points and/or attachments.

(38) Platform rated load. The combined weight of workers, tools, equipment and other material which is permitted to be carried by the working platform at the installation, as stated on the load rating plate.

(39) Poured socket. The method of providing wire rope terminations in which the ends of the rope are held in a tapered socket by means of poured spelter or resins.

(40) Powered platform. Equipment to provide access to the exterior of a building for maintenance, consisting of a suspended power-operated working platform, a roof car, or other suspension means, and the requisite operating and control devices.

(41) Primary brake. A brake designed to be applied automatically whenever power to the prime mover is interrupted or discontinued.

(42) Prime mover. The source of mechanical power for a machine.

(43) Rated load. The combined weight of employees, tools, equivalent, and other material which the working platform is designed and installed to lift.

(44) Rated strength. The strength of wire rope, as designated by its manufacturer or vendor, based on standard testing procedures or acceptable engineering design practices.

(45) Rated working load. The combined static weight of men, materials, and suspended or supported equipment.

(46) Registered professional engineer. A person who has been duly and currently registered and licensed by an authority within the United States or its territories to practice the profession of engineering.

(47) Relay, direction. An electrically energized contactor responsive to an initiating control circuit, which in turn causes a moving member to travel in a particular direction.

(48) Relay, potential for vertical travel. An electrically energized contactor responsive to initiating control circuit, which in turn controls the operation of a moving member in both directions. This relay usually operates in conjunction with direction relays, as covered under the definition "relay direction."

(49) Roof car. A structure for the suspension of a working platform, providing for its horizontal movement to working positions.

(50) Roof-powered platform. A powered platform having the raising and lowering mechanism located on a roof car.

(51) Roof rigged davit. A davit used to raise the suspended working platform above the building face being serviced. This type of davit can also be used to raise a suspended working platform which has been ground-rigged.

(52) Rope. The equipment used to suspend a component of an equipment installation, i.e., wire rope.

(53) Safe surface. A horizontal surface intended to be occupied by personnel, which is so protected by a fall protection system that it can be reasonably assured that said occupants will be protected against falls.

(54) Secondary brake. A brake designed to arrest the descent of the suspended or supported equipment in the event of an overspeed condition.

(55) Self-powered platform. A powered platform having the raising and lowering mechanism located on the working platform.

(56) Speed reducer. A positive type speed reducing machine.

(57) Stability factor. The ratio of the stabilizing moment to the overturning moment.

(58) Stabilizer tie. A flexible line connecting the building anchor and the suspension wire rope supporting the platform.

(59) Supported equipment. Building maintenance equipment that is held or moved to its working position by means of attachment directly to the building or extensions of the building being maintained.

(60) Suspended equipment. Building maintenance equipment that is suspended and raised or lowered to its working position by means of ropes or combination cables attached to some anchorage above the equipment.

(61) Suspended scaffold (swinging scaffold). A scaffold supported on wire or other ropes, used for work on, or for providing access to, vertical sides of structures on a temporary basis. Such scaffold is not designed for use on a specific structure or group of structures.

(62) Tail line. The nonsupporting end of the wire rope used to suspend the platform.

(63) Tie-in guides. The portion of a building that provides continuous positive engagement between the building and a suspended or supported unit during its vertical travel on the face of the building.

(64) Traction hoist. A type of hoisting machine that does not accumulate the suspension wire rope on the hoisting drum or sheave, and is designed to raise and lower a suspended load by the application of friction forces between the suspension wire rope and the drum or sheave.

(65) Transportable outriggers. Outriggers designed to be moved from one work location to another.

(66) Traveling cable. A cable made up of electrical or communication conductors or both, and providing electrical connection between the working platform and the roof car or other fixed point.

(67) Trolley carriage. A carriage suspended from an overhead track structure.

(68) Verified. Accepted by design, evaluation, or inspection by a registered professional engineer.

(69) Weatherproof. Equipment so constructed or protected that exposure to the weather will not interfere with its proper operation.

(70) Winding drum hoist. A type of hoisting machine that accumulates the suspension wire rope on the hoisting drum.

(71) Working platform. The suspended structure arranged for vertical travel which provides access to the exterior of the building or structure.

(72) Wrap. One complete turn of the suspension wire rope around the surface of a hoist drum.

(73) Yield point. The stress at which the material exhibits a permanent set of 0.2 percent.

(74) Zinced fastenings. The method of providing wire rope attachments in which the splayed or fanned wire

ends are held in a tapered socket by means of poured molten zinc.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87001, filed 4/10/90, effective 5/25/90; Order 73-5, § 296-24-87001, filed 5/9/73 and Order 73-4, § 296-24-87001, filed 5/7/73.]

WAC 296-24-87009 Inspections and tests. (1) Installations and alterations. All completed building maintenance equipment installations shall be inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required. A similar inspection and test shall be made following any major alteration to an existing installation. No hoist in an installation shall be subjected to a load in excess of 125 percent of its rated load.

(2) Periodic inspections and tests.

(a) Related building supporting structures shall undergo periodic inspection by a competent person at intervals not exceeding 12 months.

(b) All parts of the equipment including control systems shall be inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition. Parts subject to wear, such as wire ropes, bearings, gears, and governors shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation.

(c) The building owner shall keep a certification record of each inspection and test required under (a) and (b) of this subsection. The certification record shall include the date of the inspection, the signature of the person who performed the inspection, and the number, or other identifier, of the building support structure and equipment which was inspected. This certification record shall be kept readily available for review by the director or an authorized representative and by the employer.

(d) Working platforms and their components shall be inspected by the employer for visible defects before every use and after each occurrence which could affect the platform's structural integrity.

(3) Maintenance, inspections and tests.

(a) A maintenance inspection and, where necessary, a test shall be made of each platform installation every 30 days, or where the work cycle is less than 30 days such inspection and/or test shall be made prior to each work cycle. This inspection and test shall follow procedures recommended by the manufacturer, and shall be made by a competent person.

(b) The building owner shall keep a certification record of each inspection and test performed under (a) of this subsection. The certification record shall include the date of the inspection and test, the signature of the person who performed the inspection and/or test, and an identifier for the platform installation which was inspected. The certification record shall be kept readily available for review by the director or an authorized representative and by the employer.

(4) Special inspection of governors and secondary brakes.

(a) Governors and secondary brakes shall be inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months.

(b) The results of the inspection and test shall confirm that the initiating device for the secondary braking system operates at the proper overspeed.

(c) The results of the inspection and test shall confirm that the secondary brake is functioning properly.

(d) If any hoisting machine or initiating device for the secondary brake system is removed from the equipment for testing, all reinstalled and directly related components shall be reinspected prior to returning the equipment installation to service.

(e) Inspection of governors and secondary brakes shall be performed by a competent person.

(f) The secondary brake governor and actuation device shall be tested before each day's use. Where testing is not feasible, a visual inspection of the brake shall be made instead to ensure that it is free to operate.

(5) Adverse weather. The operation of powered platforms during severe adverse weather conditions is prohibited.

(6) Suspension wire rope maintenance, inspection and replacement.

(a) Suspension wire rope shall be maintained and used in accordance with procedures recommended by the wire rope manufacturer.

(b) Suspension wire rope shall be inspected by a competent person for visible defects and gross damage to the rope before every use and after each occurrence which might affect the wire rope's integrity.

(c) A thorough inspection of suspension wire ropes in service shall be made once a month. Suspension wire ropes that have been inactive for 30 days or longer shall have a thorough inspection before they are placed into service. These thorough inspections of suspension wire ropes shall be performed by a competent person.

(d) The need for replacement of a suspension wire rope shall be determined by inspection and shall be based on the condition of the wire rope. Any of the following conditions or combination of conditions will be cause for removal of the wire rope:

(i) Broken wires exceeding three wires in one strand or six wires in one rope lay;

(ii) Distortion of rope structure such as would result from crushing or kinking;

(iii) Evidence of heat damage;

(iv) Evidence of rope deterioration from corrosion;

(v) A broken wire within 18 inches (460.8 mm) of the end attachments;

(vi) Noticeable rusting and pitting;

(vii) Evidence of core failure (a lengthening of rope lay, protrusion of the rope core and a reduction in rope diameter suggests core failure); or

(viii) More than one valley break (broken wire);

(ix) Outer wire wear exceeds one-third of the original outer wire diameter;

(x) Any other condition which the competent person determines has significantly affected the integrity of the rope.

(e) The building owner shall keep a certification record of each monthly inspection of a suspension wire rope as required in subdivision (c) of this subsection. The record shall include the date of the inspection, the signature of the person who performed the inspection, and a number, or other identifier, of the wire rope which was inspected. This record of inspection shall be made available for review by the director or an authorized representative and by the employer.

(7) Hoist inspection. Before lowering personnel below the top elevation of the building, the hoist shall be tested each day in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87009, filed 4/10/90, effective 5/25/90; Order 73-5, § 296-24-87009, filed 5/9/73 and Order 73-4, § 296-24-87009, filed 5/7/73.]

WAC 296-24-87011 Powered platform installations--Affected parts of buildings. (1) General requirements. The following requirements apply to affected parts of buildings which utilize working platforms for building maintenance.

(a) Structural supports, tie-downs, tie-in guides, anchoring devices and any affected parts of the building included in the installation shall be designed by or under the direction of a registered professional engineer experienced in such design;

(b) Exterior installations shall be capable of withstanding prevailing climatic conditions;

(c) The building installation shall provide safe access to, and egress from, the equipment and sufficient space to conduct necessary maintenance of the equipment;

(d) The affected parts of the building shall have the capability of sustaining all the loads imposed by the equipment; and

(e) The affected parts of the building shall be designed so as to allow the equipment to be used without exposing employees to a hazardous condition.

(2) Tie-in guides.

(a) The exterior of each building shall be provided with tie-in guides unless the conditions in (b) or (c) of this subsection are met.

Note: See Figure 1 in Appendix B of this section for a description of a typical continuous stabilization system utilizing tie-in guides.

(b) If angulated roping is employed, tie-in guides required in (a) of this subsection may be eliminated for not more than 75 feet (22.9 m) of the uppermost elevation of the building, if infeasible due to exterior building design, provided an angulation force of at least 10 pounds (44.4 n) is maintained under all conditions of loading.

(c) Tie-in guides required in (a) of this subsection may be eliminated if one of the guide systems in items (i), (ii), or (iii) of this subdivision is provided, or an equivalent.

(i) Intermittent stabilization system. The system shall keep the equipment in continuous contact with the building facade, and shall prevent sudden horizontal movement of the platform. The system may be used together with continuous positive building guide systems using tie-in guides on the same building, provided the requirements for each system are met.

(A) The maximum vertical interval between building anchors shall be 3 floors or 50 feet (15.3 m), whichever is less.

(B) Building anchors shall be located vertically so that attachment of the stabilizer ties will not cause the platform suspension ropes to angulate the platform horizontally across the face of the building. The anchors shall be positioned horizontally on the building face so as to be symmetrical about the platform suspension ropes.

(C) Building anchors shall be easily visible to employees and shall allow a stabilizer tie attachment for each of the platform suspension ropes at each vertical interval. If more than two suspension ropes are used on a platform, only the two building-side suspension ropes at the platform ends shall require a stabilizer attachment.

(D) Building anchors which extend beyond the face of the building shall be free of sharp edges or points. Where cables, suspension wire ropes and lifelines may be in contact with the building face, external building anchors shall not interfere with their handling or operation.

(E) The intermittent stabilization system building anchors and components shall be capable of sustaining without failure at least 4 times the maximum anticipated load applied or transmitted to the components and anchors. The minimum design wind load for each anchor shall be 300 (1334 n) pounds, if 2 anchors share the wind load.

(F) The building anchors and stabilizer ties shall be capable of sustaining anticipated horizontal and vertical loads from winds specified for roof storage design which may act on the platform and wire ropes if the platform is stranded on a building face. If the building anchors have different spacing than the suspension wire rope or if the building requires different suspension spacings on one platform, one building anchor and stabilizer tie shall be capable of sustaining the wind loads.

Note: See Figure 2 in Appendix B of this section for a description of a typical intermittent stabilization system.

(ii) Button guide stabilization system.

(A) Guide buttons shall be coordinated with platform mounted equipment of WAC 296-24-87013 (5)(f).

(B) Guide buttons shall be located horizontally on the building face so as to allow engagement of each of the guide tracks mounted on the platform.

(C) Guide buttons shall be located in vertical rows on the building face for proper engagement of the guide tracks mounted on the platform.

(D) Two guide buttons shall engage each guide track at all times except for the initial engagement.

(E) Guide buttons which extend beyond the face of the building shall be free of sharp edges or points. Where cables, ropes and lifelines may be in contact with

the building face, guide buttons shall not interfere with their handling or operation.

(F) Guide buttons, connections and seals shall be capable of sustaining without damage at least the weight of the platform, or provision shall be made in the guide tracks or guide track connectors to prevent the platform and its attachments from transmitting the weight of the platform to the guide buttons, connections and seals. In either case, the minimum design load shall be 300 pounds (1334 n) per building anchor.

Note: See WAC 296-24-87013 (5)(f) for relevant equipment provisions.

Note: See Figure 3 in Appendix B of this section for a description of a typical button guide stabilization system.

(iii) System utilizing angulated roping and building face rollers. The system shall keep the equipment in continuous contact with the building facade, and shall prevent sudden horizontal movement of the platform. This system is acceptable only where the suspended portion of the equipment in use does not exceed 130 feet (39.6 m) above a safe surface or ground level, and where the platform maintains no less than 10 pounds (44.4 n) angulation force on the building facade.

(d) Tie-in guides for building interiors (atriums) may be eliminated when a registered professional engineer determines that an alternative stabilization system, including systems in (c)(i), (ii), and (iii) of this subsection, or a platform tie-off at each work station will provide equivalent safety.

(3) Roof guarding.

(a) Employees working on roofs while performing building maintenance shall be protected by a perimeter guarding system which meets the requirements of WAC 296-24-75007(1).

(b) The perimeter guard shall not be more than 6 inches (152 mm) inboard of the inside face of a barrier, i.e. the parapet wall, or roof edge curb of the building being serviced; however, the perimeter guard location shall not exceed an 18 inch (457 mm) setback from the exterior building face.

(4) Equipment stops. Operational areas for trackless type equipment shall be provided with structural stops, such as curbs, to prevent equipment from traveling outside its intended travel areas and to prevent a crushing or shearing hazard.

(5) Maintenance access. Means shall be provided to traverse all carriages and their suspended equipment to a safe area for maintenance and storage.

(6) Elevated track.

(a) An elevated track system which is located 4 feet (1.2 m) or more above a safe surface, and traversed by carriage supported equipment, shall be provided with a walkway and guardrail system; or

(b) The working platform shall be capable of being lowered, as part of its normal operation, to the lower safe surface for access and egress of the personnel and shall be provided with a safe means of access and egress to the lower safe surface.

(7) Tie-down anchors. Imbedded tie-down anchors, fasteners, and affected structures shall be resistant to corrosion.

(8) Cable stabilization.

(a) Hanging lifelines and all cables not in tension shall be stabilized at each 200 foot (61 m) interval of vertical travel of the working platform beyond an initial 200 foot (61 m) distance.

(b) Hanging cables, other than suspended wire ropes, which are in constant tension shall be stabilized when the vertical travel exceeds an initial 600 foot (183 m) distance, and at further intervals of 600 feet (183 m) or less.

(9) Emergency planning. A written emergency action plan shall be developed and implemented for each kind of working platform operation. This plan shall explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered. The plan shall also include that employees be informed about the building emergency escape routes, procedures and alarm systems before operating a platform. Upon initial assignment and whenever the plan is changed the employer shall review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency.

(10) Building maintenance. Repairs or major maintenance of those building portions that provide primary support for the suspended equipment shall not affect the capability of the building to meet the requirements of this standard.

(11) Electrical requirements. The following electrical requirements apply to buildings which utilize working platforms for building maintenance.

(a) General building electrical installations shall comply with WAC 296-24-956 through 296-24-95615, unless otherwise specified in this section;

(b) Building electrical wiring shall be of such capacity that when full load is applied to the equipment power circuit not more than a five percent drop from building service vault voltage shall occur at any power circuit outlet used by equipment regulated by this section;

(c) The equipment power circuit shall be an independent electrical circuit that shall remain separate from all other equipment within or on the building, other than power circuits used for hand tools that will be used in conjunction with the equipment. If the building is provided with an emergency power system, the equipment power circuit may also be connected to this system;

(d) The power circuit shall be provided with a disconnect switch that can be locked in the "OFF" and "ON" positions. The switch shall be conveniently located with respect to the primary operating area of the equipment to allow the operators of the equipment access to the switch;

(e) The disconnect switch for the power circuit shall be locked in the "ON" position when the equipment is in use; and

(f) An effective two-way voice communication system shall be provided between the equipment operators and persons stationed within the building being serviced. The

communications facility shall be operable and shall be manned at all times by persons stationed within the building whenever the platform is being used.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87011, filed 4/10/90, effective 5/25/90.]

WAC 296-24-87013 Powered platform installations--Equipment. (1) General requirements. The following requirements apply to equipment which are part of a powered platform installation, such as platforms, stabilizing components, carriages, outriggers, davits, hoisting machines, wire ropes and electrical components.

(a) Equipment installations shall be designed by or under the direction of a registered professional engineer experienced in such design;

(b) The design shall provide for a minimum live load of 250 pounds (113.6 kg) for each occupant of a suspended or supported platform;

(c) Equipment that is exposed to wind when not in service shall be designed to withstand forces generated by winds of at least 100 miles per hour (44.7 m/s) at 30 feet (9.2 m) above grade; and

(d) Equipment that is exposed to wind when in service shall be designed to withstand forces generated by winds of at least 50 miles per hour (22.4 m/s) for all elevations.

(2) Construction requirements. Bolted connections shall be self-locking or shall otherwise be secured to prevent loss of the connections by vibration.

(3) Suspension methods. Elevated building maintenance equipment shall be suspended by a carriage, outriggers, davits or an equivalent method.

(a) Carriages. Carriages used for suspension of elevated building maintenance equipment shall comply with the following:

(i) The horizontal movement of a carriage shall be controlled so as to ensure its safe movement and allow accurate positioning of the platform for vertical travel or storage;

(ii) Powered carriages shall not exceed a traversing speed of 50 feet per minute (0.3 m/s);

(iii) The initiation of a traversing movement for a manually propelled carriage on a smooth level surface shall not require a person to exert a horizontal force greater than 40 pounds (444.8 n);

(iv) Structural stops and curbs shall be provided to prevent the traversing of the carriage beyond its designed limits of travel;

(v) Traversing controls for a powered carriage shall be of a continuous pressure weatherproof type. Multiple controls when provided shall be arranged to permit operation from only one control station at a time. An emergency stop device shall be provided on each end of a powered carriage for interrupting power to the carriage drive motors;

(vi) The operating control(s) shall be so connected that in the case of suspended equipment, traversing of a carriage is not possible until the suspended portion of the equipment is located at its uppermost designed position for traversing; and is free of contact with the face of the building or building guides. In addition, all protective devices and interlocks are to be in the proper position to allow traversing of the carriage;

(vii) Stability for underfoot supported carriages shall be obtained by gravity, by an attachment to a structural support, or by a combination of gravity and a structural support. The use of flowing counterweights to achieve stability is prohibited.

(A) The stability factor against overturning shall not be less than 2 for horizontal traversing of the carriage, including the effects of impact and wind.

(B) The carriages and their anchorages shall be capable of resisting accidental over-tensioning of the wire ropes suspending the working platform, and this calculated value shall include the effect of one and one-half times the stall capacity of the hoist motor. All parts of the installation shall be capable of withstanding without damage to any part of the installation the forces resulting from the stall load of the hoist and one-half the wind load.

(C) Roof carriages which rely on having tie-down devices secured to the building to develop the required stability against overturning shall be provided with an interlock which will prevent vertical platform movement unless the tie-down is engaged;

(viii) An automatically applied braking or locking system, or equivalent, shall be provided that will prevent unintentional traversing of power-traversed or power assisted carriages;

(ix) A manual or automatic braking or locking system or equivalent, shall be provided that will prevent unintentional traversing of manually propelled carriages;

(x) A means to lock out the power supply for the carriage shall be provided;

(xi) Safe access to and egress from the carriage shall be provided from a safe surface. If the carriage traverses an elevated area, any operating area on the carriage shall be protected by a guardrail system in compliance with the provisions of subsection (5)(a)(vi) of this section. Any access gate shall be self-closing and self-latching, or provided with an interlock;

(xii) Each carriage work station position shall be identified by location markings and/or position indicators; and

(xiii) The motors shall stall if the load on the hoist motors is at any time in excess of three times that necessary for lifting the working platform with its rated load.

(b) Transportable outriggers.

(i) Transportable outriggers may be used as a method of suspension for ground rigged working platforms where the point of suspension does not exceed 300 feet (91.5 m) above a safe surface. Tie-in guide system(s) shall be provided which meet the requirements of WAC 296-24-87011(2).

(ii) Transportable outriggers shall be used only with self-powered, ground rigged working platforms.

(iii) Each transportable outrigger shall be secured with a tie-down to a verified anchorage on the building during the entire period of its use. The anchorage shall be designed to have a stability factor of not less than 4 against overturning or upsetting of the outrigger.

(iv) Access to and egress from the working platform shall be from and to a safe surface below the point of suspension.

(v) Each transportable outrigger shall be designed for lateral stability to prevent roll–over in the event an accidental lateral load is applied to the outrigger. The accidental lateral load to be considered in this design shall be not less than 70 percent of the rated load of the hoist.

(vi) Each transportable outrigger shall be designed to support an ultimate load of not less than 4 times the rated load of the hoist.

(vii) Each transportable outrigger shall be so located that the suspension wire ropes for two point suspended working platforms are hung parallel.

(viii) A transportable outrigger shall be tied–back to a verified anchorage on the building with a rope equivalent in strength to the suspension rope.

(ix) The tie–back rope shall be installed parallel to the centerline of the outrigger.

(c) Davits.

(i) Every davit installation, fixed or transportable, rotatable or nonrotatable shall be designed and installed to insure that it has a stability factor against overturning of not less than 4.

(ii) The following requirements apply to roof rigged davit systems:

(A) Access to and egress from the working platform shall be from a safe surface. Access or egress shall not require persons to climb over a building's parapet or guard railing; and

(B) The working platform shall be provided with wheels, casters or a carriage for traversing horizontally.

(iii) The following requirements apply to ground rigged davit systems:

(A) The point of suspension shall not exceed 300 feet (91.5 m) above a safe surface. Guide system(s) shall be provided which meet the requirements of WAC 296–24–87011(2);

(B) Access and egress to and from the working platform shall only be from a safe surface below the point of suspension.

(iv) A rotating davit shall not require a horizontal force in excess of 40 pounds (177.9 n) per person to initiate a rotating movement.

(v) The following requirements shall apply to transportable davits:

(A) A davit or part of a davit weighing more than 80 pounds (36 kg) shall be provided with a means for its transport, which shall keep the center of gravity of the davit at or below 36 inches (914 mm) above the safe surface during transport;

(B) A davit shall be provided with a pivoting socket or with a base that will allow the insertion or removal of a davit at a position of not more than 35 degrees above the horizontal, with the complete davit inboard of the building face being serviced; and

(C) Means shall be provided to lock the davit to its socket or base before it is used to suspend the platform.

(4) Hoisting machines.

(a) Raising and lowering of suspended or supported equipment shall be performed only by a hoisting machine.

(b) Each hoisting machine shall be capable of arresting any overspeed descent of the load.

(c) Each hoisting machine shall be powered only by air, electric or hydraulic sources.

(d) Flammable liquids shall not be carried on the working platform.

(e) Each hoisting machine shall be capable of raising or lowering 125 percent of the rated load of the hoist.

(f) Moving parts of a hoisting machine shall be enclosed or guarded in compliance with Part C of chapter 296–24 WAC.

(g) Winding drums, traction drums and sheaves and directional sheaves used in conjunction with hoisting machines shall be compatible with, and sized for, the wire rope used.

(h) Each winding drum shall be provided with a positive means of attaching the wire rope to the drum. The attachment shall be capable of developing at least 4 times the rated load of the hoist.

(i) Each hoisting machine shall be provided with a primary brake and at least one independent secondary brake, each capable of stopping and holding not less than 125 percent of the lifting capacity of the hoist.

(i) The primary brake shall be directly connected to the drive train of the hoisting machine, and shall not be connected through belts, chains, clutches, or set screw type devices. The brake shall automatically set when power to the prime mover is interrupted.

(ii) The secondary brake shall be an automatic emergency type of brake that, if actuated during each stopping cycle, shall not engage before the hoist is stopped by the primary brake.

(iii) When a secondary brake is actuated, it shall stop and hold the platform within a vertical distance of 24 inches (609.6 mm).

(j) Any component of a hoisting machine which requires lubrication for its protection and proper functioning shall be provided with a means for that lubrication to be applied.

(5) Suspended equipment.

(a) General requirements.

(i) Each suspended unit component, except suspension ropes and guardrail systems, shall be capable of supporting, without failure, at least 4 times the maximum intended live load applied or transmitted to that component.

(ii) Each suspended unit component shall be constructed of materials that will withstand anticipated weather conditions.

(iii) Each suspended unit shall be provided with a load rating plate, conspicuously located, stating the unit weight and rated load of the suspended unit.

(iv) When the suspension points on a suspended unit are not at the unit ends, the unit shall be capable of remaining continuously stable under all conditions of use and position of the live load, and shall maintain at least a 1.5 to 1 stability factor against unit upset.

(v) Guide rollers, guide shoes or building face rollers shall be provided, and shall compensate for variations in building dimensions and for minor horizontal out–of–level variations of each suspended unit.

(vi) Each working platform of a suspended unit shall be secured to the building facade by one or more of the following methods, or by an equivalent method:

(A) Continuous engagement to building anchors as provided in WAC 296–24–87011 (2)(a);

(B) Intermittent engagement to building anchors as provided in WAC 296–24–87011 (2)(c)(i);

(C) Button guide engagement as provided in WAC 296–24–87011 (2)(c)(ii);

(D) Angulated roping and building face rollers as provided in WAC 296–24–87011 (2)(c)(iii).

(vii) Each working platform of a suspended unit shall be provided with a guardrail system on all sides which shall meet the following requirements:

(A) The system shall consist of a top guardrail, midrail, and a toeboard;

(B) The top guardrail shall not be less than 36 inches (914 mm) high and shall be able to withstand at least a 200–pound (444 n) force in any downward or outward direction;

(C) The midrail shall be able to withstand at least a 75–pound (333 n) force in any downward or outward direction; and

(D) The areas between the guardrail and toeboard on the ends and outboard side, and the area between the midrail and toeboard on the inboard side, shall be closed with a material that is capable of withstanding a load of 100 pounds (45.4 KG.) applied horizontally over any area of one square foot (.09 m^2). The material shall have all openings small enough to reject passage of life lines and potential falling objects which may be hazardous to persons below.

(E) Toeboards shall be capable of withstanding, without failure, a force of at least 50 pounds (222 n) applied in any downward or horizontal direction at any point along the toeboard.

(F) Toeboards shall be 4 inches (9 cm) minimum in length from their top edge to the level of the platform floor.

(G) Toeboards shall be securely fastened in place at the outermost edge of the platform and have no more than one–half inch (1.3 cm) clearance above the platform floor.

(H) Toeboards shall be solid or with an opening not over one inch (2.5 cm) in the greatest dimension.

(b) Two and four–point suspended working platforms.

(i) The working platform shall be not less than 24 inches (610 mm) wide and shall be provided with a minimum of a 12 inch (305 mm) wide passage at or past any obstruction on the platform.

(ii) The flooring shall be of a slip–resistant type and shall contain no opening that would allow the passage of life lines, cables and other potential falling objects. If a larger opening is provided, it shall be protected by placing a material under the opening which shall prevent the passage of life lines, cables and potential falling objects.

(iii) The working platform shall be provided with a means of suspension that will restrict the platform's inboard to outboard roll about its longitudinal axis to a maximum of 15 degrees from a horizontal plane when moving the live load from the inboard to the outboard side of the platform.

(iv) Any cable suspended from above the platform shall be provided with a means for storage to prevent accumulation of the cable on the floor of the platform.

(v) All operating controls for the vertical travel of the platform shall be of the continuous–pressure type, and shall be located on the platform.

(vi) Each operating station of every working platform shall be provided with a means of interrupting the power supply to all hoist motors to stop any further powered ascent or descent of the platform.

(vii) The maximum rated speed of the platform shall not exceed 50 feet per minute (0.3 ms) with single speed hoists, nor 75 feet per minute (0.4 ms) with multispeed hoists.

(viii) Provisions shall be made for securing all tools, water tanks, and other accessories to prevent their movement or accumulation on the floor of the platform.

(ix) Portable fire extinguishers conforming to the provisions of WAC 296–24–585 and 296–24–592 shall be provided and securely attached on all working platforms.

(x) Access to and egress from a working platform, except for those that land directly on a safe surface, shall be provided by stairs, ladders, platforms and runways conforming to the provisions of Part J–1 of chapter 296–24 WAC. Access gates shall be self–closing and self–latching.

(xi) Means of access to or egress from a working platform which is 48 inches (1.2 m) or more above a safe surface shall be provided with a guardrail system or ladder handrails that conform to the provisions of Part J–1 of chapter 296–24 WAC.

(xii) The platform shall be provided with a secondary wire rope suspension system if the platform contains overhead structures which restrict the emergency egress of employees. A horizontal lifeline or a direct connection anchorage shall be provided, as part of a fall arrest system which meets the requirements of Appendix C, for each employee on such a platform.

(xiii) A vertical lifeline shall be provided as part of a fall arrest system which meets the requirements of Appendix C, for each employee on a working platform suspended by 2 or more wire ropes, if the failure of one wire rope or suspension attachment will cause the platform to upset. If a secondary wire rope suspension is used, vertical lifelines are not required for the fall arrest system, provided that each employee is attached to a horizontal lifeline anchored to the platform.

(xiv) An emergency electric operating device shall be provided on roof powered platforms near the hoisting machine for use in the event of failure of the normal operating device located on the working platform, or failure of the cable connected to the platform. The emergency electric operating device shall be mounted in a secured compartment, and the compartment shall be labeled with instructions for use. A means for opening

the compartment shall be mounted in a break-glass receptable located near the emergency electric operating device or in an equipment secure and accessible location.

(c) Single point suspended working platforms.

(i) The requirements of (b)(i) through (xi) of this subsection shall also apply to a single point working platform.

(ii) Each single point suspended working platform shall be provided with a secondary wire rope suspension system, which will prevent the working platform from falling should there be a failure of the primary means of support, or if the platform contains overhead structures which restrict the egress of the employees. A horizontal life line or a direct connection anchorage shall be provided, as part of a fall arrest system which meets the requirements of Appendix C, for each employee on the platform.

(d) Ground-rigged working platforms.

(i) Ground-rigged working platforms shall comply with all the requirements of (b)(i) through (xiii) of this subsection.

(ii) After each day's use, the power supply within the building shall be disconnected from a ground-rigged working platform, and the platform shall be either disengaged from its suspension points or secured and stored at grade.

(e) Intermittently stabilized platforms.

(i) The platform shall comply with (b)(i) through (xiii) of this subsection.

(ii) Each stabilizer tie shall be equipped with a "quick connect-quick disconnect" device which cannot be accidently disengaged, for attachment to the building anchor, and shall be resistant to adverse environmental conditions.

(iii) The platform shall be provided with a stopping device that will interrupt the hoist power supply in the event the platform contacts a stabilizer tie during its ascent.

(iv) Building face rollers shall not be placed at the anchor setting if exterior anchors are used on the building face.

(v) Stabilizer ties used on intermittently stabilized platforms shall allow for the specific attachment length needed to effect the predetermined angulation of the suspended wire rope. The specific attachment length shall be maintained at all building anchor locations.

(vi) The platform shall be in continuous contact with the face of the building during ascent and descent.

(vii) The attachment and removal of stabilizer ties shall not require the horizontal movement of the platform.

(viii) The platform-mounted equipment and its suspension wire ropes shall not be physically damaged by the loads from the stabilizer tie or its building anchor. The platform, platform-mounted equipment and wire ropes shall be able to withstand a load that is at least twice the ultimate strength of the stabilizer tie.

Note: See Figure 2 in Appendix B of this section for a description of a typical intermittent stabilization system.

(f) Button-guide stabilized platforms.

(i) The platform shall comply with (b)(i) through (xiii) of this subsection.

(ii) Each guide track on the platform shall engage a minimum of two guide buttons during any vertical travel of the platform following the initial button engagement.

(iii) Each guide track on a platform that is part of a roof rigged system shall be provided with a storage position on the platform.

(iv) Each guide track on the platform shall be sufficiently maneuverable by platform occupants to permit easy engagement of the guide buttons, and easy movement into and out of its storage position on the platform.

(v) Two guide tracks shall be mounted on the platform and shall provide continuous contact with the building face.

(vi) The load carrying components of the button guide stabilization system which transmit the load into the platform shall be capable of supporting the weight of the platform, or provision shall be made in the guide track connectors or platform attachments to prevent the weight of the platform from being transmitted to the platform attachments.

Note: See Figure 3 in Appendix B of this section for a description of a typical button guide stabilization system.

(6) Supported equipment.

(a) Supported equipment shall maintain a vertical position in respect to the face of the building by means other than friction.

(b) Cog wheels or equivalent means shall be incorporated to provide climbing traction between the supported equipment and the building guides. Additional guide wheels or shoes shall be incorporated as may be necessary to ensure that the drive wheels are continuously held in positive engagement with the building guides.

(c) Launch guide mullions indexed to the building guides and retained in alignment with the building guides shall be used to align drive wheels entering the building guides.

(d) Manned platforms used on supported equipment shall comply with the requirements of (b)(i), (ii), and (iv) through (xi) of this subsection, covering suspended equipment.

(7) Suspension wire ropes and rope connections.

(a) Each specific installation shall use suspension wire ropes or combination cable and connections meeting the specification recommended by the manufacturer of the hoisting machine used. Connections shall be capable of developing at least 80 percent of the rated breaking strength of the wire rope.

(b) Each suspension rope shall have a "Design Factor" of at least 10. The "Design Factor" is the ratio of the rated strength of the suspension wire rope to the rated working load, and shall be calculated using the following formula:

$$F = \frac{S(N)}{W}$$

Where:
F = Design factor
S = Manufacturer's rated strength of one suspension rope
N = Number of suspension ropes under load
W = Rated working load on all ropes at any point of travel

(c) Suspension wire rope grade shall be at least improved plow steel or equivalent.

(d) Suspension wire ropes shall be sized to conform with the required design factor, but shall not be less than 5/16 inch (7.94 mm) in diameter.

(e) No more than one reverse bend in 6 wire rope lays shall be permitted.

(f) A corrosion–resistant tag shall be securely attached to one of the wire rope fastenings when a suspension wire rope is to be used at a specific location and will remain in that location. This tag shall bear the following wire rope data:

(i) The diameter (inches and/or mm);

(ii) Construction classification;

(iii) Whether nonpreformed or preformed;

(iv) The grade of material;

(v) The manufacturer's rated strength;

(vi) The manufacturer's name;

(vii) The month and year the ropes were installed; and

(viii) The name of the person or company which installed the ropes.

(g) A new tag shall be installed at each rope renewal.

(h) The original tag shall be stamped with the date of the resocketing, or the original tag shall be retained and a supplemental tag shall be provided when ropes are resocketed. The supplemental tag shall show the date of resocketing and the name of the person or company that resocketed the rope.

(i) Winding drum type hoists shall contain at least 3 wraps of the suspension wire rope on the drum when the suspended unit has reached the lowest possible point of its vertical travel.

(j) Traction drum and sheave type hoists shall be provided with a wire rope of sufficient length to reach the lowest possible point of vertical travel of the suspended unit, and an additional length of the wire rope of at least 4 feet (1.2 m).

(k) The lengthening or repairing of suspension wire ropes is prohibited.

(l) Babbitted fastenings for suspension wire rope are prohibited.

(8) Control circuits, power circuits and their components.

(a) Electrical wiring and equipment shall comply with Part L of chapter 296–24 WAC, except as otherwise required by this section.

(b) Electrical runway conductor systems shall be of a type designed for use in exterior locations, and shall be located so that they do not come into contact with accumulated snow or water.

(c) Cables shall be protected against damage resulting from overtensioning or from other causes.

(d) Devices shall be included in the control system for the equipment which will provide protection against electrical overloads, three phase reversal and phase failure. The control system shall have a separate method, independent of the direction control circuit, for breaking the power circuit in case of an emergency or malfunction.

(e) Suspended or supported equipment shall have a control system which will require the operator of the equipment to follow predetermined procedures.

(f) The following requirements shall apply to electrical protection devices:

(i) On installations where the carriage does not have a stability factor of at least 4 against overturning, electrical contract(s) shall be provided and so connected that the operating devices for the suspended or supported equipment shall be operative only when the carriage is located and mechanically retained at an established operating point.

(ii) Overload protection shall be provided in the hoisting or suspension system to protect against the equipment operating in the "up" direction with a load in excess of 125 percent of the rated load of the platform; and

(iii) An automatic detector shall be provided for each suspension point that will interrupt power to all hoisting motors for travel in the "down" direction, and apply the primary brakes if any suspension wire rope becomes slack. A continuous–pressure rigging–bypass switch designed for use during rigging is permitted. This switch shall only be used during rigging.

(g) Upper and lower directional switches designed to prevent the travel of suspended units beyond safe upward and downward levels shall be provided.

(h) Emergency stop switches shall be provided on remote controlled, roof–powered manned platforms adjacent to each control station on the platform.

(i) Cables which are in constant tension shall have overload devices which will prevent the tension in the cable from interfering with the load limiting device required in (f)(ii) of this subsection, or with the platform roll limiting device required in subsection (5)(b)(iii) of this section. The setting of these devices shall be coordinated with other overload settings at the time of design of the system, and shall be clearly indicated on or near the device. The device shall interrupt the equipment travel in the "down" direction.

[Statutory Authority: Chapter 49.17 RCW. 90–09–026 (Order 90–01), § 296–24–87013, filed 4/10/90, effective 5/25/90.]

WAC 296–24–87015 Maintenance. (1) General maintenance. All parts of the equipment affecting safe operation shall be maintained in proper working order so that they may perform the functions for which they were intended. The equipment shall be taken out of service when it is not in proper working order.

(2) Cleaning.

(a) Control or power contactors and relays shall be kept clean.

(b) All other parts shall be kept clean if their proper functioning would be affected by the presence of dirt or other contaminants.

(3) Periodic resocketing of wire rope fastenings.

(a) Hoisting ropes utilizing poured socket fastenings shall be resocketed at the nondrum ends at intervals not exceeding 24 months. In resocketing the ropes, a sufficient length shall be cut from the end of the rope to remove damaged or fatigued portions.

(b) Resocketed ropes shall conform to the requirements of WAC 296-24-87013(7).

(c) Limit switches affected by the resocketed ropes shall be reset, if necessary.

(4) Periodic reshackling of suspension wire ropes. The hoisting ropes shall be reshackled at the nondrum ends at intervals not exceeding 24 months. When reshackling the ropes, a sufficient length shall be cut from the end of the rope to remove damaged or fatigued portions.

(5) Roof systems. Roof track systems, tie-downs, or similar equipment shall be maintained in proper working order so that they perform the function for which they were intended.

(6) Building face guiding members. T-rails, indented mullions, or equivalent guides located in the face of a building shall be maintained in proper working order so that they perform the functions for which they were intended. Brackets for cable stabilizers shall similarly be maintained in proper working order.

(7) Inoperative safety devices. No person shall render a required safety device or electrical protective device inoperative, except as necessary for tests, inspections, and maintenance. Immediately upon completion of such tests, inspections, and maintenance, the device shall be restored to its normal operating condition.

(8) Damaged rope. Wire ropes shall be replaced whenever there are six or more broken wires in any one lay of the wire rope, or whenever the ropes are damaged or in a deteriorated condition.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87015, filed 4/10/90, effective 5/25/90.]

WAC 296-24-87017 Operations. (1) Training.

(a) Working platforms shall be operated only by persons who are proficient in the operation, safe use and inspection of the particular working platform to be operated.

(b) All employees who operate working platforms shall be trained in the following:

(i) Recognition of, and preventive measures for, the safety hazards associated with their individual work tasks.

(ii) General recognition and prevention of safety hazards associated with the use of working platforms, including the provisions in the section relating to the particular working platform to be operated.

(iii) Emergency action plan procedures required in WAC 296-24-87011(9).

(iv) Work procedures required in (d) of this subsection.

(v) Personal fall arrest system inspection, care, use and system performance.

(c) Training of employees in the operation and inspection of working platforms shall be done by a competent person.

(d) Written work procedures for the operation, safe use and inspection of working platforms shall be provided for employee training. Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures.

(e) The employer shall certify that employees have been trained in operating and inspecting a working platform 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 that training was completed. The certification record shall be prepared at the completion of the training required in (b) of this subsection, and shall be maintained in a file for the duration of the employee's employment. The certification record shall be kept readily available for review by the director or an authorized representative.

(2) Use.

(a) Working platforms shall not be loaded in excess of the rated load, as stated on the platform load rating plate.

(b) Employees shall be prohibited from working on snow, ice, or other slippery material covering platforms, except for the removal of such materials.

(c) Adequate precautions shall be taken to protect the platform, wire ropes and life lines from damage due to acids or other corrosive substances, in accordance with the recommendations of the corrosive substance producer, supplier, platform manufacturer or other equivalent information sources. Platform members which have been exposed to acids or other corrosive substances shall be washed down with a neutralizing solution, at a frequency recommended by the corrosive substance producer or supplier.

(d) Platform members, wire ropes and life lines shall be protected when using a heat producing process. Wire ropes and life lines which have been contacted by the heat producing process shall be considered to be permanently damaged and shall not be used.

(e) The platform shall not be operated in winds in excess of 25 miles per hour (40.2 km/hr) except to move it from an operating to a storage position. Wind speed shall be determined based on the best available information, which includes on-site anemometer readings and local weather forecasts which predict wind velocities for the area.

(f) On exterior installations, an anemometer shall be mounted on the platform to provide information of on-site wind velocities prior to and during the use of the platform. The anemometer may be a portable (hand held) unit which is temporarily mounted during platform use.

(g) Tools, materials and debris not related to the work in progress shall not be allowed to accumulate on platforms. Stabilizer ties shall be located so as to allow unencumbered passage along the full length of the platform and shall be of such length so as not to become entangled in rollers, hoists or other machinery.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87017, filed 4/10/90, effective 5/25/90.]

WAC 296-24-87019 Personal fall protection. Employees on working platforms shall be protected by a personal fall arrest system meeting the requirements of Appendix C, Part I, WAC 296-24-87035 of this standard, and as otherwise provided by this standard.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87019, filed 4/10/90, effective 5/25/90.]

WAC 296-24-87031 Appendix A--Guidelines (advisory). (1) Use of the appendix. Appendix A provides examples of equipment and methods to assist the employer in meeting the requirements of the indicated provision of the standard. Employers may use other equipment or procedures which conform to the requirements of the standard. This appendix neither adds to nor detracts from the mandatory requirements set forth in WAC 296-24-870 through 296-24-87037.

(2) Assurance. WAC 296-24-870(3) requires the building owner to inform the employer in writing that the powered platform installation complies with certain requirements of the standard, since the employer may not have the necessary information to make these determinations. The employer, however, remains responsible for meeting these requirements which have not been set off in WAC 296-24-870 (3)(a).

(3) Design requirements. The design requirements for each installation should be based on the limitations (stresses, deflections, etc.), established by nationally recognized standards as promulgated by the following organizations, or to equivalent standards:

AA—The Aluminum Association, 818 Connecticut Avenue N.W., Washington, D.C. 20006

Aluminum Construction Manual
Specifications for Aluminum Structures
Aluminum Standards and Data

AGMA—American Gear Manufacturers Association, 101 North Fort Meyer Dr., Suite 1000, Arlington, VA 22209

AISC—American Institute of Steel Construction, 400 North Michigan Avenue, Chicago, IL 60611

ANSI—American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

ASCE—American Society of Civil Engineers, 345 East 47th Street, New York, NY 10017

ASME—American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017

ASTM—American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

AWS—American Welding Society, Inc., Box 351040, 550 N.W. LeJeunne Road, Miami, FL 33126

JIC—Joint Industrial Council, 2139 Wisconsin Avenue N.W., Washington, D.C. 20007

NEMA—National Electric Manufacturers Association, 2101 L Street N.W., Washington, D.C. 20037

(4) Tie-in guides. Indented mullions, T-rails or other equivalent guides are acceptable as tie-in guides in a building face for a continuous stabilization system. Internal guides are embedded in other building members with only the opening exposed (see Figure 1 of Appendix B). External guides, however, are installed external to the other building members and so are fully exposed. The minimum opening for tie-in guides is three-quarters of an inch (19 mm), and the minimum inside dimensions are one-inch (25 mm) deep and two inches (50 mm) wide.

Employers should be aware of the hazards associated with tie-in guides in a continuous stabilization system which was not designed properly. For example, joints in these track systems may become extended or discontinuous due to installation or building settlement. If this alignment problem is not corrected, the system could jam when a guide roller or guide shoe strikes a joint and this would cause a hazardous situation for employees. In another instance, faulty design will result in guide rollers being mounted in a line so they will jam in the track at the slightest misalignment.

(5) Building anchors (intermittent stabilization system). In the selection of the vertical distance between building anchors, certain factors should be given consideration. These factors include building height and architectural design, platform length and weight, wire rope angulation, and the wind velocities in the building area. Another factor to consider is the material of the building face, since this material may be adversely affected by the building rollers.

External or indented type building anchors are acceptable. Receptacles in the building facade used for the indented type should be kept clear of extraneous materials which will hinder their use. During the inspection of the platform installation, evidence of a failure or abuse of the anchors should be brought to the attention of the employer.

(6) Stabilizer tie length. A stabilizer tie should be long enough to provide for the planned angulation of the suspension cables. However, the length of the tie should not be excessive and become a problem by possibly becoming entangled in the building face rollers or parts of the platform machinery.

The attachment length may vary due to material elongation and this should be considered when selecting the material to be used. Consideration should also be

given to the use of ties which are easily installed by employees, since this will encourage their use.

(7) Intermittent stabilization system. Intermittent stabilization systems may use different equipment, tie-in devices and methods to restrict the horizontal movement of a powered platform with respect to the face of the building. One acceptable method employs corrosion-resistant building anchors secured in the face of the building in vertical rows every third floor or 50 feet (15.3 m), whichever is less. The anchors are spaced horizontally to allow a stabilization attachment (stabilizer tie) for each of the two platform suspension wire ropes. The stabilizer tie consists of two parts. One part is a quick connect-quick disconnect device which utilizes a corrosion-resistant yoke and retainer spring that is designed to fit over the building anchors. The second part of the stabilizer tie is a lanyard which is used to maintain a fixed distance between the suspension wire rope and the face of the building.

In this method, as the suspended powered platform descends past the elevation of each anchor, the descent is halted and each of the platform occupants secures a stabilizer tie between a suspension wire rope and a building anchor. The procedure is repeated as each elevation of a building anchor is reached during the descent of the powered platform.

As the platform ascends, the procedure is reversed; that is, the stabilizer ties are removed as each elevation of a building anchor is reached. The removal of each stabilizer tie is assured since the platform is provided with stopping devices which will interrupt power to its hoist(s) in the event either stopping device contacts a stabilizer during the ascent of the platform.

Figure 2 of Appendix B illustrates another type of acceptable intermittent stabilization system which utilizes retaining pins as the quick connect-quick disconnect device in the stabilizer tie.

(8) Wire rope inspection. The inspection of the suspension wire rope is important since the rope gradually loses strength during its useful life. The purpose of the inspection is to determine whether the wire rope has sufficient integrity to support a platform with the required design factor.

If there is any doubt concerning the condition of a wire rope or its ability to perform the required work, the rope should be replaced. The cost of wire rope replacement is quite small if compared to the cost in terms of human injuries, equipment down time and replacement.

No listing of critical inspection factors, which serve as a basis for wire rope replacement in the standard, can be a substitute for an experienced inspector of wire rope. The listing serves as a user's guide to the accepted standards by which ropes must be judged.

Rope life can be prolonged if preventive maintenance is performed regularly. Cutting off an appropriate length of rope at the end termination before the core degrades and valley brakes appear minimizes degradation at these sections.

(9) General maintenance. In meeting the general maintenance requirement in WAC 296-24-87015(1), the employer should undertake the prompt replacement of broken, worn and damaged parts, switch contacts, brushes, and short flexible conductors of electrical devices. The components of the electrical service system and traveling cables should be replaced when damaged or significantly abraded. In addition, gears, shafts, bearings, brakes and hoisting drums should be kept in proper alignment.

(10) Training. In meeting the training requirement of WAC 296-24-87017(1), employers should use both on the job training and formal classroom training. The written work procedures used for this training should be obtained from the manufacturer, if possible, or prepared as necessary for the employee's information and use.

Employees who will operate powered platforms with intermittent stabilization systems should receive instruction in the specific ascent and descent procedures involving the assembly and disassembly of the stabilizer ties.

An acceptable training program should also include employee instruction in basic inspection procedures for the purpose of determining the need for repair and replacement of platform equipment. In addition, the program should cover the inspection, care and use of the personal fall protection equipment required in Appendix C, Part I, subsections (5) and (6).

In addition, the training program should also include emergency action plan elements. OSHA brochure #3088 (Rev.) 1985, "How to Prepare for Workplace Emergencies," details the basic steps needed to prepare to handle emergencies in the workplace.

Following the completion of a training program, the employee should be required to demonstrate competency in operating the equipment safely. Supplemental training of the employee should be provided by the employer, as necessary, if the equipment used or other working conditions should change.

An employee who is required to work with chemical products on a platform should receive training in proper cleaning procedures, and in the hazards, care and handling of these products. In addition, the employee should be supplied with the appropriate personal protective equipment, such as gloves and eye and face protection.

(11) Suspension and securing of powered platforms (equivalency). One acceptable method of demonstrating the equivalency of a method of suspending or securing a powered platform, as required in WAC 296-24-87011 (2)(c), 296-24-87013(3), and (5)(a)(vi), is to provide an engineering analysis by a registered professional engineer. The analysis should demonstrate that the proposed method will provide an equal or greater degree of safety for employees than any one of the methods specified in the standard.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87031, filed 4/10/90, effective 5/25/90.]

WAC 296-24-87033 Appendix B--Exhibits (advisory). The three drawings in Appendix B illustrate typical platform stabilization systems which are addressed in the standard. The drawings are to be used for reference purposes only, and do not illustrate all the mandatory requirements for each system.

Figure 1. Typical Self-Powered Platform--Continuous External or Indented Mullion Guide System

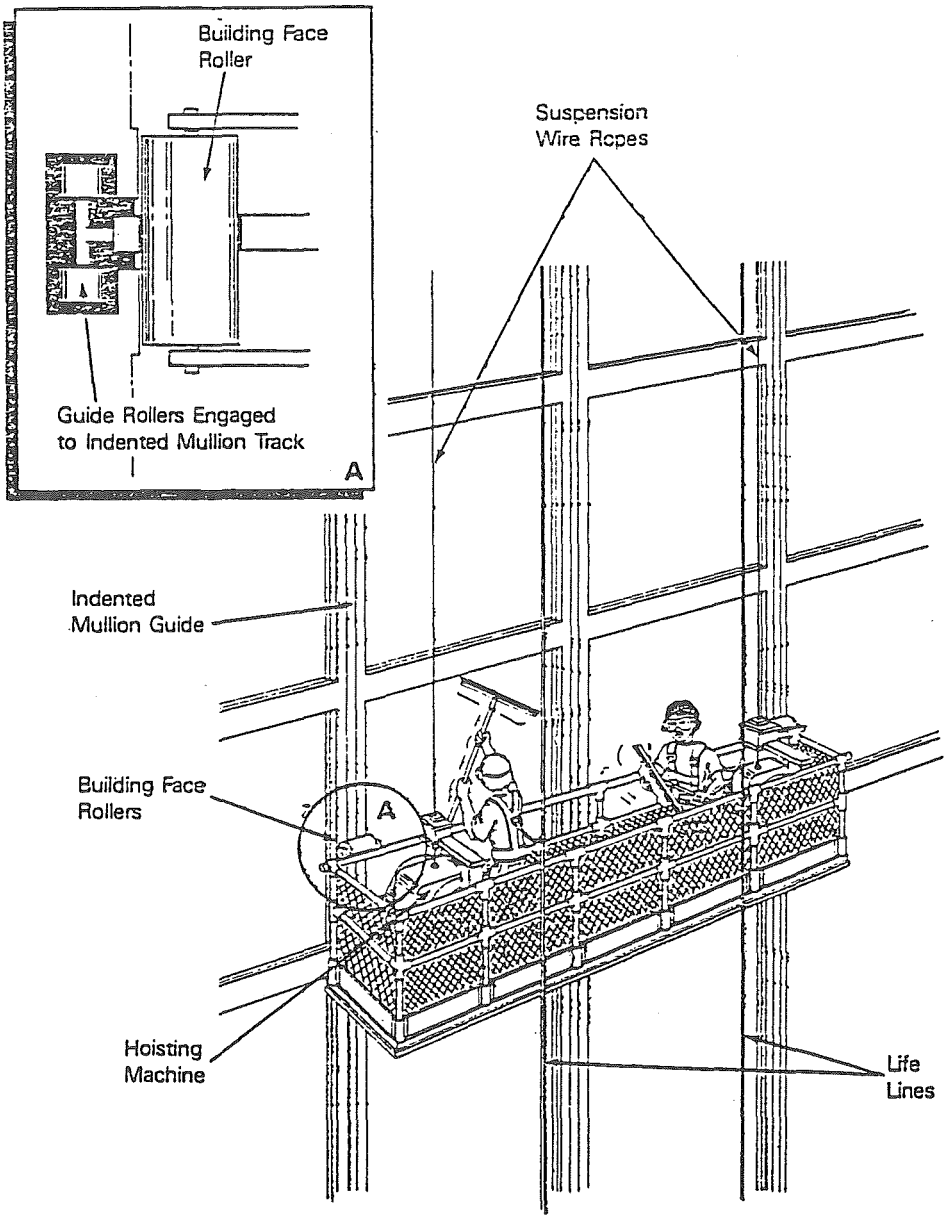


Figure 2. Typical Self-Powered Platform--
Intermittent Tie-In System

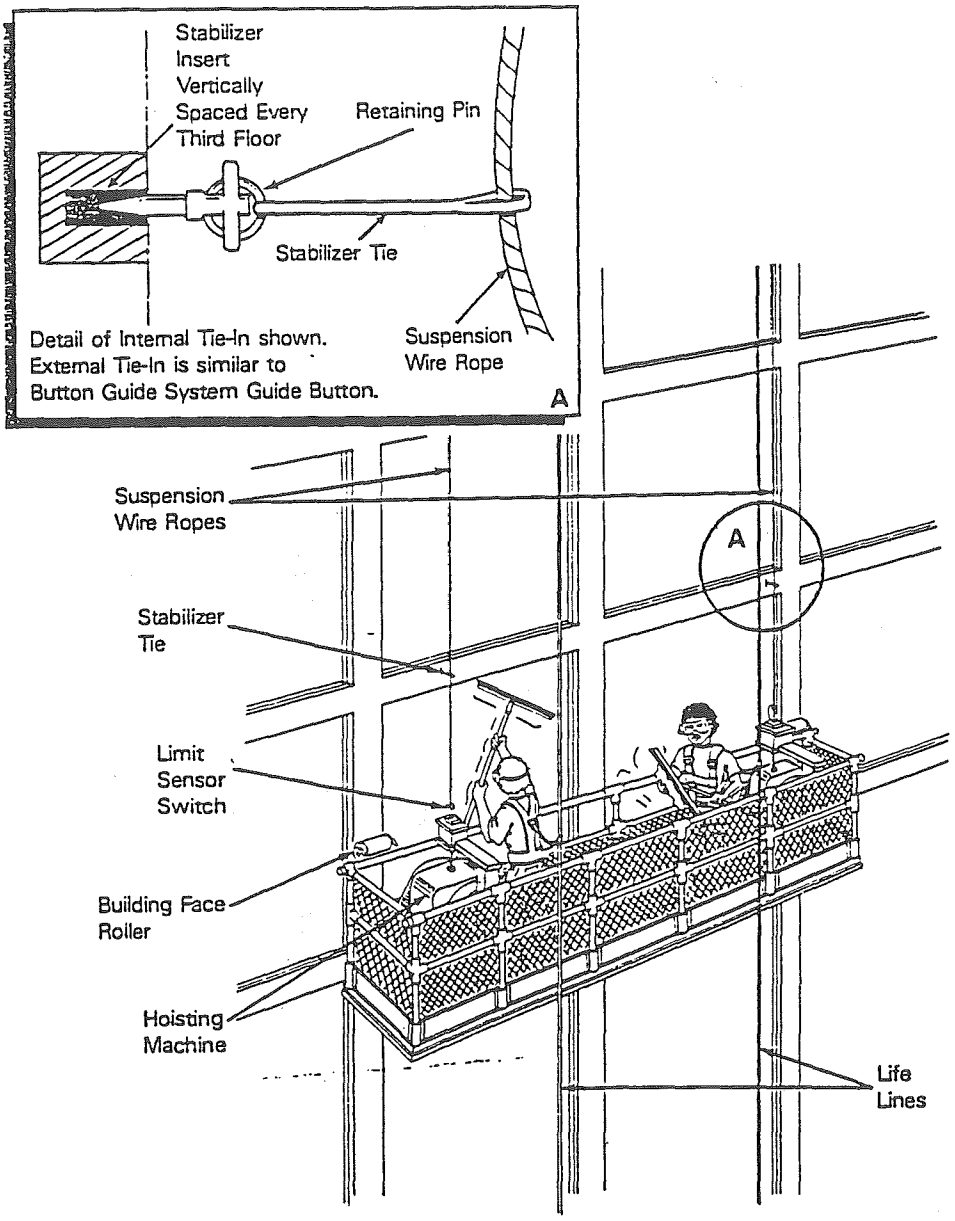
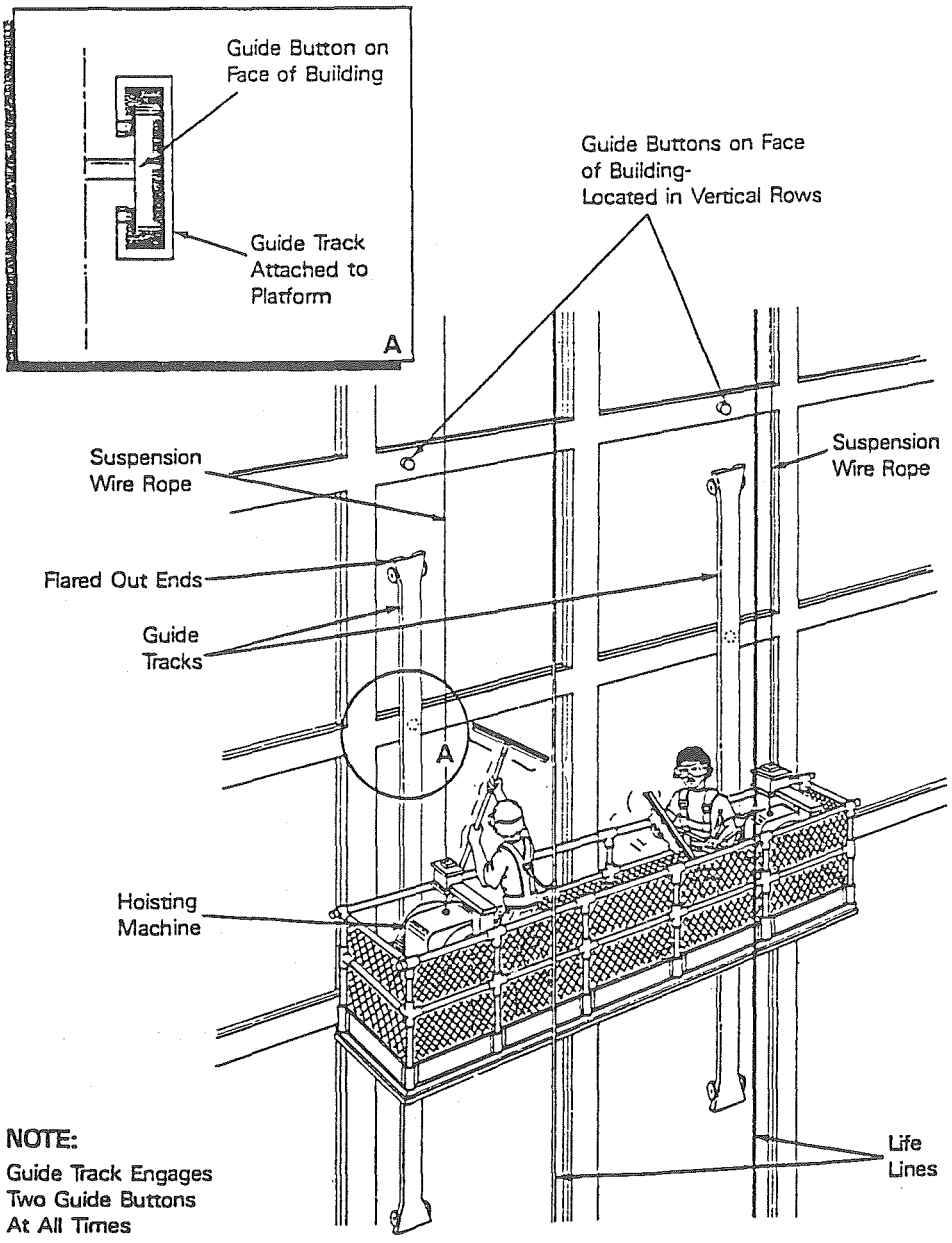


Figure 3. Typical Self-Powered Platform–
Button Guide System



[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87033, filed 4/10/90, effective 5/25/90.]

WAC 296-24-87035 Appendix C--Personal fall arrest system (Part I--Mandatory; Parts II and III--Nonmandatory). (1) Use of the appendix.

Part I of Appendix C sets out the mandatory criteria for personal fall arrest systems used by all employees using powered platforms. Part II sets out nonmandatory test procedures which may be used to determine compliance with applicable requirements contained in Part I of this appendix. Part III provides nonmandatory guidelines which are intended to assist employers in complying with these provisions.

Part I

Personal fall arrest systems (mandatory)—(1) Scope and application. This section establishes the application of and performance criteria for personal fall arrest systems which are required for use by all employees using powered platforms under WAC 296-24-87019.

(2) Definitions.

(a) Anchorage. A secure point of attachment for lifelines, lanyards or deceleration devices, and which is independent of the means of supporting or suspending the employee.

(b) Body harness. A design of straps which may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

(c) Buckle. Any device for holding the body harness closed around the employee's body.

(d) Competent person. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment.

(e) Connector. A device which is used to couple (connect) parts of the system together. It may be an independent component of the system (such as a carabiner), or an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

(f) Deceleration device. Any mechanism, such as a rope grab, ripstitch lanyard, specially woven lanyard, tearing or deforming lanyard, or automatic self retracting-lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

(g) Deceleration distance. The additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

(h) Equivalent. Alternative designs, materials or methods which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

(i) Free fall. The act of falling before the personal fall arrest system begins to apply force to arrest the fall.

(j) Free fall distance. The vertical displacement of the fall arrest attachment point on the employee's body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, lifeline and lanyard elongation but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

(k) Lanyard. A flexible line of rope, wire rope, or strap which is used to secure the body harness to a deceleration device, lifeline, or anchorage.

(l) Lifeline. A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

(m) Personal fall arrest system. A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

(n) Qualified person. A person with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product.

(o) Rope grab. A deceleration device which travels on a lifeline and automatically frictionally engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/lever locking, or both.

(p) Self-retracting lifeline/lanyard. A deceleration device which contains a drum-wound line which may be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

(q) Snap-hook. A connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snap-hooks are generally one of two types:

(i) The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection, or

(ii) The nonlocking type with a self-closing keeper which remains closed until pressed open for connection or disconnection.

(r) Tie-off. The act of an employee, wearing personal fall protection equipment, connecting directly or indirectly to an anchorage. It also means the condition of an employee being connected to an anchorage.

(3) Design for system components.

(a) Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

(b) Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

(c) Lanyards and vertical lifelines which tie-off one employee shall have a minimum breaking strength of 5,400 pounds (23.9 kN).

(d) Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet (0.61 m) or

less shall have components capable of sustaining a minimum static tensile load of 5,400 pounds (23.9 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(e) Self–retracting lifelines and lanyards which do not limit free fall distance to 2 feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,400 pounds (23.9 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(f) Dee–rings and snap–hooks shall be capable of sustaining a minimum tensile load of 5000 pounds (22.2 N).

(g) Dee–rings and snap–hooks shall be 100 percent proof–tested to a minimum tensile load of 3600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(h) Snap–hooks shall be sized to be compatible with the member to which they are connected so as to prevent unintentional disengagement of the snap–hook by depression of the snap–hook keeper by the connected member, or shall be a locking type snap–hook designed and used to prevent disengagement of the snap–hook by the contact of the snap–hook keeper by the connected member.

(i) Horizontal lifelines, where used, shall be designed, and installed as part of a complete personal fall arrest system, which maintains a safety factor of at least 2, under the supervision of a qualified person.

(j) Anchorages to which personal fall arrest equipment is attached shall be capable of supporting at least 5,400 pounds (23.9 kN) per employee attached, or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least 2, under the supervision of a qualified person.

(k) Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body harnesses, shall be made from synthetic fibers or wire rope.

(4) System performance criteria.

(a) Personal fall arrest systems shall, when stopping a fall:

(i) Limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;

(ii) Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); and

(iii) Shall have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

(b) (i) When used by employees having a combined person and tool weight of less than 310 pounds (140 kg), personal fall arrest systems which meet the criteria and protocols contained in subsections (2), (3), and (4) in Part II of this appendix shall be considered as complying with the provisions of (a) of this subsection.

(ii) When used by employees having a combined tool and body weight of 310 pounds (140 kg) or more, personal fall arrest systems which meet the criteria and protocols contained in subsections (2), (3), and (4) of Part II may be considered as complying with the provisions of (a) of this subsection provided that the criteria and protocols are modified appropriately to provide proper protection for such heavier weights.

(5) Care and use.

(a) Snap–hooks, unless of a locking type designed and used to prevent disengagement from the following connections, shall not be engaged:

(i) Directly to webbing, rope or wire rope;

(ii) To each other;

(iii) To a dee–ring to which another snap–hook or other connector is attached;

(iv) To a horizontal lifeline; or

(v) To any object which is incompatibly shaped or dimensioned in relation to the snap–hook such that the connected object could depress the snap–hook keeper a sufficient amount to release itself.

(b) Devices used to connect to a horizontal lifeline which may become a vertical lifeline shall be capable of locking in either direction on the lifeline.

(c) 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.

(d) The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

(e) When vertical lifelines are used, each employee shall be provided with a separate lifeline.

(f) Personal fall arrest systems or components shall be used only for employee fall protection.

(g) Personal fall arrest systems or components subjected to impact loading shall be immediately removed from service and shall not be used again.

(h) The employer shall provide for prompt rescue of employees in the event of a fall or shall assure the self–rescue capability of employees.

(i) Before using a personal fall arrest system, and after any component or system is changed, employees shall be trained in accordance with the requirements of WAC 296–24–87017(1), in the safe use of the system.

(6) Inspections. Personal fall arrest systems shall be inspected prior to each use for mildew, wear, damage and other deterioration, and defective components shall be removed from service if their strength or function may be adversely affected.

PART II
Test methods for personal fall arrest systems
(nonmandatory)

(1) General. Subsections (2), (3), (4) and (5) of this Part II set forth test procedures which may be used to determine compliance with the requirements in subsection (4) of Part I of this appendix.

(2) General conditions for all tests in Part II.

(a) Lifelines, lanyards and deceleration devices should be attached to an anchorage and connected to the body harness in the same manner as they would be when used to protect employees.

(b) The anchorage should be rigid, and should not have a deflection greater than .04 inches (1 mm) when a force of 2,250 pounds (10 kN) is applied.

(c) The frequency response of the load measuring instrumentation should be 120 Hz.

(d) The test weight used in the strength and force tests should be a rigid, metal, cylindrical or torso–shaped object with a girth of 38 inches plus or minus 4 inches (96 cm plus or minus 10 cm).

(e) The lanyard or lifeline used to create the free fall distance should be supplied with the system, or in its absence, the least elastic lanyard or lifeline available to be used with the system.

(f) The test weight for each test should be hoisted to the required level and should be quickly released without having any appreciable motion imparted to it.

(g) The system's performance should be evaluated taking into account the range of environmental conditions for which it is designed to be used.

(h) Following the test, the system need not be capable of further operation.

(3) Strength test.

(a) During the testing of all systems, a test weight of 300 pounds plus or minus 5 pounds (135 kg plus or minus 2.5 kg) should be used. (See subsection (2)(d) of this part.)

(b) The test consists of dropping the test weight once. A new unused system should be used for each test.

(c) For lanyard systems, the lanyard length should be 6 feet plus or minus 2 inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(d) For rope–grab–type deceleration systems, the length of the lifeline above the centerline of the grabbing mechanism to the lifeline's anchorage point should not exceed 2 feet (0.61 m).

(e) For lanyard systems, for systems with deceleration devices which do not automatically limit free fall distance to 2 feet (0.61 m) or less, and for systems with deceleration devices which have a connection distance in excess of one foot (0.3 m) (measured between the centerline of the lifeline and the attachment point to the body harness), the test weight should be rigged to free fall a distance of 7.5 feet (2.3 m) from a point that is 1.5 feet (46 cm) above the anchorage point, to its hanging location (6 feet below the anchorage). The test weight should fall without interference, obstruction, or hitting the floor or ground during the test. In some cases a nonelastic wire lanyard of sufficient length may need to be added to the system (for test purposes) to create the necessary free fall distance.

(f) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less, the test weight should be rigged to free fall a distance of 4 feet (1.22 m).

(g) Any weight which detaches from the harness should constitute failure for the strength test.

(4) Force test.

(a) General. The test consists of dropping the respective test weight specified in (b)(i) or (c)(i) of this subsection once. A new, unused system should be used for each test.

(b) For lanyard systems.

(i) A test weight of 220 pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See subsection (2)(d) above.)

(ii) Lanyard length should be 6 feet plus or minus 2 inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body harness.

(iii) The test weight should fall free from the anchorage level to its hanging location (a total of 6 feet (1.83 m) free fall distance) without interference, obstruction, or hitting the floor or ground during the test.

(c) For all other systems.

(i) A test weight of 220 pounds plus or minus 3 pounds (100 kg plus or minus 1.6 kg) should be used. (See subsection (2)(d) above.)

(ii) The free fall distance to be used in the test should be the maximum fall distance physically permitted by the system during normal use conditions, up to a maximum free fall distance for the test weight of 6 feet (1.83 m), except as follows:

(A) For deceleration systems which have a connection link or lanyard, the test weight should free fall a distance equal to the connection distance (measured between the centerline of the lifeline and the attachment point to the body harness).

(B) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less, the test weight should free fall a distance equal to that permitted by the system in normal use. (For example, to test a system with a self–retracting lifeline or lanyard, the test weight should be supported and the system allowed to retract the lifeline or lanyard as it would in normal use. The test weight would then be released and the force and deceleration distance measured).

(d) A system fails the force test if the recorded maximum arresting force exceeds 2,520 pounds (11.2 kN) when using a body harness.

(e) The maximum elongation and deceleration distance should be recorded during the force test.

(5) Deceleration device tests.

(a) General. The device should be evaluated or tested under the environmental conditions, (such as rain, ice, grease, dirt, type of lifeline, etc.), for which the device is designed.

(b) Rope–grab–type deceleration devices.

(i) Devices should be moved on a lifeline 1,000 times over the same length of line a distance of not less than one foot (30.5 cm), and the mechanism should lock each time.

(ii) Unless the device is permanently marked to indicate the type(s) of lifeline which must be used, several types (different diameters and different materials), of lifelines should be used to test the device.

(c) Other self–activating–type deceleration devices. The locking mechanisms of other self–activating–type deceleration devices designed for more than one arrest should lock each of 1,000 times as they would in normal service.

Part III

Additional nonmandatory guidelines for personal fall arrest systems. The following information constitutes additional guidelines for use in complying with requirements for a personal fall arrest system.

(1) Selection and use considerations. The kind of personal fall arrest system selected should match the particular work situation, and any possible free fall distance should be kept to a minimum. Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse affect on the system. Wire rope should not be used where an electrical hazard is anticipated. As required by the standard, the employer must plan to have means available to promptly rescue an employee should a fall occur, since the suspended employee may not be able to reach a work level independently.

Where lanyards, connectors, and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. The employer should fully evaluate the work conditions and environment (including seasonal weather changes) before selecting the appropriate personal fall protection system. Once in use, the system's effectiveness should be monitored. In some cases, a program for cleaning and maintenance of the system may be necessary.

(2) Testing considerations. Before purchasing or putting into use a personal fall arrest system, an employer should obtain from the supplier information about the system based on its performance during testing so that the employer can know if the system meets this standard. Testing should be done using recognized test methods. Part II of this Appendix C contains test methods recognized for evaluating the performance of fall arrest systems. Not all systems may need to be individually tested; the performance of some systems may be based on data and calculations derived from testing of similar systems, provided that enough information is available to demonstrate similarity of function and design.

(3) Component compatibility considerations. Ideally, a personal fall arrest system is designed, tested, and supplied as a complete system. However, it is common practice for lanyards, connectors, lifelines, deceleration devices, and body harnesses to be interchanged since some components wear out before others. The employer and employee should realize that not all components are interchangeable. For instance, a lanyard should not be connected between a body harness and a deceleration device of the self-retracting type since this can result in additional free fall for which the system was not designed. Any substitution or change to a personal fall arrest system should be fully evaluated or tested by a competent person to determine that it meets the standard, before the modified system is put in use.

(4) Employee training considerations. Thorough employee training in the selection and use of personal fall arrest systems is imperative. As stated in the standard, before the equipment is used, employees must be trained in the safe use of the system. This should include the following: Application limits; proper anchoring and tie-off techniques; estimation of free fall distance, including determination of deceleration distance, and total fall distance to prevent striking a lower level; methods of use; and inspection and storage of the system. Careless or improper use of the equipment can result in serious injury or death. Employers and employees should become familiar with the material in this Appendix, as well as manufacturer's recommendations, before a system is used. Of uppermost importance is the reduction in strength caused by certain tie-offs (such as using knots, tying around sharp edges, etc.) and maximum permitted free fall distance. Also, to be stressed are the importance of inspections prior to use, the limitations of the equipment, and unique conditions at the worksite which may be important in determining the type of system to use.

(5) Instruction considerations. Employers should obtain comprehensive instructions from the supplier as to the system's proper use and application, including, where applicable:

(a) The force measured during the sample force test;

(b) The maximum elongation measured for lanyards during the force test;

(c) The deceleration distance measured for deceleration devices during the force test;

(d) Caution statements on critical use limitations;

(e) Application limits;

(f) Proper hook-up, anchoring and tie-off techniques, including the proper dee-ring or other attachment point to use on the body harness for fall arrest;

(g) Proper climbing techniques;

(h) Methods of inspection, use, cleaning, and storage; and

(i) Specific lifelines which may be used. This information should be provided to employees during training.

(6) Inspection considerations. As stated in WAC 296-24-87035(6), personal fall arrest systems must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions which might affect its efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted to the shoulder of buckles; loose or damaged mountings; nonfunctioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

(7) Rescue considerations. As required by WAC 296-24-87035 (5)(h) when personal fall arrest systems are used, the employer must assure that employees can be promptly rescued or can rescue themselves should a fall occur. The availability of rescue personnel, ladders or other rescue equipment should be evaluated. In some situations, equipment which allows employees to rescue themselves after the fall has been arrested may be desirable, such as devices which have descent capability.

(8) Tie-off considerations.

(a) One of the most important aspects of personal fall protection systems is fully planning the system before it

is put into use. Probably the most overlooked component is planning for suitable anchorage points. Such planning should ideally be done before the structure or building is constructed so that anchorage points can be incorporated during construction for use later for window cleaning or other building maintenance. If properly planned, these anchorage points may be used during construction, as well as afterwards.

(b) Employers and employees should at all times be aware that the strength of a personal fall arrest system is based on its being attached to an anchoring system which does not significantly reduce the strength of the system (such as a properly dimensioned eye-bolt/snap-hook anchorage). Therefore, if a means of attachment is used that will reduce the strength of the system, that component should be replaced by a stronger one, but one that will also maintain the appropriate maximum arrest force characteristics.

(c) Tie-off using a knot in a rope lanyard or lifeline (at any location) can reduce the lifeline or lanyard strength by 50 percent or more. Therefore, a stronger lanyard or lifeline should be used to compensate for the weakening effect of the knot, or the lanyard length should be reduced (or the tie-off location raised) to minimize free fall distance, or the lanyard or lifeline should be replaced by one which has an appropriately incorporated connector to eliminate the need for a knot.

(d) Tie-off of a rope lanyard or lifeline around an "H" or "I" beam or similar support can reduce its strength as much as 70 percent due to the cutting action of the beam edges. Therefore, use should be made of a webbing lanyard or wire core lifeline around the beam; or the lanyard or lifeline should be protected from the edge; or free fall distance should be greatly minimized.

(e) Tie-off where the line passes over or around rough or sharp surfaces reduces strength drastically. Such a tie-off should be avoided or an alternative tie-off rigging should be used. Such alternatives may include use of a snap-hook/dee-ring connection, wire rope tie-off, an effective padding of the surfaces, or an abrasion-resistance strap around or over the problem surface.

(f) Horizontal lifelines may, depending on their geometry and angle of sag, be subjected to greater loads than the impact load imposed by an attached component. When the angle of horizontal lifeline sag is less than 30 degrees, the impact force imparted to the lifeline by an attached lanyard is greatly amplified. For example, with a sag angle of 15 degrees, the force amplification is about 2:1 and at 5 degrees sag, it is about 6:1. Depending on the angle of sag, and the line's elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-offs. The reason for this is that in multiple tie-offs to a horizontal lifeline, if one employee falls, the movement of the falling employee and the horizontal lifeline during arrest of the fall may cause other employees to also fall. Horizontal lifeline and anchorage strength should be increased for each additional employee to be tied-off. For these and other reasons, the design of systems using horizontal lifelines must only be done by qualified persons. Testing of installed lifelines and anchors prior to use is recommended.

(g) The strength of an eye-bolt is rated along the axis of the bolt and its strength is greatly reduced if the force is applied at an angle to this axis (in the direction of shear). Also, care should be exercised in selecting the proper diameter of the eye to avoid accidental disengagement of snap-hooks not designed to be compatible for the connection.

(h) Due to the significant reduction in the strength of the lifeline/lanyard (in some cases, as much as a 70 percent reduction), the sliding hitch knot should not be used for lifeline/lanyard connections except in emergency situations where no other available system is practical. The "one-and-one" sliding hitch knot should never be used because it is unreliable in stopping a fall. The "two-and-two," or "three-and-three" knot (preferable), may be used in emergency situations; however, care should be taken to limit free fall distance to a minimum because of reduced lifeline/lanyard strength.

(9) Vertical lifeline considerations. As required by the standard, each employee must have a separate lifeline when the lifeline is vertical. The reason for this is that in multiple tie-offs to a single lifeline, if one employee falls, the movement of the lifeline during the arrest of the fall may pull other employees' lanyards, causing them to fall as well.

(10) Snap-hook considerations.

(a) Although not required by this standard for all connections, locking snap-hooks designed for connection to suitable objects (of sufficient strength) are highly recommended in lieu of the nonlocking type. Locking snap-hooks incorporate a positive locking mechanism in addition to the spring loaded keeper, which will not allow the keeper to open under moderate pressure without someone first releasing the mechanism. Such a feature, properly designed, effectively prevents roll-out from occurring.

(b) As required by the standard WAC 296-24-87035 (5)(a) the following connections must be avoided (unless properly designed locking snap-hooks are used) because they are conditions which can result in roll-out when a nonlocking snap-hook is used:

- Direct connection of a snap-hook to a horizontal lifeline.
- Two (or more) snap-hooks connected to one dee-ring.
- Two snap-hooks connected to each other.
- A snap-hook connected back on its integral lanyard.
- A snap-hook connected to a webbing loop or webbing lanyard.
- Improper dimensions of the dee-ring, rebar, or other connection point in relation to the snap-hook dimensions which would allow the snap-hook keeper to be depressed by a turning motion of the snap-hook.

(11) Free fall considerations. The employer and employee should at all times be aware that a system's maximum arresting force is evaluated under normal use conditions established by the manufacturer, and in no

case using a free fall distance in excess of 6 feet (1.8 m). A few extra feet of free fall can significantly increase the arresting force on the employee, possibly to the point of causing injury. Because of this, the free fall distance should be kept at a minimum, and, as required by the standard, in no case greater than 6 feet (1.8 m). To help assure this, the tie-off attachment point to the lifeline or anchor should be located at or above the connection point of the fall arrest equipment to harness. (Since otherwise additional free fall distance is added to the length of the connecting means (i.e. lanyard)). Attaching to the working surface will often result in a free fall greater than 6 feet (1.8 m). For instance, if a 6 foot (1.8 m) lanyard is used, the total free fall distance will be the distance from the working level to the body harness attachment point plus the 6 feet (1.8 m) of lanyard length. Another important consideration is that the arresting force which the fall system must withstand also goes up with greater distances of free fall, possibly exceeding the strength of the system.

(12) Elongation and deceleration distance considerations. Other factors involved in a proper tie-off are elongation and deceleration distance. During the arresting of a fall, a lanyard will experience a length of stretching or elongation, whereas activation of a deceleration device will result in a certain stopping distance. These distances should be available with the lanyard or device's instructions and must be added to the free fall distance to arrive at the total fall distance before an employee is fully stopped. The additional stopping distance may be very significant if the lanyard or deceleration device is attached near or at the end of a long lifeline, which may itself add considerable distance due to its own elongation. As required by the standard, sufficient distance to allow for all of these factors must also be maintained between the employee and obstructions below, to prevent an injury due to impact before the system fully arrests the fall. In addition, a minimum of 12 feet (3.7 m) of lifeline should be allowed below the securing point of a rope grab type deceleration device, and the end terminated to prevent the device from sliding off the lifeline. Alternatively, the lifeline should extend to the ground or the next working level below. These measures are suggested to prevent the worker from inadvertently moving past the end of the lifeline and having the rope grab become disengaged from the lifeline.

(13) Obstruction considerations. The location of the tie-off should also consider the hazard of obstructions in the potential fall path of the employee. Tie-offs which minimize the possibilities of exaggerated swinging should be considered.

(14) Other considerations. Because of the design of some personal fall arrest systems, additional considerations may be required for proper tie-off. For example, heavy deceleration devices of the self-retracting type should be secured overhead in order to avoid the weight of the device having to be supported by the employee. Also, if self-retracting equipment is connected to a horizontal lifeline, the sag in the lifeline should be minimized to prevent the device from sliding down the lifeline to a position which creates a swing hazard during fall arrest. In all cases, manufacturer's instructions should be followed.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87035, filed 4/10/90, effective 5/25/90.]

WAC 296-24-87037 Appendix D--Existing installations (mandatory). (1) Use of the appendix.

Appendix D sets out the mandatory building and equipment requirements for applicable permanent installations completed after August 27, 1971, and no later than July 23, 1990 which are exempt from WAC 296-24-870 through 296-24-87013.

Note: All existing installations subject to this Appendix shall also comply with WAC 296-24-87009, 296-24-87015, 296-24-87017, 296-24-87019, and Appendix C.

(2) Definitions applicable to this appendix.

(a) Angulated roping. A system of platform suspension in which the upper wire rope sheaves or suspension points are closer to the plane of the building face than the corresponding attachment points on the platform, thus causing the platform to press against the face of the building during its vertical travel.

(b) ANSI. American National Standards Institute.

(c) Babbitted fastenings. The method of providing wire rope attachments in which the ends of the wire strands are bent back and are held in a tapered socket by means of poured molten babbitt metal.

(d) Brake—disc type. A brake in which the holding effect is obtained by frictional resistance between one or more faces of discs keyed to the rotating member to be held and fixed discs keyed to the stationary or housing member (pressure between the discs being applied axially).

(e) Brake—self-energizing band type. An essentially undirectional brake in which the holding effect is obtained by the snubbing action of a flexible band wrapped about a cylindrical wheel or drum affixed to the rotating member to be held, the connections and linkages being so arranged that the motion of the brake wheel or drum will act to increase the tension or holding force of the band.

(f) Brake—shoe type. A brake in which the holding effect is obtained by applying the direct pressure of two or more segmental friction elements held to a stationary member against a cylindrical wheel or drum affixed to the rotating member to be held.

(g) Building face rollers. A specialized form of guide roller designed to contact a portion of the outer face or wall structure of the building, and to assist in stabilizing the operators' platform during vertical travel.

(h) Continuous pressure. Operation by means of buttons or switches, any one of which may be used to control the movement of the working platform or roof car, only as long as the button or switch is manually maintained in the actuating position.

(i) Control. A system governing starting, stopping, direction, acceleration, speed, and retardation of moving members.

(j) Controller. A device or group of devices, usually contained in a single enclosure, which serves to control

in some predetermined manner the apparatus to which it is connected.

(k) Electrical ground. A conducting connection between an electrical circuit or equipment and the earth, or some conducting body which serves in place of the earth.

(l) Guide roller. A rotating, bearing–mounted, generally cylindrical member, operating separately or as part of a guide shoe assembly, attached to the platform, and providing rolling contact with building guideways, or other building contact members.

(m) Guide shoe. An assembly of rollers, slide members, or the equivalent, attached as a unit to the operators' platform, and designed to engage with the building members provided for the vertical guidance of the operators' platform.

(n) Interlock. A device actuated by the operation of some other device with which it is directly associated, to govern succeeding operations of the same or allied devices.

(o) Operating device. A pushbutton, lever, or other manual device used to actuate a control.

(p) Powered platform. Equipment to provide access to the exterior of a building for maintenance, consisting of a suspended power–operated working platform, a roof car, or other suspension means, and the requisite operating and control devices.

(q) Rated load. The combined weight of employees, tools, equipment, and other material which the working platform is designed and installed to lift.

(r) Relay, direction. An electrically energized contactor responsive to an initiating control circuit, which in turn causes a moving member to travel in a particular direction.

(s) Relay, potential for vertical travel. An electrically energized contactor responsive to initiating control circuit, which in turn controls the operation of a moving member in both directions. This relay usually operates in conjunction with direction relays, as covered under the definition, "relay, direction."

(t) Roof car. A structure for the suspension of a working platform, providing for its horizontal movement to working positions.

(u) Roof–powered platform. A powered platform having the raising and lowering mechanism located on a roof car.

(v) Self–powered platform. A powered platform having the raising and lowering mechanism located on the working platform.

(w) Traveling cable. A cable made up of electrical or communication conductors or both, and providing electrical connection between the working platform and the roof car or other fixed point.

(x) Weatherproof. Equipment so constructed or protected that exposure to the weather will not interfere with its proper operation.

(y) Working platform. The suspended structure arranged for vertical travel which provides access to the exterior of the building or structure.

(z) Yield point. The stress at which the material exhibits a permanent set of 0.2 percent.

(aa) Zinced fastenings. The method of providing wire rope attachments in which the splayed or fanned wire ends are held in a tapered socket by means of poured molten zinc.

(3) General requirements.

(a) Design requirements. All powered platform installations for exterior building maintenance completed as of August 27, 1971, but no later than January 25, 1990, shall meet all of the design, construction and installation requirements of Part II and III of the "American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance ANSI A120.1–1970" and of this appendix. References shall be made to appropriate parts of ANSI A120.1–1970 for detail specifications for equipment and special installations.

(b) Limitation. The requirements of this appendix apply only to electric–powered platforms. It is not the intent of this appendix to prohibit the use of other types of power. Installation of powered platforms using other types of power is permitted, provided such platforms have adequate protective devices for the type of power used, and otherwise provide for reasonable safety of life and limb to users of equipment and to others who may be exposed.

(c) Types of powered platforms.

(i) For the purpose of applying this appendix, powered platforms are divided into two basic types, Type F and Type T.

(ii) Powered platforms designated as Type F shall meet all the requirements in Part II of ANSI A120.1–1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance. A basic requirement of Type F equipment is that the work platform is suspended by at least 4 wire ropes and designed so that failure of any one wire rope will not substantially alter the normal position of the working platform. Another basic requirement of Type F equipment is that only one layer of hoisting rope is permitted on winding drums. Type F powered platforms may be either roof–powered or self–powered.

(iii) Powered platforms designated as Type T shall meet all the requirements in Part III of ANSI A120.1–1970 American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance, except for section 28, Safety Belts and Life Lines. A basic requirement of Type T equipment is that the working platform is suspended by at least 2 wire ropes. Failure of one wire rope would not permit the working platform to fall to the ground, but would upset its normal position. Type T powered platforms may be either roof–powered or self–powered.

(iv) The requirements of this section apply to powered platforms with winding drum type hoisting machines. It is not the intent of this section to prohibit powered platforms using other types of hoisting machines such as, but not limited to, traction drum hoisting machines, air powered machines, hydraulic powered machines, and internal combustion machines. Installation of powered platforms with other types of hoisting machines is permitted, provided adequate protective devices are used,

and provided reasonable safety of life and limb to users of the equipment and to others who may be exposed is assured.

(v) Both Type F and Type T powered platforms shall comply with the requirements of Appendix C of this standard.

(4) Type F powered platforms.

(a) Roof car, general.

(i) A roof car shall be provided whenever it is necessary to move the working platform horizontally to working or storage positions.

(ii) The maximum rated speed at which a power traversed roof car may be moved in a horizontal direction shall be 50 feet per minute.

(b) Movement and positioning of roof car.

(i) Provision shall be made to protect against having the roof car leave the roof or enter roof areas not designed for travel.

(ii) The horizontal motion of the roof cars shall be positively controlled so as to insure proper movement and positioning of the roof car.

(iii) Roof car positioning devices shall be provided to insure that the working platform is placed and retained in proper position for vertical travel and during storage.

(iv) Mechanical stops shall be provided to prevent the traversing of the roof car beyond its normal limits of travel. Such stops shall be capable of withstanding a force equal to 100 percent of the inertial effect of the roof car in motion with traversing power applied.

(v) The operating device of a power–operated roof car for traversing shall be located on the roof car, the working platform, or both, and shall be of the continuous pressure weather–proof electric type. If more than one operating device is provided, they shall be so arranged that traversing is possible only from one operating device at a time.

(vi) The operating device shall be so connected that it is not operable until:

(A) The working platform is located at its uppermost position of travel and is not in contact with the building face or fixed vertical guides in the face of the building; and

(B) All protective devices and interlocks are in a position for traversing.

(c) Roof car stability. Roof car stability shall be determined by either items (i) or (ii), whichever is greater.

(i) The roof car shall be continuously stable, considering overturning moment as determined by 125 percent rated load, plus maximum dead load and the prescribed wind loading.

(ii) The roof car and its anchorages shall be capable of resisting accidental over–tensioning of the wire ropes suspending the working platform and this calculated value shall include the effect of one and one–half times the value. For this calculation, the simultaneous effect of one–half wind load shall be included, and the design stresses shall not exceed those referred to in subsection (3)(a) of this Appendix.

(iii) If the load on the motors is at any time in excess of three times that required for lifting the working platform with its rated load the motor shall stall.

(d) Access to the roof car. Safe access to the roof car and from the roof car to the working platform shall be provided. If the access to the roof car at any point of its travel is not over the roof area or where otherwise necessary for safety, self–closing, self–locking gates shall be provided. Applicable provisions WAC 296–24–735 through 296–24–810 shall apply.

(e) Means for maintenance, repair, and storage. Means shall be provided to run the roof car away from the roof perimeter, where necessary, and to provide a safe area for maintenance, repairs, and storage. Provisions shall be made to secure the machine in the stored position. For stored machines subject to wind forces, see special design and anchorage requirements for "wind forces" in Part II, section 10.5.1.1 of ANSI A120.1–1970 American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(f) General requirements for working platforms. The working platform shall be of girder or truss construction and shall be adequate to support its rated load under any position of loading, and comply with the provisions set forth in section 10 of ANSI A120.1–1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(g) Load rating plate. Each working platform shall bear a manufacturer's load rating plate, conspicuously posted; stating the maximum permissible rated load. Load rating plates shall be made of noncorrosive material and shall have letters and figures stamped, etched, or cast on the surface. The minimum height of the letters and figures shall be one–fourth inch.

(h) Minimum size. The working platform shall have a minimum net width of 24 inches.

(i) Guardrails. Working platforms shall be furnished with permanent guard rails not less than 36 inches high, and not more than 42 inches high at the front (building side). At the rear, and on the sides, the rail shall not be less than 42 inches high. An intermediate guardrail shall be provided around the entire platform between the top guardrail and the toeboard. The top rail shall withstand a minimum of 200 pounds pressure.

(j) Toeboards. A four–inch toeboard shall be provided along all sides of the working platform.

(k) Open spaces between guardrails and toeboards. The spaces between the intermediate guardrail and platform toeboard on the building side of the working platform, and between the top guardrail and the toeboard on other sides of the platform, shall be filled with metallic mesh or similar material that will reject a ball one inch in diameter. The installed mesh shall be capable of withstanding a load of 100 pounds applied horizontally over any area of 144 square inches. If the space between the platform and the building face does not exceed eight inches, and the platform is restrained by guides, the mesh may be omitted on the front side.

(l) Flooring. The platform flooring shall be of the nonskid type, and if of open construction, shall reject a 9/16–inch diameter ball, or be provided with a screen below the floor to reject a 9/16–inch diameter ball.

(m) Access gates. Where access gates are provided, they shall be self–closing and self–locking.

(n) Operating device for vertical movement of the working platform.

(i) The normal operating device for the working platform shall be located on the working platform and shall be of the continuous pressure weatherproof electric type.

(ii) The operating device shall be operable only when all electrical protective devices and interlocks on the working platform are in position for normal service and, the roof car, if provided, is at an established operating point.

(o) Emergency electric operative device.

(i) In addition, on roof–powered platforms, an emergency electric operating device shall be provided near the hoisting machine for use in the event of failure of the normal operating device for the working platform, or failure of the traveling cable system. The emergency operating device shall be mounted in a locked compartment and shall have a legend mounted thereon reading: "For Emergency Operation Only. Establish Communication With Personnel on Working Platform Before Use."

(ii) A key for unlocking the compartment housing the emergency operating device shall be mounted in a break–glass receptacle located near the emergency operating device.

(p) Manual cranking for emergency operation. Emergency operation of the main drive machine may be provided to allow manual cranking. This provision for manual operation shall be designed so that not more than two persons will be required to perform this operation. The access to this provision shall include a means to automatically make the machine inoperative electrically while under the emergency manual operation. The design shall be such that the emergency brake is operative at or below governor tripping speed during manual operation.

(q) Arrangement and guarding of hoisting equipment.

(i) Hoisting equipment shall consist of a power–driven drum or drum contained in the roof car (roof–powered platforms) or contained on the working platform (self–powered platform).

(ii) The hoisting equipment shall be power–operated in both up and down directions.

(iii) Guard or other protective devices shall be installed wherever rotating shafts or other mechanisms or gears may expose personnel to a hazard.

(iv) Friction devices or clutches shall not be used for connecting the main driving mechanism to the drum or drums. Belt or chain–driven machines are prohibited.

(r) Hoisting motors.

(i) Hoisting motors shall be electric and of weather–proof construction.

(ii) Hoisting motors shall be in conformance with applicable provisions of subdivision (v) of this subsection, Electric Wiring and Equipment.

(iii) Hoisting motors shall be directly connected to the hoisting machinery. Motor couplings, if used, shall be of steel construction.

(s) Brakes. The hoisting machine(s) shall have two independent braking means, each designed to stop and hold the working platform with 125 percent of rated load.

(t) Hoisting ropes and rope connections.

(i) Working platforms shall be suspended by wire ropes of either 6 x 19 or 6 x 37 classification, preformed or nonpreformed.

(ii) (Reserved)

(iii) The minimum factor of safety shall be 10, and shall be calculated by the following formula:

$F=SxN/W$

Where

S= Manufacturer's rated breaking strength of one rope.

N= Number of ropes under load.

W= Maximum static load on all ropes with the platform and its rated load at any point of its travel.

(iv) Hoisting ropes shall be sized to conform with the required factor of safety, but in no case shall the size be less than 5/16 inch diameter.

(v) Winding drums shall have at least three turns of rope remaining when the platform has landed at the lowest possible point of its travel.

(vi) The lengthening or repairing of wire rope by the joining of two or more lengths is prohibited.

(vii) The nondrum ends of the hoisting ropes shall be provided with individual shackle rods which will permit individual adjustment of rope lengths, if required.

(viii) More than two reverse bends in each rope is prohibited.

(u) Rope tag data. A metal data tag shall be securely attached to one of the wire rope fastenings. This data tag shall bear the following wire rope data:

(i) The diameter in inches.

(ii) Construction classification.

(iii) Whether nonpreformed or preformed.

(iv) The grade of material used.

(v) The manufacturer's rated breaking strength.

(vi) Name of the manufacturer of the rope.

(vii) The month and year the ropes were installed.

(v) Electrical wiring and equipment.

(i) All electrical equipment and wiring shall conform to the requirements of the National Electrical Code, NFPA 70–1987; ANSI C1–1987, except as modified by ANSI A120.1–1970 "American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance." For detail design specifications for electrical equipment, see Part 2, ANSI A120.1–1970.

(ii) All motors and operation and control equipment shall be supplied from a single power source.

(iii) The power supply for the powered platform shall be an independent circuit supplied through a fused disconnect switch.

(iv) Electrical conductor parts of the power supply system shall be protected against accidental contact.

(v) Electrical grounding shall be provided.

(A) Provisions for electrical grounding shall be included with the power–supply system.

(B) Controller cabinets, motor frames, hoisting machines, the working platform, roof car and roof car track

system, and noncurrent carrying parts of electrical equipment, where provided, shall be grounded.

(C) The controller, where used, shall be so designed and installed that a single ground or short circuit will not prevent both the normal and final stopping device from stopping the working platform.

(D) Means shall be provided on the roof car and working platform for grounding portable electric tools.

(E) The working platform shall be grounded through a grounding connection in a traveling cable. Electrically powered tools utilized on the working platform shall be grounded.

(vi) Electrical receptacles located on the roof or other exterior location shall be of a weatherproof type and shall be located so as not to be subject to contact with water or accumulated snow. The receptacles shall be grounded and the electric cable shall include a grounding conductor. The receptacle and plug shall be a type designed to avoid hazard to persons inserting or withdrawing the plug. Provision shall be made to prevent application of cable strain directly to the plug and receptacle.

(vii) Electric runway conductor systems shall be of the type designed for use in exterior locations and shall be located so as not to be subject to contact with water or accumulated snow. The conductors, collectors, and disconnecting means shall conform to the same requirements as those for cranes and hoists in Article 610 of the National Electrical Code, NFPA 70–1987; ANSI C1–1987. A grounded conductor shall parallel the power conductors and be so connected that it cannot be opened by the disconnecting means. The system shall be designed to avoid hazard to persons in the area.

(viii) Electrical protective devices and interlocks of the weatherproof type shall be provided.

(ix) Where the installation includes a roof car, electric contact(s) shall be provided and so connected that the operating devices for the working platform shall be operative only when the roof car is located and mechanically retained at an established operating point.

(x) Where the powered platform includes a power–operated roof car, the operating device for the roof car shall be inoperative when the roof car is mechanically retained at an established operating point.

(xi) An electric contact shall be provided and so connected that it will cause the down direction relay for vertical travel to open if the tension in the traveling cable exceeds safe limits.

(xii) An automatic overload device shall be provided to cut off the electrical power to the circuit in all hoisting motors for travel in the up direction, should the load applied to the hoisting ropes at either end of the working platform exceed 125 percent of its normal tension with rated load, as shown on the manufacturer's data plate on the working platform.

(xiii) An automatic device shall be provided for each hoisting rope which will cut off the electrical power to the hoisting motor or motors in the down direction and apply the brakes if any hoisting rope becomes slack.

(xiv) Upper and lower directional limit devices shall be provided to prevent the travel of the working platform beyond the normal upper and lower limits of travel.

(xv) Operation of a directional limit device shall prevent further motion in the appropriate direction, if the normal limit of travel has been reached.

(xvi) Directional limit devices, if driven from the hoisting machine by chains, tapes, or cables, shall incorporate a device to disconnect the electric power from the hoisting machine and apply both the primary and secondary brakes in the event of failure of the driving means.

(xvii) Final terminal stopping devices of the working platform:

(A) Final terminal stopping devices for the working platform shall be provided as a secondary means of preventing the working platform from over–traveling at the terminals.

(B) The device shall be set to function as close to each terminal landing as practical, but in such a way that under normal operating conditions it will not function when the working platform is stopped by the normal terminal stopping device.

(C) Operation of the final terminal stopping device shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine, and applying both the primary and secondary brakes.

(D) The final terminal stopping device for the upper limit of travel shall be mounted so that it is operated directly by the motion of the working platform itself.

(xviii) Emergency stop switches shall be provided in or adjacent to each operating device.

(xix) Emergency stop switches shall:

(A) Have red operating buttons or handles.

(B) Be conspicuously and permanently marked "Stop."

(C) Be the manually opened and manually closed type.

(D) Be positively opened with the opening not solely dependent on springs.

(xx) The manual operation of an emergency stop switch associated with an operating device for the working platform shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine and applying both the primary and secondary brakes.

(xxi) The manual operation of the emergency stop switch associated with the operating device for a power–driven roof car shall cause the electrical power to the traverse machine to be interrupted, and the traverse machine brake to apply.

(w) Requirements for emergency communications.

(i) Communication equipment shall be provided for each powered platform for use in an emergency.

(ii) Two–way communication shall be established between personnel on the roof and personnel on the stalled working platform before any emergency operation of the working platform is undertaken by personnel on the roof.

(iii) The equipment shall permit two–way voice communication between the working platform; and

(A) Designated personnel continuously available while the powered platform is in use; and

(B) Designated personnel on roof-powered platforms, undertaking emergency operation of the working platform by means of the emergency operating device located near the hoisting machine.

(iv) The emergency communication equipment shall be one of the following types:

(A) Telephone connected to the central telephone exchange system; or

(B) Telephones on a limited system or an approved two-way radio system, provided designated personnel are available to receive a message during the time the powered platform is in use.

(5) Type T powered platforms.

(a) Roof car. The requirements of subsection (4)(a) through (4)(e) of this Appendix shall apply to Type T powered platforms.

(b) Working platform. The requirements of subsection (4)(f) through (4)(p) of this Appendix apply to Type T powered platforms.

(i) The working platform shall be suspended by at least two wire ropes.

(ii) The maximum rated speed at which the working platform of self-powered platforms may be moved in a vertical direction shall not exceed 35 feet per minute.

(c) Hoisting equipment. The requirements of subsection (4)(q) and (r) of this Appendix shall apply to Type T powered platforms.

(d) Brakes. Brakes requirements of subsection (4)(s) of this Appendix shall apply.

(e) Hoisting ropes and rope connections.

(i) Subsection (4)(t)(i) through (vi) and (viii) of this Appendix shall apply to Type T powered platforms.

(ii) Adjustable shackle rods in subsection (4)(t)(vii) of this Appendix shall apply to Type T powered platforms, if the working platform is suspended by more than two wire ropes.

(f) Electrical wiring and equipment.

(i) The requirements of subsection (4)(v)(i) through (vi) of this Appendix shall apply to Type T powered platforms. "Circuit protection limitation," "powered platform electrical service system," all operating services and control equipment shall comply with the specifications contained in Part 2, section 26, ANSI A120.1-1970.

(ii) For electrical protective devices the requirements of subsection (4)(v)(i) through (viii) of this Appendix shall apply to Type T powered platforms. Requirements for the "circuit potential limitation" shall be in accordance with specifications contained in Part 2, section 26, of ANSI A120.1-1970.

(g) Emergency communications. All the requirements of subsection (4)(w) of this Appendix shall apply to Type T powered platforms.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-24-87037, filed 4/10/90, effective 5/25/90.]

WAC 296-24-885 Vehicle-mounted elevating and rotating work platforms.

[Order 76-6, § 296-24-885, filed 3/1/76; Order 73-5, § 296-24-885, filed 5/9/73 and Order 73-4, § 296-24-885, filed 5/7/73.]

WAC 296-24-88501 Definitions. (1) Aerial device. Any vehicle-mounted device, telescoping or articulating or both, which is used to position workmen and/or materials.

(2) Aerial ladder. An aerial device consisting of a single- or multiple-section extensible ladder.

(3) Articulating boom platform. An aerial device with two or more hinged boom sections.

(4) Extensible boom platform. An aerial device (except ladders) with a telescopic or extensible boom. Telescopic derricks with personnel platform attachments shall be considered to be extensible boom platforms when used with a personnel platform.

(5) Electric line truck. A truck used to transport men, tools and material, and to serve as a traveling workshop for electric power line construction and maintenance work. It is sometimes equipped with a boom and auxiliary equipment for setting poles, digging holes and elevating material and/or men.

(6) Mobile unit. A combination of an aerial device, its vehicle, and related equipment.

(7) Platform. Any personnel-carrying device (basket or bucket) which is a component of an aerial device.

(8) Vehicle. Any carrier that is not manually propelled.

(9) Vertical tower. An aerial device designed to elevate a platform in a substantially vertical axis.

[Order 76-6, § 296-24-88501, filed 3/1/76; Order 73-5, § 296-24-88501, filed 5/9/73 and Order 73-4, § 296-24-88501, filed 5/7/73.]

WAC 296-24-88503 General requirements. (1) Unless otherwise provided in this section, aerial devices (aerial lifts) acquired on or after July 1, 1975, shall be designed and constructed in conformance with the applicable requirements of the American National Standard for "Vehicle Mounted Elevating and Rotating Work Platforms," ANSI A92.2-1969, including appendix. Aerial lifts acquired for use before July 1, 1975 which do not meet the requirements of ANSI A92.2-1969, may not be used after July 1, 1976, unless they shall have been modified so as to conform with the applicable design and construction requirements of ANSI A92.2-1969. Aerial devices include the following types of vehicle-mounted aerial devices used to elevate personnel and/or material to jobsites above ground:

(a) Extensible boom platforms;

(b) Aerial ladders;

(c) Articulating boom platforms;

(d) Vertical towers, and

(e) A combination of any of the above.

(f) Aerial equipment may be made of metal, wood, fiberglass reinforced plastic (FRP), or other material; may be powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

(2) Aerial lifts may be "field modified" for uses other than those intended by the manufacturer, provided the

modification has been certified in writing by the manufacturer or by any other equivalent entity, such as a nationally recognized testing laboratory, to be in conformity with all applicable provisions of ANSI A92.2–1969 and this section, and to be at least as safe as the equipment was before modification.

(3) The requirements of this section do not apply to firefighting equipment or electric line trucks used in the construction and maintenance of power distribution lines by telecommunications employees, line clearance tree trimming employees, electric contractor employees and electric utility employees, except with the requirement that a vehicle be a stable support for the aerial device.

(4) When operating aerial lifts proximate to, under, over, by or near electric power lines, the requirements of subsection (4) shall apply.

(a) The following clearances shall be maintained:

(i) For lines rated at 50kV or less, the minimum clearance between the lines and any part of the aerial lift shall be at least 10 feet;

(ii) When the lines are rated in excess of 50kV, the minimum clearance between the lines and any part of the aerial lift shall be at least 10 feet plus 0.4 inch for each kilovolt in excess of 50kV, or twice the length of the line insulator, but never less than 10 feet;

(iii) The requirements set forth in subdivision (4)(a) do not apply.

(A) Where the electric power transmission or distribution lines have been deenergized and visibly grounded at the point of work, or where insulating barriers, not a part of or an attachment to the aerial lift, have been erected to prevent physical contact with the lines.

(b) Proximity warning devices may be used, but not in lieu of meeting the requirements contained in this subsection.

(c) The owner of the lines or his authorized representative shall be notified and provided with all pertinent information before the commencement of operations near electric lines.

(d) Any overhead wire shall be considered to be an energized line until the owner of the line or his authorized representative states that it is deenergized.

[Order 76-6, § 296-24-88503, filed 3/1/76; Order 73-5, § 296-24-88503, filed 5/9/73 and Order 73-4, § 296-24-88503, filed 5/7/73.]

WAC 296-24-88505 Specific requirements. (1) Ladder trucks and tower trucks. Before the truck is moved for highway travel, aerial ladders shall be secured in the lower traveling position by the locking device above the truck cab, and the manually operated device at the base of the ladder, or by other equally effective means (e.g., cradles which prevent rotation of the ladder in combination with positive acting linear actuators).

(2) Extensible and articulating boom platforms.

(a) Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.

(b) Only trained persons shall operate an aerial lift.

(c) Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.

(d) Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

(e) A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.

(f) Boom and basket load limits specified by the manufacturer shall not be exceeded.

(g) The brakes shall be set and outriggers, when used, shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline.

(h) An aerial lift truck may not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of WAC 296-24-88503 (1)(2).

(i) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

(j) Climbers shall not be worn while performing work from an aerial lift.

(k) Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position, except as provided in subdivision (h).

(3) Bursting safety factor. All critical hydraulic and pneumatic components shall comply with the provisions of the American National Standards Institute Standard, ANSI A92.2–1969, Section 4.9 Bursting Safety Factor. Critical components are those in which a failure would result in a free fall or free rotation of the boom. All noncritical components shall have a bursting safety factor of at least two to one.

(4) Welding standards. All welding shall conform to the following Automotive Welding Society (AWS) Standards, as applicable:

(a) Standard Qualification Procedure, AWS B3.0–41.

(b) Recommended Practices for Automotive Welding Design, AWS D8.4–61.

(c) Standard Qualification of Welding Procedures and Welders for Piping and Tubing, AWS D10.9–69.

(d) Specifications for Welding Highway and Railway Bridges, AWS D2.0–69. (Rev. 2–5–76.)

[Order 76-6, § 296-24-88505, filed 3/1/76.]

WAC 296-24-900 Manlifts.

[Order 73-5, § 296-24-900, filed 5/9/73 and Order 73-4, § 296-24-900, filed 5/7/73.]

WAC 296-24-90001 Definitions. (1) Handhold (handgrip). A handhold is a device attached to the belt which can be grasped by the passenger to provide a means of maintaining balance.

(2) Open type. One which has a handgrip surface fully exposed and capable of being encircled by the passenger's fingers.

(3) Closed type. A cup–shaped device, open at the top in the direction of travel of the step for which it is to be used, and closed at the bottom into which the passenger may place his fingers.

(4) Limit switch. A device, the purpose of which is to cut off the power to the motor and apply the brakes to stop the carrier in the event that a loaded step passes the terminal landing.

(5) Manlift. A device consisting of a power–driven endless belt moving in one direction only, and provided with steps or platforms and handholds attached to it for the transportation of personnel from floor to floor.

(6) Rated speed. Rated speed is the speed for which the device is designed and installed.

(7) Split–rail switch. An electric limit switch operated mechanically by the rollers on the manlift steps. It consists of an additional hinged or "split" rail, mounted on the regular guiderail, over which the step rollers pass. It is spring–loaded in the "split" position. If the step supports no load, the rollers will "bump" over the switch; if a loaded step should pass over the section, the split rail will be forced straight, tripping the switch and opening the electrical circuit.

(8) Step (platform). A step is a passenger carrying unit.

(9) Travel. The travel is the distance between the centers of the top and bottom pulleys.

[Order 73–5, § 296–24–90001, filed 5/9/73 and Order 73–4, § 296–24–90001, filed 5/7/73.]

WAC 296–24–90003 General requirements. (1) Application. These standards apply to the construction, maintenance, inspection, and operation of manlifts in relation to accident causing hazards. Manlifts covered by these standards consist of platforms or brackets and accompanying handholds mounted on, or attached to an endless belt, operating vertically in one direction only and being supported by, and driven through pulleys, at the top and bottom. These manlifts are intended for conveyance of persons only. It is not intended that these standards cover moving stairways, elevators with enclosed platforms ("Paternoster" elevators), gravity lifts, nor conveyors used only for conveying material. These standards apply to manlifts used to carry only personnel trained and authorized by the employer in their use.

(2) Exceptions for new and existing equipment. The purpose of these standards is to provide reasonable safety for life and limb.

(3) Design requirements. All new manlift installations and equipment installed after the effective date of these standards shall meet the design requirements of the "American National Safety Standard for Manlifts ANSI A90.1–1969," and the requirements of this section.

(4) Reference to other codes. The following codes are applicable to this section. Safety Code for Mechanical Power Transmission Apparatus ANSI B15.1–1953 (R 1958) and WAC 296–24–150 through 296–24–20533; National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968) and WAC 296–45–590; Safety Code for Fixed Ladders, ANSI A14.3–1956 and Safety Requirements for Floor and Wall Openings, Railings and Toeboards, ANSI A12.1–1967 and WAC 296–24–735 through 296–24–85505.

(5) Floor openings.

(a) Allowable size. Floor openings for both the "up" and "down" runs shall be not less than 28 inches nor more than 36 inches in width for a 12–inch belt not less than 34 inches nor more than 38 inches for a 14–inch belt; and not less than 36 inches nor more than 40 inches for a 16–inch belt and shall extend not less than 24 inches, nor more than 28 inches from the face of the belt.

(b) Uniformity. All floor openings for a given manlift shall be uniform in size and shall be approximately circular, and each shall be located vertically above the opening below it.

(6) Landing.

(a) Vertical clearance. The clearance between the floor or mounting platform and the lower edge for the conical guard above it required by WAC 296–24–90003(7) shall not be less than 7 feet 6 inches. Where this clearance cannot be obtained no access to the manlift shall be provided and the manlift runway shall be enclosed where it passes through such floor.

(b) Clear landing space. The landing space adjacent to the floor openings shall be free from obstruction and kept clear at all times. This landing space shall be at least 2 feet in width from the edge of the floor opening used for mounting and dismounting.

(c) Lighting and landing. Adequate lighting not less than 5–foot candles, shall be provided at each floor landing at all times when the lift is in operation.

(d) Landing surface. The landing surfaces at the entrances and exits to the manlift shall be constructed and maintained as to provide safe footing at all times.

(e) Emergency landings. Where there is a travel of 50 feet or more between floor landings, one or more emergency landings shall be provided so that there will be a landing (either floor or emergency) for every 25 feet or less of manlift travel.

(i) Emergency landings shall be accessible from both the "up" and "down" rungs of the manlift and shall give access to the ladder required in WAC 296–24–90003(12).

(ii) Emergency landings shall be completely enclosed with a standard railing and toeboard.

(iii) Platforms constructed to give access to bucket elevators or other equipment for the purpose of inspection, lubrication, and repair may also serve as emergency landings under this rule. All such platforms will then be considered part of the emergency landing and shall be provided with standard railings and toeboards.

(7) Guards on underside of floor openings.

(a) Fixed type. On the ascending side of the manlift floor openings shall be provided with a bevel guard or cone meeting the following requirements:

(i) The cone shall make an angle of not less than 45° with the horizontal. An angle of 60° or greater shall be used where ceiling heights permit.

(ii) The lower edge of this guard shall extend at least 42 inches outward from any handhold on the belt. It shall not extend beyond the upper surface of the floor above.

(iii) The cone shall be made of not less than No. 18 U.S. gauge sheet steel or material of equivalent strength or stiffness. The lower edge shall be rolled to a minimum diameter of one-half inch and the interior shall be smooth with no rivets, bolts or screws protruding.

(b) Floating type. In lieu of the fixed guards specified in WAC 296-24-90003 (7)(a) a floating type safety cone may be used, such floating cones to be mounted on hinges at least 6 inches below the under side of the floor and so constructed as to actuate a limit switch should a force of 2 pounds be applied on the edge of the cone closest to the hinge. The depth of this floating cone need not exceed 12 inches.

(8) Protection of entrances and exits.

(a) Guardrail requirement. The entrances and exits at all floor landings affording access to the manlift shall be guarded by a maze (staggered railing) or a handrail equipped with self-closing gates.

(b) Construction. The rails shall be standard guardrails with toeboards meeting the provisions of the Safety Requirements for Floor and Wall Openings, Railings and Toeboards, ANSI A12.1-1967 and WAC 296-24-750 through 296-24-75011.

(c) Gates. Gates, if used, shall open outward and shall be self-closing. Corners of gates shall be rounded.

(d) Maze. Maze or staggered openings shall offer no direct passage between enclosure and outer floor space.

(e) Except where building layout prevents, entrances at all landings shall be in the same relative position.

(f) If located in buildings to which the public has access, such manlift or manlifts shall be located in an enclosure protected by self-closing spring-locked doors. Keys to such doors shall be limited to authorized personnel.

(9) Guards for openings.

(a) Construction. The floor opening at each landing shall be guarded on sides not used for entrance or exit by a standard railing and toeboard or by panels or wire mesh of not less than Number 10 U.S. gage, expanded metal of not less than Number 13 U.S. gage or sheet metal of equivalent strength.

(b) Guardrails in stairwells. When belt manlift is installed in a stairwell a standard guardrail shall be placed between the floor openings of the manlift and the stairways.

(c) Height and location. Such rails or guards shall be at least forty-two inches in height on the "up" running side and sixty-six inches on the "down" running side. If a guardrail is used the section of the guard above the rail may be of the construction specified in WAC 296-24-90003 (9)(a) or may consist of vertical or horizontal bars which will reject a ball six inches in diameter. Rails or guards shall be located not more than one foot from the edge of the floor opening.

(d) Safeguards required. Expanded metal, sheet metal or wood guards must be installed to cover the area from the floor to seven feet above the floor on each exposed side of the belt manlift at each floor landing, so persons cannot place their hands in the area where the step rollers travel.

(10) Bottom arrangement.

(a) Bottom landing. At the bottom landing the clear area shall be not smaller than the area enclosed by the guardrails on the floors above, and any wall in front of the down-running side of the belt shall be not less than 48 inches from the face of the belt. This space shall not be encroached upon by stairs or ladders.

(b) Location of lower pulley. The lower (boot) pulley shall be installed so that it is supported by the lowest landing served. The sides of the pulley support shall be guarded to prevent contact with the pulley or the steps.

(c) Mounting platform. A mounting platform shall be provided in front or to one side of the uprun at the lowest landing, unless the floor level is such that the following requirement can be met: The floor or platform shall be at or above the point at which the upper surface of the ascending step completes its turn and assumes a horizontal position.

(d) Guardrails. To guard against persons walking under a descending step, the area on the downside of the manlift shall be guarded in accordance with WAC 296-24-90003(8). To guard against a person getting between the mounting platform and an ascending step, the area between the belt and the platform shall be protected by a guardrail.

(11) Top arrangements.

(a) Clearance from floor. A top clearance shall be provided of at least 11 feet above the top terminal landing. This clearance shall be maintained from a plane through each face of the belt to a vertical cylindrical plane having a diameter 2 feet greater than the diameter of the floor opening, extending upward from the top floor to the ceiling on the up-running side of the belt. No encroachment of structural or machine supporting members within this space will be permitted.

(b) Pulley clearance.

(i) There shall be a clearance of at least 5 feet between the center of the head pulley shaft and any ceiling obstruction.

(ii) The center of the head pulley shaft shall be not less than 6 feet above the top terminal landing.

(c) Emergency grab rail. An emergency grab bar or rail and platform shall be provided at the head pulley when the distance to the head pulley is over 6 feet above the top landing, otherwise only a grab bar or rail is to be provided to permit the rider to swing free should the emergency stops become inoperative.

(12) Emergency exit ladder. A fixed metal ladder accessible from both the "up" and "down" run of the manlift shall be provided for the entire travel of the manlift. Such ladder shall be in accordance with ANSI A14.3-1956, Safety Code for Fixed Ladders and WAC 296-24-810 through 296-24-81013.

(13) Superstructure bracing. Manlift rails shall be secured in such a manner as to avoid spreading, vibration, and misalignment.

(14) Illumination.

(a) General. Both runs of the manlift shall be illuminated at all times when the lift is in operation. An intensity of not less than 1–foot candle shall be maintained at all points. (However, see WAC 296–24–90003 (6)(c) for illumination requirements at landings.)

(b) Control of illumination. Lighting of manlift runways shall be by means of circuits permanently tied into the building circuits (no switches), or shall be controlled by switches at each landing. Where separate switches are provided at each landing, any switch shall turn on all lights necessary to illuminate the entire runway.

(15) Weather protection. The entire manlift and its driving mechanism shall be protected from the weather at all times.

[Order 76–6, § 296–24–90003, filed 3/1/76; Order 73–5, § 296–24–90003, filed 5/9/73 and Order 73–4, § 296–24–90003, filed 5/7/73.]

WAC 296–24–90005 Mechanical requirements. (1) Machines, general.

(a) Brakes. Brakes provided for stopping and holding a manlift shall be inherently self–engaging, by requiring power or force from an external source to cause disengagement. The brake shall be electrically released, and shall be applied to the motor shaft for direct–connected units or to the input shaft for belt–driven units. The brake shall be capable of stopping and holding the manlift when the descending side is loaded with 250 lb on each step.

(b) Belt.

(i) The belts shall be of hard–woven canvas, rubber–coated canvas, leather, or other material meeting the strength requirements of WAC 296–24–90003(3) and having a co–efficient of friction such that when used in conjunction with an adequate tension device it will meet the brake test specified in WAC 296–24–90005 (1)(a).

(ii) The width of the belt shall be not less than 12 inches for a travel not exceeding 100 feet, not less than 14 inches for a travel greater than 100 feet but not exceeding 150 feet and 16 inches for a travel exceeding 150 feet.

(iii) A belt that has become torn while in use on a manlift shall not be spliced and put back in service.

(iv) Belt fastenings. Belts shall be fastened by a lapped splice or shall be butt spliced with a strap on the side of the belt away from the pulley. For lapped splices, the overlap of the belt at the splice shall be not less than three feet where the total travel of the manlift does not exceed one hundred feet and not less than four feet, if the travel exceeds one hundred feet.

Where butt splices are used the straps shall extend not less than three feet on one side of the butt for a travel not in excess of one hundred feet, and four feet for a travel in excess of one hundred feet.

For twelve inch belts, the joint shall be fastened with not less than twenty special elevator bolts, each of a minimum diameter of one–quarter inch. These bolts shall be arranged symetrically in five rows so arranged as to cover the area of the joint effectively. The minimum number of bolts for a belt width of fourteen inches shall be not less than twenty–three and for belt widths of sixteen inches, the number of bolts shall be not less than twenty–seven.

(v) Pulleys. Drive pulleys and idler (boot) pulleys shall have a diameter not less than given in Table 1.

TABLE 1

Belt Construction	Minimum Strength (lb. per inch of width)	Minimum Pulley (diameter inches)
5 ply	1500	20
6 ply	1800	20
7 ply	2100	22

Note: Table No. 1 is included solely for the purpose of determining the minimum diameter of pulley required for the listed number of plys of belt construction.

[(vi) Pulley protection. The machine shall be so designed] and constructed as to catch and hold the driving pulley in event of shaft failure.

(2) Speed.

(a) Maximum speed. No manlift designed for a speed in excess of 80 feet per minute shall be installed.

(3) Platforms or steps.

(a) Minimum depth. Steps or platforms shall be not less than 12 inches nor more than 14 inches deep, measured from the belt to the edge of the step or platform.

(b) Width. The width of the step or platform shall be not less than the width of the belt to which it is attached.

(c) Distance between steps. The distance between steps shall be equally spaced and not less than 16 feet measured from the upper surface of one step to the upper surface of the next step above it.

(d) Angle of step. The surface of the step shall make approximately a right angle with the "up" and "down" run of the belt, and shall travel in the approximate horizontal position with the "up" and "down" run of the belt.

(e) Surfaces. The upper or working surfaces of the step shall be of a material having inherent nonslip characteristics (coefficient of friction not less than 0.5) or shall be covered completely by a nonslip tread securely fastened to it.

(f) Strength of step supports. When subjected to a load of 400 pounds applied at the approximate center of the step, step frames, or supports and their guides shall be of adequate strength to:

(i) Prevent the disengagement of any step roller.

(ii) Prevent any appreciable misalignment.

(iii) Prevent any visible deformation of the steps or its support.

(g) Prohibition of steps without handholds. No steps shall be provided unless there is a corresponding handhold above or below it meeting the requirements of WAC 296–24–90005(4). If a step is removed for repairs or permanently, the handholds immediately above and

below it shall be removed before the lift is again placed in service.

(4) Handholds.

(a) Location. Handholds attached to the belt shall be provided and installed so that they are not less than 4 feet nor more than 4 feet 8 inches above the step tread. These shall be so located as to be available on the both "up" and "down" run of the belt.

(b) Size. The grab surface of the handhold shall be not less than 4 1/2 inches in width, not less than 3 inches in depth, and shall provide 2 inches of clearance from the belt. Fastenings for handholds shall be located not less than 1 inch from the edge of the belt.

(c) Strength. The handhold shall be capable of withstanding, without damage, a load of 300 pounds applied parallel to the run of the belt.

(d) Prohibition of handhold without steps. No handhold shall be provided without a corresponding step. If a handhold is removed permanently or temporarily, the corresponding step and handhold for the opposite direction of travel shall also be removed before the lift is again placed in service.

(e) Type. All handholds shall be of the closed type.

(5) Up limit stops.

(a) Requirements. Two separate automatic stop devices shall be provided to cut off the power and apply the brake when a loaded step passes the upper terminal landing. One of these shall consist of a split–rail switch mechanically operated by the step roller and located not more than 6 inches above the top terminal landing. The second automatic stop device may consist of any of the following:

(i) Any split–rail switch placed 6 inches above and on the side opposite the first limit switch.

(ii) An electronic device.

(iii) A switch actuated by a lever, rod, or plate, the latter to be placed on the "up" side of the head pulley so as to just clear a passing step.

(b) Emergency stop switch, treadle type in pit on down side. An emergency stop treadle switch shall be placed in the area below the lowest landing on the "down" side. This switch must stop the mechanism if a person should fail to get off at the lowest landing and be ejected from the step as it approaches its position to travel around the boot pulley.

(c) Manual reset location. After the manlift has been stopped by a stop device it shall be necessary to reset the automatic stop manually. The device shall be so located that a person resetting it shall have a clear view of both the "up" and "down" runs of the manlift. It shall not be possible to reset the device from any step or platform.

(d) Cut–off point. The initial limit stop device shall function so that the manlift will be stopped before the loaded step has reached a point of 24 inches above the top terminal landing.

(e) Electrical requirements.

(i) Where such switches open the main motor circuit directly they shall be of the multipole type.

(ii) Where electronic devices are used they shall be so designed and installed that failure will result in shutting off the power to the driving motor.

(iii) Where flammable vapors or dusts may be present all electrical installations shall be in accordance with the National Electric Code, NFPA 70–1971; ANSI C 1–1971 (Rev. of 1968), requirements for such locations.

(iv) Unless of the oil–immersed type controller contacts carrying the main motor current shall be copper to carbon or equal, except where the circuit is broken at two or more points simultaneously.

(6) Emergency stop.

(a) General. An emergency stop means shall be provided.

(b) Location. This stop means shall be within easy reach of the ascending and descending runs of the belt.

(c) Operation. This stop means shall be so connected with the control lever or operating mechanism that it will cut off the power and apply the brake when pulled in the direction of travel.

(d) Rope. If rope is used, it shall be not less than three–eighths inch in diameter. Wire rope, unless marlin–covered, shall not be used.

(7) Instruction and warning signs.

(a) Instruction signs at landings or belts. Signs of conspicuous and easily read style giving instructions for the use of the manlift shall be posted at each landing or stenciled on the belt.

(i) Such signs shall be of letters not less than 1 inch in height and of a color having high contrast with the surface on which it is stenciled or painted (white or yellow on black or black on white or gray).

(ii) The instructions shall read approximately as follows:

Face the belt.
Use the handholds.
To stop–pull rope.

(b) Top floor warning sign and light. (i) At the top floor an illuminated sign shall be displayed bearing the following wording:

"TOP FLOOR–GET OFF"

Signs shall be in block letters not less than 2 inches in height. This sign shall be located within easy view of an ascending passenger and not more than 2 feet above the top terminal landing.

(ii) In addition to the sign required by WAC 296–24–90005(7), a red warning light of not less than 40–watt rating shall be provided immediately below the upper landing terminal and so located as to shine in the passenger's face.

(c) Bottom of manlift warning signs, light and buzzer.

(i) Sign or light. A sign or light warning the passenger he is approaching the bottom landing shall be posted above bottom landing in a conspicuous place. Sign or light to be similar in size to top warning light and sign noted above.

(ii) An electric buzzer. An electric buzzer shall be installed five feet above the bottom landing on the down side to warn the rider that he is approaching the bottom landing and the buzzer shall be activated automatically by the weight of a load on a step.

(d) Visitor warning. A conspicuous sign have the following legend–AUTHORIZED PERSONNEL ONLY–shall be displayed at each landing. The sign shall be of block letters not less than 2 inches in height and shall be of a color offering high contrast with the background color.

[Order 74-27, § 296-24-90005, filed 5/7/74; Order 73-5, § 296-24-90005, filed 5/9/73 and Order 73-4, § 296-24-90005, filed 5/7/73.]

WAC 296-24-90007 Operating rules. (1) Proper use of manlifts. No freight, packaged goods, pipe, lumber, or construction materials of any kind shall be handled on any manlift.

[Order 73-5, § 296-24-90007, filed 5/9/73 and Order 73-4, § 296-24-90007, filed 5/7/73.]

WAC 296-24-90009 Periodic inspection. (1) Frequency. All manlifts shall be inspected by a competent designated person at intervals of not more than 30 days. Limit switches shall be checked weekly. Manlifts found to be unsafe shall not be operated until properly repaired.

(2) Items covered. This periodic inspection shall cover but is not limited to the following items:

Steps.
Step fastenings.
Rails.
Rail supports and fastenings.
Rollers and slides.
Belt and belt tension.
Handholds and fastenings.
Floor landings.
Guardrails.
Lubrication.
Limit switches.
Warning signs and lights.
Illumination.
Drive pulley.
Bottom (boot) pulley and clearance.
Pulley supports.
Motor.
Driving mechanism.
Brake.
Electrical switches.
Vibration and misalignment.
"Skip" on up or down run when mounting step (indicating worn gears).

(3) Inspection log. A written record shall be kept of findings at each inspection. Records of inspection shall be made available to the director of labor and industries or his duly authorized representative.

[Order 73-5, § 296-24-90009, filed 5/9/73 and Order 73-4, § 296-24-90009, filed 5/7/73.]

Part K
COMPRESSED GAS AND COMPRESSED GAS EQUIPMENT

WAC

WAC 296-24-920 Inspection of compressed gas cylinders.

[Order 73-5, § 296-24-920, filed 5/9/73 and Order 73-4, § 296-24-920, filed 5/7/73.]

WAC 296-24-92001 Definitions. (1) High- and low-pressure cylinders. High-pressure cylinders means those cylinders with a marked service pressure of 900 p.s.i. or greater; low-pressure cylinders are those with a marked service pressure less than 900 p.s.i.

(2) Minimum allowable wall thickness. The minimum allowable wall thickness means the minimum wall thickness required by the specification under which the cylinder was manufactured.

(3) Dents. Dents (in cylinders) means deformations caused by the cylinder coming in contact with a blunt object in such a way that the thickness of metal is not materially impaired.

(4) Cuts, gouges, or digs. Cuts, gouges, or digs (in cylinders) means deformations caused by contact with a sharp object in such a way as to cut into or upset the metal of the cylinder, decreasing the wall thickness at that point.

(5) Corrosion or pitting. Means corrosion or pitting in cylinders involving the loss of wall thickness by corrosive media.

Note: There are several kinds of pitting or corrosion to be considered.

(6) Isolated pitting. Means isolated pits of small cross-section which do not effectively weaken the cylinder wall but are indicative of possible complete penetration and leakage.

Note: Since the pitting is isolated the original wall is essentially intact.

(7) Line corrosion. Means pits which are not isolated but are connected or nearly connected to others in a narrow band or line.

Note: This condition is more serious than isolated pitting. Line corrosion frequently occurs in the area of intersection of the footring and bottom of a cylinder. This is sometimes referred to as "crevice corrosion."

(8) General corrosion. Means corrosion which covers considerable surface areas of the cylinder.

Note: It reduces the structural strength. It is often difficult to measure or estimate the depth of general corrosion because direct comparison with the original wall cannot always be made. General corrosion is often accompanied by pitting.

(9) "DOT" means the U.S. Department of Transportation.

[Order 73-5, § 296-24-92001, filed 5/9/73 and Order 73-4, § 296-24-92001, filed 5/7/73.]

WAC 296-24-92003 General requirements. (1) Application.

(a) Each employer shall determine that compressed gas cylinders under his control are in a safe condition to the extent that this can be determined by visual, and other inspection required by WAC 296-24-920 through 296-24-92011.

(b) The requirements contained in these standards are not intended to apply to cylinders manufactured under specification DOT (ICC)-3HT (49 CFR Ch.1). Separate requirements covering service life and standards for visual inspection of these cylinders are contained in Compressed Gas Association Pamphlet C-8, "Standard for Requalification of ICC-3HT Cylinders."

(2) Quality of inspection. Experience in the inspection of cylinders is an important factor in determining the acceptability of a given cylinder for continued service.

Note: Users lacking this experience and having doubtful cylinders should return them to a manufacturer of the same type of cylinders for reinspection.

[Order 73-5, § 296-24-92003, filed 5/9/73 and Order 73-4, § 296-24-92003, filed 5/7/73.]

WAC 296-24-92005 Inspection of low-pressure cylinders exempt from the hydrostatic test including acetylene cylinders. (1) Application. This section covers cylinders of the type that are exempt from the hydrostatic retest requirements of the DOT by virtue of their exclusive use in certain noncorrosive gas service. They are not subject to internal corrosion and do not require internal shell inspection.

(2) Preparation for inspection. Rust, scale, caked paint, etc., shall be removed from the exterior surface so that the surface can be adequately observed. Facilities shall be provided for inverting the cylinder to facilitate inspection of the bottom. This is important because experience has shown this area to be the most susceptible to corrosion.

(3) Exterior inspection. Cylinders shall be checked as outlined below for corrosion, general distortion, or any other defect that might indicate a weakness which would render it unfit for service.

(a) To fix corrosion limits for all types, designs, and sizes of cylinders, and include them in this section is not practicable. Cylinders categorized by this section and subsection (1) of this section shall meet the following requirements. Failure to meet any of these requirements is of itself cause for rejection of a cylinder. Rejected cylinders shall be removed from the work place. Rejected cylinders may be returned to the manufacturer for reinspection.

(i) A cylinder shall be rejected when the tare weight is less than ninety-five percent of the original tare weight marked on the cylinder. When determining tare weight, be sure that the cylinder is empty.

(ii) A cylinder shall be rejected when the remaining wall in an area having isolated pitting only is less than one-third of the minimum allowable wall thickness as determined under (b) and (d) of this subsection.

(iii) A cylinder shall be rejected when line corrosion on the cylinder is three inches in length or over and the remaining wall is less than three-fourths of the minimum allowable wall thickness or when line corrosion is less than three inches in length and the remaining wall thickness is less than one-half the minimum allowable wall thickness as determined under (b) through (d) of this subsection.

(iv) A cylinder shall be rejected when the remaining wall in an area of general corrosion is less than one-half of the minimum allowable wall thickness as determined under (b) through (d) of this subsection.

(b) To use the criteria in (a) of this subsection, it is necessary to know the original wall thickness of the cylinder or the minimum allowable wall thickness. Table M-1 lists the minimum allowable wall thickness under DOT specifications (49 CFR Ch. 1) for a number of common size low-pressure cylinders.

TABLE M-1

Cylinder size O.D. x length (inches)	DOT Specification marking	Nominal water capacity (pounds)	Minimum allowable wall thickness (inches)
15 x 46	4B240[1]	239	0.128
14 13/16 x 47	4E240	239	.140
14 15/16 x 46	4BA240	239	.086
14 11/16 x 28 3/8	4BA240	143	.086
11 29/32 x 32 11/16	4BA240	95	.078
11 29/32 x 18 11/32	4BA240	48	.078

[1] Without longitudinal seam.

(c) When the wall thickness of the cylinder at manufacture is not known, and the actual wall thickness cannot be measured, this cylinder shall be rejected when the inspection reveals that the deepest pit in a general corrosion area exceeds three sixty-fourths inch. This is arrived at by considering that in no case shall the pitting exceed one-half the minimum allowable wall thickness which is 0.064 inch. When a pit measures 0.043 inch (approximately three sixty-fourths inch) in a corrosion area, general corrosion will already have removed 0.021 inch of the original wall and the total pit depth as compared to the initial wall will be 0.064 inch.

(d) When the original wall thickness at manufacture is known, or the actual wall thickness is measured, this thickness less one and one-half times the maximum measured pit depth shall be 0.064 inch or greater. If it is less, the cylinder shall be rejected.

(e) Dents are of concern where the metal deformation is sharp and confined, or where they are near a weld. Where metal deformation is not sharp, dents of larger magnitude can be tolerated.

(f) Where denting occurs so that any part of the deformation includes a weld, the maximum allowable dent depth shall be one-fourth inch.

(g) When denting occurs so that no part of the deformation includes a weld, the cylinder shall be rejected if the depth of the dent is greater than one-tenth of the mean diameter of the dent.

(h) Cuts, gouges, or digs reduce the wall thickness of the cylinder and in addition are considered to be stress raisers. Depth limits are set in these standards; however, cylinders shall be rejected at one-half of the limit set whenever the length of the defect is three inches or more.

(i) When the original wall thickness at manufacture is not known, and the actual wall thickness cannot be measured a cylinder shall be rejected if the cut, gouge, or dig exceeds one-half of the minimum allowable wall thickness as determined under (b) through (d) of this subsection.

(ii) When the original wall thickness at manufacture is known, or the actual wall thickness is measured, a cylinder shall be rejected if the original wall thickness minus the depth of the defect is less than one-half of the minimum allowable wall thickness as determined under (b) through (d) of this subsection.

(i) Leaks can originate from a number of sources, such as defects in a welded or brazed seam, defects at the threaded opening, or from sharp dents, digs, gouges, or pits.

(i) To check for leaks, the cylinder shall be charged and carefully examined. All seams and pressure openings shall be coated with a soap or other suitable solution to detect the escape of gas. Any leakage is cause for rejection.

(ii) Safety relief devices as defined in WAC 296-24-93001(1) shall be tested for leaks before a charged cylinder is shipped from the cylinder filling plant.

(j) After fire damage, cylinders shall be carefully inspected for evidence of exposure to fire.

(i) Common evidences of exposure to fire are:

(A) Charring or burning of the paint or other protective coat.

(B) Burning or sintering of the metal.

(C) Distortion of the cylinder.

(D) Melted out fuse plugs.

(E) Burning or melting of valve.

(ii) The evaluation of fire damage by DOT regulations state that, "a cylinder which has been subjected to the action of fire must not again be placed in service until it has been properly reconditioned," in accordance with 49 CFR 173.34(f). The general intent of this requirement is to remove from service cylinders which have been subject to the action of fire which has changed the metallurgical structure or the strength properties of the steel, or in the case of acetylene cylinders caused breakdown of porous filler. This is normally determined by visual examination as covered above with particular emphasis to the condition of the protective coating. If the protective coating has been burnt off or if the cylinder body is burnt, warped, or distorted, it is assumed that the cylinder has been overheated and 49 CFR 173.34(f) shall be complied with. If, however, the protective coating is only dirtied from smoke or other debris, and is found by examination to be intact underneath, the cylinder shall not be considered affected within the scope of this requirement.

(k) Cylinders are manufactured with a reasonably symmetrical shape. Cylinders which have definite visible bulges shall be removed from service and evaluated. Cylinders shall be rejected when a variation of one percent or more is found in the measured circumferences or in peripheral distances measured from the valve spud to the center seam (of equivalent fixed point).

(l) Cylinder necks shall be examined for serious cracks, folds, and flaws. Neck cracks are normally detected by testing the neck during charging operations with a soap solution.

(m) Cylinder neck threads shall be examined whenever the valve is removed from the cylinder. Cylinders shall be rejected if the required number of effective threads are materially reduced, or if a gas tight seal cannot be obtained by reasonable valving methods. Gages shall be used to measure the number of effective threads.

(n) If the valve is noticeably tilted the cylinder shall be rejected.

(o) The footring and headring of cylinders may become so distorted through service abuse that they no longer perform their functions:

(i) To cause the cylinder to remain stable and upright.

(ii) To protect the valve. Rings shall be examined for distortion; for looseness, and for failure of welds. Appearances may often warrant rejection of the cylinder.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-24-92005, filed 5/15/89, effective 6/30/89; Order 73-5, § 296-24-92005, filed 5/9/73 and Order 73-4, § 296-24-92005, filed 5/7/73.]

WAC 296-24-92007 Low-pressure cylinders subject to hydrostatic testing. (1) Application. Cylinders covered in this section are low-pressure cylinders other than those covered in WAC 296-24-92005 through 296-24-92005 (3)(o)(ii). They differ essentially from such cylinders in that they require a periodic hydrostatic retest which includes an internal and external examination. Defect limits for the external examination are prescribed in WAC 296-24-92005 through 296-24-92005 (3)(o)(ii), with exceptions for aluminum cylinders shown in WAC 296-24-92007(4).

(2) Preparation for inspection. Flammable gas cylinders shall be purged before being examined with a light. Lamps used for flammable gas cylinder inspection shall be explosion proof.

(3) Internal inspection. Cylinders shall be inspected internally at least every time the cylinder is periodically retested. The examination shall be made with a light of sufficient intensity to clearly illuminate the interior walls.

(4) External inspection of aluminum cylinders. The inspection requirements of WAC 296-24-92005 through 296-24-92005 (3)(o)(ii) shall be met, except as follows:

(a) Aluminum cylinders shall be rejected when impairment to the surface (corrosion or mechanical defect) exceeds a depth where the remaining wall is less than

three–fourths of the minimum allowable wall thickness required by the specification under which the cylinder was manufactured.

(b) Aluminum cylinders subjected to the action of fire shall be removed from service.

[Order 73–5, § 296–24–92007, filed 5/9/73 and Order 73–4, § 296–24–92007, filed 5/7/73.]

WAC 296–24–92009 High–pressure cylinders. (1) Application. High–pressure cylinders are those with a marked service pressure of 900 p.s.i. or higher. They are seamless; no welding is permitted. The great bulk of such cylinders are of the 3A or 3AA types under DOT specifications (49 CFR Ch. 1).

(2) Preparation for inspection.

(a) Cylinders shall be cleaned for inspection so that the inside and outside surfaces and all conditions can be observed. This shall include removal of scale and caked paint from the exterior and the thorough removal of internal scale. Cylinders with interior coating shall be examined for defects in the coating. If the coating is defective, it shall be removed.

(b) A good inspection light of sufficient intensity to clearly illuminate the interior wall is mandatory for internal inspection. Flammable gas cylinders shall be purged before being examined with a light. Lamps for flammable gas cylinder inspection shall be explosion proof.

(3) Exterior inspection.

(a) To fix corrosion limits for all types, designs, and sizes of cylinders, and include them in this section, is not practicable. Considerable judgment is required in evaluating cylinders fit for service. Experience is a major factor, aside from strength considerations for high pressure cylinders.

(b) When the original wall thickness of the cylinder is not known, and the actual wall thickness cannot be measured, the cylinder shall be rejected if corrosion exceeds one thirty–second inch in depth. This is arrived at by subtracting from the minimum allowable wall at manufacture (0.221 inch), the limiting wall in service (0.195 inch), to give the maximum allowable corrosion limit of 0.026 inch, the equivalent of one thirty–second inch.

(c) When the wall thickness is known, or the actual wall thickness is measured, the difference between this known wall and the limiting value establishes the maximum corrosion figure. The normal hot forged cylinder of this size will have a measured wall of about 0.250 inch. Comparison of this with the limiting wall thickness shows that defects up to about one–sixteenth inch are allowable provided, of course, that the actual wall is measured or is known.

(d) Cylinders with general corrosion are evaluated by subjecting them to a hydrostatic test. Thus, a cylinder with an elastic expansion of 227 cc. or greater shall be rejected. If areas of pronounced pitting are included within the general corrosion, the depth of such pitting should also be measured (with the high spots of the actual surface as a reference plane) and the criteria established in the first example apply. Thus, the maximum corrosion limit would be one thirty–second inch when the wall was not known.

(e) Any defect of appreciable depth having a sharp bottom is a stress raiser and even though a cylinder may be acceptable from a stress standpoint, it is common practice to remove such defects. After any such repair operation, verification of the cylinder strength and structure shall be made by a hydrostatic test of other suitable means.

(f) Dents can be tolerated when the cylinder wall is not deformed excessively or abruptly. Generally speaking, dents are accepted up to a depth of about one–sixteenth inch when the major diameter of the dent is equal to or greater than 32 times the depth of the dent. Sharper dents than this are considered too abrupt and shall require rejection of the cylinder. On small diameter cylinders these general rules may have to be adjusted. Considerations of appearance play a major factor in the evaluation of dents.

(g) Cylinders with arc or torch burns shall be removed from service. Defects of this nature may be recognized by one of the following conditions:

(i) Removal of metal by scarfing or cratering.

(ii) A sentering or burning of the base metal.

(iii) A hardened heat affected zone. A simple method for verifying the presence of small arc burns is to file the suspected area. The hardened heat affected zone. A simple method for verifying the presence of small arc burns is to file the suspected area. The hardened zone will resist filing as compared to the softer base metal.

(h) Cylinders are normally produced with a symmetrical shape. Cylinders with distinct visual bulges shall be removed from service until the nature of the defect is determined. Some cylinders may have small discontinuities related to the manufacturing process – mushroomed bottoms, offset shoulders, etc. These usually can be identified and are not normally cause for concern.

(i) Cylinders shall be carefully inspected for evidences of exposure to fire. (See WAC 296–24–92005 (3)(j).)

(j) Cylinder necks shall be examined for serious cracks, folds, and flaws. (See WAC 296–24–92005 (3)(l) and (m).)

[Order 73–5, § 296–24–92009, filed 5/9/73 and Order 73–4, § 296–24–92009, filed 5/7/73.]

WAC 296–24–92011 Internal inspection. (1) Cylinders shall be inspected internally at least every time the cylinder is periodically retested. This examination shall be made with a light of sufficient intensity to clearly illuminate the interior walls.

(2) A hammer test consists of tapping a cylinder a light blow with a suitably sized hammer. A cylinder, emptied of liquid content, with a clean internal surface, standing free, will have a clear ring. Cylinders with internal corrosion will give a duller ring dependent upon the amount of corrosion and accumulation of foreign material. Such cylinders shall be investigated. The hammer test is very sensitive and is an easy, quick, and convenient test that can be made without removing the valve before each charging. It is an invaluable indicator of internal corrosion.

[Order 73-5, § 296-24-92011, filed 5/9/73 and Order 73-4, § 296-24-92011, filed 5/7/73.]

WAC 296-24-930 Safety relief devices for compressed gas cylinders.

[Order 73-5, § 296-24-930, filed 5/9/73 and Order 73-4, § 296-24-930, filed 5/7/73.]

WAC 296-24-93001 Definitions. (1) Safety relief device. A "safety relief device" is a device intended to prevent rupture of a cylinder under certain conditions of exposures. (The term as used herein shall include the approach channel, the operating parts, and the discharge channel.)

(2) Approach channel. An "approach channel" is the passage or passages through which gas must pass from the cylinder to reach the operating parts of the safety relief device.

(3) Discharge channel. A "discharge channel" is the passage or passages beyond the operating parts through which gas must pass to reach the atmosphere exclusive of any piping attached to the outlet of the device.

(4) Safety relief device channel. A "safety relief device channel" is the channel through which gas released by operation of the device must pass from the cylinder to the atmosphere exclusive of any piping attached to the inlet or outlet of the device.

(5) Operating part. The "operating part" of a safety relief device is the part of a safety relief device that normally closes the safety discharge channel but when moved from this position as a result of the action of heat or pressure, or a combination of the two, permits escape of gas from the cylinder.

(6) Frangible disc. A "frangible disc" is an operating part in the form of a disc, usually of metal and which is so held as to close the safety relief device channel under normal conditions. The disc is intended to burst at a predetermined pressure to permit the escape of gas.

(7) Pressure opening. A "pressure opening" is the orifice against which the frangible disc functions.

(8) Rated bursting pressure. A "rated bursting pressure" of a frangible disc is the maximum pressure for which the disc is designed to burst when in contact with the pressure opening for which it was designed when tested.

(9) Fusible plug. A "fusible plug" is an operating part in the form of a plug of suitable low melting material, usually a metal alloy, which closes the safety relief device channel under normal conditions and is intended to yield or melt at a predetermined temperature to permit the escape of gas.

(10) Yield temperature. The "yield temperature" of a fusible plug is the temperature at which the fusible metal or alloy will yield when tested.

(11) Reinforced fusible plug. A "reinforced fusible plug" is a fusible plug consisting of a core of suitable material having a comparatively high yield temperature surrounded by a low-melting point fusible metal of the required yield temperature.

(12) Combination frangible disc-fusible plug. A "combination frangible disc-fusible plug" is a frangible disc in combination with a low melting point fusible metal, intended to prevent its bursting at its predetermined bursting pressure unless the temperature also is high enough to cause yielding or melting of the fusible metal

(13) Safety relief valve. A "safety relief valve" is a safety relief device containing an operating part that is held normally in a position closing the safety relief device channel by spring force and is intended to open and to close at predetermined pressures.

(14) Combination safety relief valve and fusible plug. A "combination safety relief valve and fusible plug" is a safety relief device utilizing a safety relief valve in combination with a fusible plug. This combination device may be an integral unit or separate units and is intended to open and to close at predetermined pressures or to open at a predetermined temperature.

(15) Set pressure. The "set pressure" of a safety relief valve is the pressure marked on the valve and at which it is set to start-to-discharge.

(16) Start-to-discharge pressure. The "start-to-discharge pressure" of a safety relief valve is the pressure at which the first bubble appears through a water seal of not over 4 inches in the outlet of the safety relief valve.

(17) Flow capacity. The "flow capacity" of a safety relief device is the capacity in cubic feet per minute of free air discharged at the required flow rating pressure.

(18) Flow rating pressure. The "flow rating pressure" is the pressure at which a safety relief device is rated for capacity.

(19) Nonliquefied compressed gas. A "nonliquefied compressed gas" is a gas, other than a gas in solution which under the charging pressure, is entirely gaseous at a temperature of 70°F.

(20) Liquefied compressed gas. A "liquefied compressed gas" is a gas which, under the charging pressure, is partially liquid at a temperature of 70°F. A flammable compressed gas which is normally nonliquefied at 70°F but which is partially liquid under the charging pressure and temperature, shall follow the requirements for liquefied compressed gases.

(21) Compressed gas in solution. A "compressed gas in solution" (Acetylene) is a nonliquefied gas which is dissolved in a solvent.

(22) Pressurized liquid compressed gas. A "pressurized liquid compressed gas" is a compressed gas other than a compressed gas in solution, which cannot be liquefied at a temperature of 70°F, and which is maintained in the liquid state at a pressure not less than 40 p.s.i.a. by maintaining the gas at a temperature less than 70°F.

(23) Test pressure of the cylinder. The "test pressure of the cylinder" is the minimum pressure at which a cylinder must be tested as prescribed in DOT specifications for compressed gas cylinders 41 CFR Ch. 1.

(24) Free air or free gas. "Free air" or "free gas" is air or gas measured at a pressure of 14.7 pounds per square inch absolute and a temperature of 60°F.

(25) DOT regulations. As used in these standards "DOT regulations" refers to the U.S. Department of

Transportation Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight, Express and Baggage Services and by Motor Vehicle (Highway) and Water, including Specifications for Shipping Containers, Code of Federal Regulations, Title 49, Parts 171 to 178.

[Order 73-5, § 296-24-93001, filed 5/9/73 and Order 73-4, § 296-24-93001, filed 5/7/73.]

WAC 296-24-93003 General requirements. (1) Application. Compressed gas cylinder, portable tanks, and cargo tanks shall have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda and S-1.2-1963.

(2) Types of safety relief devices. Types of safety relief devices as covered by this section are designated as follows:

(a) Type CG-1: Frangible disc.

(b) Type CG-2: Fusible plug or reinforced fusible plug utilizing a fusible alloy with yield temperature not over 170°F, nor less than 157°F (165°F nominal).

(c) Type CG-3: Fusible plug or reinforced fusible plug utilizing a fusible alloy with yield temperature not over 220°F, nor less than 208°F (212°F nominal).

(d) Type CG-4: Combination frangible disc-fusible plug, utilizing a fusible alloy with yield temperature not over 170°F, nor less than 157°F (165°F nominal).

(e) Type CG-5: Combination frangible disc-fusible plug, utilizing a fusible alloy with yield temperature not over 220°F, nor less than 208°F (212°F nominal).

(f) Type CG-7: Safety relief valve.

(g) Type CG-8: Combination safety relief valve and fusible plug.

(3) Specifications and tests. All safety relief devices covered by this section shall meet the design, construction, marking and test specification of the "Compressed Gas Association Safety Relief Device Standards Part 1-Cylinders for Compressed Gases: S1.1-1963."

(4) Specific requirements for safety relief devices.

(a) Compressed gas cylinders, which under the regulations of the department of transportation must be equipped with safety relief devices, shall be considered acceptable when equipped with devices of proper construction, location, and discharge capacity under the conditions prescribed in Table 1 of the Compressed Gas Associations Standard S-1.1-1963.

(b) Only replacement parts or assemblies provided by the manufacturer shall be used unless the advisability of interchange is proved by adequate tests.

(c) When a frangible disc is used with a compressed gas cylinder, the rated bursting pressure of the disc shall not exceed the minimum required test pressure of the cylinder with which the device is used, except for DOT-3E cylinders (49 CFR Ch. 1) the rated bursting pressure of the device shall not exceed 4,500 pounds per square inch gage (p.s.i.g.).

(d) When a safety relief valve is used on a compressed gas cylinder, the flow rating pressure shall not exceed the minimum required test pressure of the cylinder on which the safety relief valve is installed and the reseating pressure shall not be less than the pressure in a normally charged cylinder at 130°F.

(e) When fittings and piping are used on either the upstream or downstream side or both of a safety relief device or devices, the passages shall be so designed that the flow capacity of the safety relief device will not be reduced below the capacity required for the container on which the safety relief device assembly is installed, nor to the extent that the operation of the device could be impaired. Fittings, piping, and method of attachment shall be designed to withstand normal handling and the pressures developed when the device or devices function.

(f) No shutoff valve shall be installed between the safety relief devices and the cylinder.

(5) Maintenance requirements for safety relief devices.

(a) As a precaution to keep cylinder safety relief devices in reliable operating condition, care shall be taken in the handling or storing of compressed gas cylinders to avoid damage. Care shall also be exercised to avoid plugging by paint or other dirt accumulation of safety relief device channels or other parts which could interfere with the functioning of the device. Only qualified personnel shall be allowed to service safety relief devices.

(b) Each time a compressed gas cylinder is received at a point for refilling, all safety relief devices shall be examined externally for corrosion, damage, plugging of external safety relief device channels, and mechanical defects such as leakage or extrusion of fusible metal. If there is any doubt regarding the suitability of the safety relief device for service the cylinder shall not be filled until it is equipped with a suitable device.

[Order 73-5, § 296-24-93003, filed 5/9/73 and Order 73-4, § 296-24-93003, filed 5/7/73.]

WAC 296-24-935 Safety relief devices for cargo and portable tanks storing compressed gases.

[Order 73-5, § 296-24-935, filed 5/9/73 and Order 73-4, § 296-24-935, filed 5/7/73.]

WAC 296-24-93501 Definitions. (1) Cargo tank. A "cargo tank" means any container designed to be permanently attached to any motor vehicle or other highway vehicle and in which is to be transported any compressed gas. The term "cargo tank" shall not be construed to include any tank used solely for the purpose of supplying fuel for the propulsion of the vehicle or containers fabricated under specifications for cylinders.

(2) Portable tank. A "portable tank" means any container designed primarily to be temporarily attached to a motor vehicle, other vehicle, railroad car other than tank car, or marine vessel, and equipped with skids, mountings, or accessories to facilitate handling of the container by mechanical means, in which is to be transported any compressed gas. The term "portable tank" shall not be construed to include any cargo tank, any tank car tank or any tank of the DOT-106A and DOT-110A-W type.

(3) Safety relief device. A "safety relief device" means a device intended to prevent rupture of a container under certain conditions of exposure.

(4) Safety relief valve. A "safety relief valve" means a safety relief device containing an operating part that is held normally in a position closing the safety relief device channel by spring force and is intended to open and to close at predetermined pressures.

(5) Set pressure. The "set pressure" of a safety relief valve is the pressure marked on the valve and at which the valve is set to start–to–discharge.

(6) Start–to–discharge pressure. The "start–to–discharge pressure" of a safety relief valve is the pressure at which the first bubble appears through a water seal of not over 4 inches on the outlet of the valve.

Note: When the nature of the service requires the use of a metal–to–metal seat safety relief, valve, with or without secondary sealing means, the start–to–discharge pressure may be considered the pressure at which an audible discharge occurs.

(7) Resealing pressure. The "resealing pressure" of a safety relief valve is the pressure at which leakage ceases through a water seal of not over 4 inches on the outlet of the valve.

(8) Flow capacity. The "flow capacity" of a safety relief device is the capacity in cubic feet per minute of free air discharged at the required flow rating pressure.

(9) Flow rating pressure. The "flow rating pressure" means the pressure at which a safety relief device is rated for capacity.

(10) Free air or free gas. "Free air" or "free gas" means air or gas measured at a pressure of 14.7 pounds per square inch absolute and a temperature of 60°F.

(11) Frangible disc. A "frangible disc" means a safety relief device in the form of a disc, usually of metal, which is so held as to close the safety relief device channel under normal conditions. The disc is intended to burst at a predetermined pressure to permit the escape of gas.

(12) Fusible plug. A "fusible plug" means a safety relief device in the form of a plug of suitable low–melting material, usually a metal alloy, which closes the safety relief device channel under normal conditions and is intended to yield or melt at a predetermined temperature to permit the escape of gas.

(13) DOT design pressure. The "DOT design pressure" is identical to the term "maximum allowable working pressure" as used in the "code" and is the maximum gage pressure at the top of the tank in its operating position. To determine the minimum permissible thickness of physical characteristics of the different parts of the vessel, the static head of the lading shall be added to the DOT design pressure to determine the thickness of any specific part of the vessel. If vacuum insulation is used, the liquid container shall be designed for a pressure of 15 p.s.i. more than DOT design pressure, plus static head of the lading.

EXCEPTION: For containers constructed in accordance with paragraph U–68 or U–69 of section VIII of the ASME Boiler and Pressure Vessel Code, 1949 Edition, the maximum allowable working pressure for the purpose of these standards is considered to be 125 percent of the design pressure as provided in 49 CFR 173.315 of DOT regulations.

(14) Code. "Code" is defined as paragraph U–68, U–69, U–200, or U–201 of section VIII of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers, 1949 Edition, or section VIII of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers, 1950, 1952, 1956, 1959, and 1962 Editions; or the Code for Unfired Pressure Vessels for Petroleum Liquids and Gases of the American Petroleum Institute and the American Society of Mechanical Engineers (API–ASME), 1951 Edition.

(15) DOT regulations. The "DOT regulations" refers to department of transportation regulations for transportation of explosives and other dangerous articles by land and water in rail freight, express and baggage services and by motor vehicle (highway) and water, including specifications for shipping containers, Code of Federal Regulations, Title 49, Parts 171 to 178.

[Order 73–5, § 296–24–93501, filed 5/9/73 and Order 73–4, § 296–24–93501, filed 5/7/73.]

WAC 296–24–93503 General requirements. (1) Application. See WAC 296–24–93003(1).

(2) Specifications and tests. All safety relief devices covered by these standards shall meet the design, construction, marking, and test specifications of the "Compressed Gas Association Safety Relief Device Standards Part 2–Cargo and Portable Tanks for Compressed Gases: S–1.2–1963."

(3) Specific requirements for safety relief devices.

(a) Each container shall be provided with one or more safety relief devices which, unless otherwise specified, shall be safety relief valves of the spring–loaded type.

(b) Safety relief valves shall be set to start–to–discharge at a pressure not in excess of 110 percent of the DOT design pressure of the container nor less than the DOT design pressure of the container except as follows:

(i) If an overdesigned container is used, the set pressure of the safety relief valve may be between the minimum required DOT design pressure for the lading and 110 percent of the DOT design pressure of the container used.

(ii) For sulfur dioxide containers, a minimum set pressure of 120 and 110 p.s.i.g. is permitted for the 150 and 125 p.s.i.g. DOT design pressure containers, respectively.

(iii) For carbon dioxide (refrigerated), nitrous oxide (refrigerated), and pressurized liquid argon, nitrogen and oxygen, there shall be no minimum set pressure.

(iv) For butadiene, inhibited, and liquefied petroleum gas containers, a minimum set pressure of 90 percent of the minimum design pressure permitted for these ladings may be used.

(v) For containers constructed in accord with paragraph U–68 or U–69 of the Code 1949 Edition, the set pressure marked on the safety relief valve may be 125 percent of the original DOT design pressure of the container.

(c) Only replacement parts or assemblies provided by the manufacturer of the device shall be used unless the suitability of interchange is proved by adequate tests.

(d) Safety relief valves shall have direct communication with the vapor space of the container.

(e) Any portion of liquid piping or hose which at any time may be closed at each end must be provided with a safety relief device to prevent excessive pressure.

(f) The additional restrictions of this subdivision apply to safety relief devices on containers for carbon dioxide or nitrous oxide which are shipped in refrigerated and insulated containers. The maximum operating pressure in the container may be regulated by the use of one or more pressure controlling devices, which devices shall not be in lieu of the safety relief valve required in WAC 296-24-93503 (3)(a).

(g) All safety relief devices shall be so installed and located that the cooling effect of the contents will not prevent the effective operation of the device.

(h) In addition to the safety relief valves required by WAC 296-24-93503 (3)(a) each container for carbon dioxide may be equipped with one or more frangible disc safety relief devices of suitable design set to function at a pressure not exceeding two times the DOT design pressure of the container.

(i) Subject to conditions of 49 CFR 173.315(a)(1) (DOT regulations) for methyl chloride and sulfur dioxide optional portable tanks of 225 p.s.i.g. minimum DOT design pressure, one or more fusible plugs approved by the Bureau of Explosives, 63 Vesey Street, New York, NY 10007, may be used in lieu of safety relief valves of the spring-loaded type. If the container is over 30 inches long a safety relief device having the total required flow capacity must be at both ends.

(j) When storage containers for liquefied petroleum gas are permitted to be shipped in accordance with 49 CFR 173.315(j) (DOT regulations), they must be equipped with safety relief devices in compliance with the requirements for safety relief devices on above-ground containers as specified in the National Fire Protection Association Pamphlet No. 58-1969 "Standard for the Storage and Handling of Liquefied Petroleum Gases."

(k) When containers are filled by pumping equipment which has a discharge capacity in excess of the capacity of the container safety relief devices, and which is capable of producing pressures in excess of DOT design pressure of the container, precautions should be taken to prevent the development of pressures in the container in excess of 120 percent of its DOT design pressure. This may be done by providing additional capacity of the safety relief valves on the container, by providing a bypass on the pump discharge, or by any other suitable method.

(l) This additional requirement applies to safety relief devices on containers for liquefied hydrogen and pressurized liquid argon, nitrogen, and oxygen. The liquid container shall be protected by one or more safety relief valves and one or more frangible discs.

(m) Safety relief devices shall be arranged to discharge unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container. Safety relief devices shall be arranged to discharge upward except this is not required for carbon dioxide, nitrous oxide and pressurized liquid argon, nitrogen, and oxygen.

(n) No shutoff valves shall be installed between the safety relief devices and the container except, in cases where two or more safety relief devices are installed on the same container, a shutoff valve may be used where the arrangement of the shutoff valve or valves is such as always to insure full required capacity flow through at least one safety relief device.

(4) Maintenance requirements for safety relief devices. (a) Care shall be exercised to avoid damage to safety relief devices. Care shall also be exercised to avoid plugging by paint or other dirt accumulation of safety relief device channels or other parts which could interfere with the functioning of the device.

(b) Only qualified personnel shall be allowed to service safety relief devices. Any servicing or repairs which require resetting of safety relief valves shall be done only by or after consultation with the valve manufacturer.

(c) Safety relief devices periodically shall be examined externally for corrosion damage, plugging of external safety relief device channels, and mechanical defects such as leakage or extrusion of fusible metal. Valves equipped with secondary resilient seals shall have the seals inspected periodically. If there is any doubt regarding the suitability of the safety relief device for service the container shall not be filled until it is equipped with a suitable safety relief device.

[Order 73-5, § 296-24-93503, filed 5/9/73 and Order 73-4, § 296-24-93503, filed 5/7/73.]

WAC 296-24-940 Air receivers.

[Order 73-5, § 296-24-940, filed 5/9/73 and Order 73-4, § 296-24-940, filed 5/7/73.]

WAC 296-24-94001 General requirements.

(1) Application. These standards apply to compressed air receivers, and other equipment used in providing and utilizing compressed air for performing operations such as cleaning, drilling, hoisting, and chipping. On the other hand, however, this section does not deal with the special problems created by using compressed air to convey materials nor the problems created when men work in compressed air as in tunnels and caissons. These standards are not intended to apply to compressed air machinery and equipment used on transportation vehicles such as steam railroad cars, electric railway cars, and automotive equipment.

(2) New and existing equipment.

(a) All new air receivers installed after the effective date of these standards shall be constructed in accordance with the 1968 Edition of the A.S.M.E. Boiler and Pressure Vessel Code, section VIII.

(b) All safety valves used shall be constructed, installed, and maintained in accordance with the A.S.M.E. Boiler and Pressure Vessel Code, section VIII edition 1968.

[Order 73-5, § 296-24-94001, filed 5/9/73 and Order 73-4, § 296-24-94001, filed 5/7/73.]

WAC 296-24-94003 Installation and equipment requirements. (1) Installation. Air receivers shall be so installed that all drains, handholes, and manholes therein are easily accessible. Air receivers should be supported with sufficient clearance to permit a complete external inspection and to avoid corrosion of external surfaces. Under no circumstances shall an air receiver be buried underground or located in an inaccessible place. The receiver should be located as close to the compressor or after-cooler as is possible in order to keep the discharge pipe short.

(2) Drains and traps. All air receivers having an internal and external operating pressure exceeding 15 psi with no limitation on size, and air receivers having an inside diameter exceeding six inches, with no limitation on pressure, if subject to corrosion, shall be supplied with a drain pipe and valve at the lowest point in the vessel; or a pipe may be used extending inward from any other location to within one-quarter inch of the lowest point. Adequate automatic traps may be installed in addition to drain valves. The drain valve on the air receiver shall be opened and the receiver completely drained frequently and at such intervals as to prevent the accumulation of oil and water in the receiver.

(3) Gages and valves.

(a) Every air receiver shall be equipped with an indicating pressure gage (so located as to be readily visible) and with one or more spring-loaded safety valves. The total relieving capacity of such safety valves shall be such as to prevent pressure in the receiver from exceeding the maximum allowable working pressure of the receiver by more than 10 percent.

(b) No valve of any type shall be placed between the air receiver and its safety valve or valves.

(c) Safety appliances, such as safety valves, indicating devices and controlling devices, shall be constructed, located, and installed so that they cannot be readily rendered inoperative by any means, including the elements.

(d) All safety valves shall be tested frequently and at regular intervals to determine whether they are in good operating condition.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-24-94003, filed 5/15/89, effective 6/30/89; Order 73-5, § 296-24-94003, filed 5/9/73 and Order 73-4, § 296-24-94003, filed 5/7/73.]

Part L
ELECTRICAL

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS SUBCHAPTER

296-24-950 Electrical—Application. [Order 74-27, § 296-24-950, filed 5/7/74.] Repealed by 83-24-013 (Order 83-34), filed 11/30/83. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-24-955 National Electrical Code. [Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-015 (Order 80-21), § 296-24-955, filed 11/13/80; 78-12-017 (Order 78-22), § 296-24-955, filed 11/13/78; Order 77-12, § 296-24-955, filed 7/11/77; Order 74-27, § 296-24-955, filed 5/7/74.] Repealed by 82-08-026 (Order 82-10), filed 3/30/82. Statutory Authority: RCW 49.17.040 and 49.17.050.

WAC 296-24-956 Electrical. This section addresses electrical safety requirements that are necessary for the practical safeguarding of employees in their workplaces.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-24-956, filed 3/30/82.]

WAC 296-24-95601 Definitions applicable to WAC 296-24-956 through 296-24-95615. Unless the context indicates otherwise, words used in this section shall have the meaning given.

(1) **Acceptable.** An installation or equipment is acceptable to the director of labor and industries, and approved within the meaning of this section:

(a) If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a nationally recognized testing laboratory; or

(b) With respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another federal agency, or by a state, municipal, or other local authority responsible for enforcing occupational safety provisions of the National Electrical Code, and found in compliance with the provisions of the National Electrical Code as applied in this section; or

(c) With respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by a particular customer, if it is determined to be safe for its intended use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the director and his authorized representatives. Refer to federal regulation 29 CFR 1910.7 for definition of nationally recognized testing laboratory.

(2) **Accepted.** An installation is "accepted" if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes.

(3) **Accessible.** (As applied to wiring methods.) Capable of being removed or exposed without damaging the building structure of finish, or not permanently closed in by the structure or finish of the building. (See "concealed" and "exposed.")

(4) **Accessible.** (As applied to equipment.) Admitting close approach; not guarded by locked doors, elevation, or other effective means. (See "readily accessible.")

(5) **Ampacity.** Current–carrying capacity of electric conductors expressed in amperes.

(6) **Appliances.** Utilization equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, etc.

(7) **Approved.** Acceptable to the authority enforcing this section. The authority enforcing this section is the director of labor and industries. The definition of "acceptable" indicates what is acceptable to the director and therefore approved within the meaning of this section.

(8) **Approved for the purpose.** Approved for a specific purpose, environment, or application described in a particular standard requirement.

Suitability of equipment or materials for a specific purpose, environment or application may be determined by a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation as part of its listing and labeling program. (See "labeled" or "listed.")

(9) **Armored cable.** Type AC armored cable is a fabricated assembly of insulated conductors in a flexible metallic enclosure.

(10) **Askarel.** A generic term for a group of nonflammable synthetic chlorinated hydrocarbons used as electrical insulating media. Askarels of various compositional types are used. Under arcing conditions the gases produced, while consisting predominantly of noncombustible hydrogen chloride, can include varying amounts of combustible gases depending upon the askarel type.

(11) **Attachment plug (plug cap) (cap).** A device which, by insertion in a receptacle, establishes connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle.

(12) **Automatic.** Self–acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature, or mechanical configuration.

(13) **Bare conductor, see "conductor."**

(14) **Bonding.** The permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

(15) **Bonding jumper.** A reliable conductor to assure the required electrical conductivity between metal parts required to be electrically connected.

(16) **Branch circuit.** The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s).

(17) **Building.** A structure which stands alone or which is cut off from adjoining structures by fire walls with all openings therein protected by approved fire doors.

(18) **Cabinet.** An enclosure designed either for surface or flush mounting, and provided with a frame, mat, or trim in which a swinging door or doors are or may be hung.

(19) **Cable tray system.** A cable tray system is a unit or assembly of units or sections, and associated fittings, made of metal or other noncombustible materials forming a rigid structural system used to support cables. Cable tray systems include ladders, troughs, channels, solid bottom trays, and other similar structures.

(20) **Cablebus.** Cablebus is an approved assembly of insulated conductors with fittings and conductor terminations in a completely enclosed, ventilated, protective metal housing.

(21) **Center pivot irrigation machine.** A center pivot irrigation machine is a multimotored irrigation machine which revolves around a central pivot and employs alignment switches or similar devices to control individual motors.

(22) **Certified.** Equipment is "certified" if it (a) has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner, or (b) is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and (c) it bears a label, tag, or other record of certification.

(23) **Circuit breaker.**

(a) **(600 volts nominal, or less.)** A device designed to open and close a circuit by nonautomatic means and to open the circuit automatically on a predetermined overcurrent without injury to itself when properly applied within its rating.

(b) **(Over 600 volts, nominal.)** A switching device capable of making, carrying, and breaking currents under normal circuit conditions, and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions, such as those of short circuit.

(24) **Class I locations.** Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations include the following:

(a) **Class I, Division 1.** A Class I, Division 1 location is a location:

(i) In which hazardous concentrations of flammable gases or vapors may exist under normal operating conditions; or

(ii) In which hazardous concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or

(iii) In which breakdown or faulty operation of equipment or processes might release hazardous concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

Note: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another; interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used; locations containing open tanks or vats of volatile flammable liquids; drying rooms or compartments for the evaporation of flammable solvents; locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where flammable liquids are used; gas generator rooms and

other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers; and all other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

(b) **Class I, Division 2.** A Class I, Division 2 location is a location:

(i) In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or

(ii) In which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or

(iii) That is adjacent to a Class I, Division 1 location, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

Note: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Locations used for the storage of flammable liquids or a liquefied or compressed gases in sealed containers would not normally be considered hazardous unless also subject to other hazardous conditions.

Electrical conduits and their associated enclosures separated from process fluids by a single seal or barrier are classed as a Division 2 location if the outside of the conduit and enclosures is a nonhazardous location.

(25) **Class II locations.** Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations include the following:

(a) **Class II, Division 1.** A Class II, Division 1 location is a location:

(i) In which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosives or ignitible mixtures; or

(ii) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes; or

(iii) In which combustible dusts of an electrically conductive nature may be present.

Note: This classification may include areas of grain handling and processing plants, starch plants, sugar-pulverizing plants, malting plants, hay-grinding plants, coal pulverizing plants, areas where metal dusts and powders are produced or processed, and other similar locations which contain dust producing machinery and equipment (except where the equipment is dust-tight or vented to the outside). These areas would have combustible dust in the air, under normal operating conditions, in quantities sufficient to produce explosive or ignitible mixtures. Combustible dusts which are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and woodflour, oil meal from beans and seed, dried hay, and other organic materials which may produce combustible dusts when processed or handled. Dusts containing magnesium or aluminum are particularly hazardous and the use of extreme caution is necessary to avoid ignition and explosion.

(b) **Class II, Division 2.** A Class II, Division 2 location is a location in which:

(i) Combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitible mixtures; and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or

(ii) Dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment, and dust accumulations resulting therefrom may be ignitible by abnormal operation or failure of electrical equipment or other apparatus.

Note: This classification includes locations where dangerous concentrations of suspended dust would not be likely but where dust accumulations might form on or in the vicinity of electric equipment. These areas may contain equipment from which appreciable quantities of dust would escape under abnormal operating conditions or be adjacent to a Class II Division 1 location, as described above, into which an explosive or ignitible concentration of dust may be put into suspension under abnormal operating conditions.

(26) **Class III locations.** Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations include the following:

(a) **Class III, Division 1.** A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

Note: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cottonseed mills; flax-processing plants; clothing manufacturing plants; woodworking plants, and establishments; and industries involving similar hazardous processes or conditions.

Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, and other materials of similar nature.

(b) **Class III, Division 2.** A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled, except in process of manufacture.

(27) **Collector ring.** A collector ring is an assembly of slip rings for transferring electrical energy from a stationary to a rotating member.

(28) **Concealed.** Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them. (See "accessible. (As applied to wiring methods.")

(29) **Conductor.**

(a) **Bare.** A conductor having no covering or electrical insulation whatsoever.

(b) **Covered.** A conductor encased within material of composition or thickness that is not recognized as electrical insulation.

(c) **Insulated.** A conductor encased within material of composition and thickness that is recognized as electrical insulation.

(30) **Conduit body.** A separate portion of a conduit or tubing system that provides access through a removable cover(s) to the interior of the system at a junction of two or more sections of the system or at a terminal point of the system. Boxes such as FS and FD or larger cast or sheet metal boxes are not classified as conduit bodies.

(31) **Controller.** A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

(32) **Cooking unit, counter-mounted.** A cooking appliance designed for mounting in or on a counter and consisting of one or more heating elements, internal wiring, and built-in or separately mountable controls. (See "oven, wall-mounted.")

(33) **Covered conductor.** See "conductor."

(34) **Cutout.** (Over 600 volts, nominal.) An assembly of a fuse support with either a fuseholder, fuse carrier, or disconnecting blade. The fuseholder or fuse carrier may include a conducting element (fuse link), or may act as the disconnecting blade by the inclusion of an nonfusible member.

(35) **Cutout box.** An enclosure designed for surface mounting and having swinging doors or covers secured directly to and telescoping with the walls of the box proper. (See "cabinet.")

(36) **Damp location.** See "location."

(37) **Dead front.** Without live parts exposed to a person on the operating side of the equipment.

(38) **Device.** A unit of an electrical system which is intended to carry but not utilize electric energy.

(39) **Dielectric heating.** Dielectric heating is the heating of a nominally insulating material due to its own dielectric losses when the materials is placed in a varying electric filed.

(40) **Disconnecting means.** A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

(41) **Disconnecting (or isolating) switch.** (Over 600 volts, nominal.) A mechanical switching device used for isolating a circuit or equipment from a source of power.

(42) **Dry location.** See "location."

(43) **Electric sign.** A fixed, stationary, or portable self-contained, electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention.

(44) **Enclosed.** Surrounded by a case, housing, fence or walls which will prevent persons from accidentally contacting energized parts.

(45) **Enclosure.** The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts, or to protect the equipment from physical damage.

(46) **Equipment.** A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like, used as a part of, or in connection with, an electrical installation.

(47) **Equipment grounding conductor.** See "grounding conductor, equipment."

(48) **Explosion-proof apparatus.** Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor which may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and which operates at such an external temperature that it will not ignite a surrounding flammable atmosphere.

(49) **Exposed.** (As applied to live parts.) Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts not suitably guarded, isolated, or insulated. (See "accessible" and "concealed.")

(50) **Exposed.** (As applied to wiring methods.) On or attached to the surface or behind panels designed to allow access. (See "accessible. (As applied to wiring methods.")

(51) **Exposed.** (For the purpose of WAC 296-24-95615(5), communications systems.) Where the circuit is in such a position that in case of failure of supports or insulation, contact with another circuit may result.

(52) **Externally operable.** Capable of being operated without exposing the operator to contact with live parts.

(53) **Feeder.** All circuit conductors between the service equipment, or the generator switchboard of an isolated plant, and the final branch-circuit overcurrent device.

(54) **Fitting.** An accessory such as a locknut, bushing, or other part of a wiring system that is intended primarily to perform a mechanical rather than an electrical function.

(55) **Fuse.** (Over 600 volts, nominal.) An overcurrent protective device with a circuit opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse comprises all the parts that form a unit capable of performing the prescribed functions. It may or may not be the complete device necessary to connect it into an electrical circuit.

(56) **Ground.** A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

(57) **Grounded.** Connected to earth or to some conducting body that serves in place of the earth.

(58) **Grounded, effectively.** (Over 600 volts, nominal.) Permanently connected to earth through a ground connection of sufficiently low impedance and having sufficient ampacity that ground fault current which may occur cannot build up to voltages dangerous to personnel.

(59) **Grounded conductor.** A system or circuit conductor that is intentionally grounded.

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

(61) **Grounding conductor, equipment.** The conductor used to connect the noncurrent-carrying metal parts of equipment, raceways, and other enclosures to the system grounded conductor and/or the grounding electrode conductor at the service equipment or at the source of a separately derived system.

(62) **Grounding electrode conductor.** The conductor used to connect the grounding electrode to the equipment grounding conductor and/or to the grounded conductor of the circuit at the service equipment or at the source of a separately derived system.

(63) **Ground-fault circuit-interrupter.** A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

(64) **Guarded.** Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach to a point of danger or contact by persons or objects.

(65) **Health care facilities.** Buildings or portions of buildings and mobile homes that contain, but are not limited to, hospitals, nursing homes, extended care facilities, clinics, and medical and dental offices, whether fixed or mobile.

(66) **Heating equipment.** For the purposes of WAC 296-24-95611(7), the term "heating equipment" includes any equipment used for heating purposes if heat is generated by induction or dielectric methods.

(67) **Hoistway.** Any shaftway, hatchway, well hole, or other vertical opening or space in which an elevator or dumbwaiter is designed to operate.

(68) **Identified.** Identified, as used in reference to a conductor or its terminal, means that such conductor or terminal can be readily recognized as grounded.

(69) **Induction heating.** Induction heating is the heating of a nominally conductive material due to its own I^2R losses when the material is placed in a varying electromagnetic field.

(70) **Insulated conductor.** See "conductor."

(71) **Interrupter switch.** (Over 600 volts, nominal.) A switch capable of making, carrying, and interrupting specified currents.

(72) **Irrigation machine.** An irrigation machine is an electrically driven or controlled machine, with one or more motors, not hand portable, and used primarily to transport and distribute water for agricultural purposes.

(73) **Isolated.** Not readily accessible to persons unless special means for access are used.

(74) **Isolated power system.** A system comprising an isolating transformer or its equivalent, a line isolation monitor, and its ungrounded circuit conductors.

(75) **Labeled.** Equipment is "labeled" if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which, (a) makes periodic inspections of the production of such equipment, and (b) whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

(76) **Lighting outlet.** An outlet intended for the direct connection of a lampholder, a lighting fixture, or a pendant cord terminating in a lampholder.

(77) **Listed.** Equipment is "listed" if it is of a kind mentioned in a list which, (a) is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment, and (b) states such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

(78) **Location.**

(a) **Damp location.** Partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses.

(b) **Dry location.** A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.

(c) **Wet location.** Installations underground or in concrete slabs or masonry in direct contact with the earth, and locations subject to saturation with water or other liquids, such as vehicle-washing areas, and locations exposed to weather and unprotected.

(79) **Medium voltage cable.** Type MV medium voltage cable is a single or multiconductor solid dielectric insulated cable rated 2000 volts or higher.

(80) **Metal-clad cable.** Type MC cable is a factory assembly of one or more conductors, each individually insulated and enclosed in a metallic sheath of interlocking tape, or a smooth or corrugated tube.

(81) **Mineral-insulated metal-sheathed cable.** Type MI mineral-insulated metal-sheathed cable is a factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper sheath.

(82) **Mobile x-ray.** X-ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled.

(83) **Nonmetallic-sheathed cable.** Nonmetallic-sheathed cable is a factory assembly of two or more insulated conductors having an outer sheath of moisture resistant, flame-retardant, nonmetallic material. Nonmetallic sheathed cable is manufactured in the following types:

(a) **Type NM.** The overall covering has a flame-retardant and moisture-resistant finish.

(b) **Type NMC.** The overall covering is flame–retardant, moisture–resistant, fungus–resistant, and corrosion–resistant.

(84) **Oil (filled) cutout.** (Over 600 volts, nominal.) A cutout in which all or part of the fuse support and its fuse link or disconnecting blade are mounted in oil with complete immersion of the contacts and the fusible portion of the conducting element (fuse link), so that arc interruption by severing of the fuse link or by opening of the contacts will occur under oil.

(85) **Open wiring on insulators.** Open wiring on insulators is an exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of single insulated conductors run in or on buildings, and not concealed by the building structure.

(86) **Outlet.** A point on the wiring system at which current is taken to supply utilization equipment.

(87) **Outline lighting.** An arrangement of incandescent lamps or electric discharge tubing to outline or call attention to certain features such as the shape of a building or the decoration of a window.

(88) **Oven, wall–mounted.** An oven for cooking purposes designed for mounting in or on a wall or other surface and consisting of one or more heating elements, internal wiring, and built–in or separately mountable controls. (See "cooking unit, counter–mounted.")

(89) **Overcurrent.** Any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload (see definition), short circuit, or ground fault. A current in excess of rating may be accommodated by certain equipment and conductors for a given set of conditions. Hence the rules for overcurrent protection are specific for particular situations.

(90) **Overload.** Operation of equipment in excess of normal, full load rating, or of a conductor in excess of rated ampacity which, when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as a short circuit or ground fault, is not an overload. (See "overcurrent.")

(91) **Panelboard.** A single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices, and with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front. (See "switchboard.")

(92) **Permanently installed decorative fountains and reflection pools.** Those that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled for storage and are served by electrical circuits of any nature. These units are primarily constructed for their aesthetic value and not intended for swimming or wading.

(93) **Permanently installed swimming pools, wading and therapeutic pools.** Those that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled for storage whether or not served by electrical circuits of any nature.

(94) **Portable x–ray.** X–ray equipment designed to be hand–carried.

(95) **Power and control tray cable.** Type TC power and control tray cable is a factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors under a nonmetallic sheath, approved for installation in cable trays, in raceways, or where supported by a messenger wire.

(96) **Power fuse.** (Over 600 volts, nominal.) See "fuse."

(97) **Power–limited tray cable.** Type PLTC nonmetallic–sheathed power limited tray cable is a factory assembly of two or more insulated conductors under a nonmetallic jacket.

(98) **Power outlet.** An enclosed assembly which may include receptacles, circuit breakers, fuseholders, fused switches, buses and watt–hour meter mounting means; intended to supply and control power to mobile homes, recreational vehicles or boats, or to serve as a means for distributing power required to operate mobile or temporarily installed equipment.

(99) **Premises wiring system.** That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all of its associated hardware, fittings, and wiring devices, both permanently and temporarily installed, which extends from the load end of the service drop, or load end of the service lateral conductors to the outlet(s). Such wiring does not include wiring internal to appliances, fixtures, motors, controllers, motor control centers, and similar equipment.

(100) **Qualified person.** One familiar with the construction and operation of the equipment and the hazards involved.

(101) **Raceway.** A channel designed expressly for holding wires, cables, or busbars, with additional functions as permitted in this subpart. Raceways may be of metal or insulating material, and the term includes rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible metal conduit, flexible metallic tubing, flexible metal conduit, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface raceways, wireways, and busways.

(102) **Readily accessible.** Capable of being reached quickly for operation, renewal, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc. (See "accessible.")

(103) **Receptacle.** A receptacle is a contact device installed at the outlet for the connection of a single attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is a single device containing two or more receptacles.

(104) **Receptacle outlet.** An outlet where one or more receptacles are installed.

(105) **Remote–control circuit.** Any electric circuit that controls any other circuit through a relay or an equivalent device.

(106) **Sealable equipment.** Equipment enclosed in a case or cabinet that is provided with a means of sealing or locking so that live parts cannot be made accessible

without opening the enclosure. The equipment may or may not be operable without opening the enclosure.

(107) **Separately derived system.** A premises wiring system whose power is derived from generator, transformer, or converter winding and has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system.

(108) **Service.** The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served.

(109) **Service cable.** Service conductors made up in the form of a cable.

(110) **Service conductors.** The supply conductors that extend from the street main or from transformers to the service equipment of the premises supplied.

(111) **Service drop.** The overhead service conductors from the last pole or other aerial support to and including the splices, if any, connecting to the service–entrance conductors at the building or other structure.

(112) **Service–entrance cable.** Service–entrance cable is a single conductor or multiconductor assembly provided with or without an overall covering, primarily used for services and of the following types:

(a) *Type SE*, having a flame–retardant, moisture–resistant covering, but not required to have inherent protection against mechanical abuse.

(b) *Type USE*, recognized for underground use, having a moisture–resistant covering, but not required to have a flame–retardant covering or inherent protection against mechanical abuse. Single–conductor cables having an insulation specifically approved for the purpose do not require an outer covering.

(113) **Service–entrance conductors, overhead system.** The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.

(114) **Service entrance conductors, underground system.** The service conductors between the terminals of the service equipment and the point of connection to the service lateral. Where service equipment is located outside the building walls, there may be no service–entrance conductors, or they may be entirely outside the building.

(115) **Service equipment.** The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means of cutoff of the supply.

(116) **Service raceway.** The raceway that encloses the service–entrance conductors.

(117) **Shielded nonmetallic–sheathed cable.** Type SNM, shielded nonmetallic–sheathed cable is a factory assembly of two or more insulated conductors in an extruded core of moisture–resistant, flame–resistant nonmetallic material, covered with an overlapping spiral metal tape and wire shield and jacketed with an extruded moisture–resistant, flame–resistant, oil–resistant, corrosion–resistant, fungus–resistant, and sunlight–resistant nonmetallic material.

(118) **Show window.** Any window used or designed to be used for the display of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear and whether or not it has a platform raised higher than the street floor level.

(119) **Sign.** See "electric sign."

(120) **Signaling circuit.** Any electric circuit that energizes signaling equipment.

(121) **Special permission.** The written consent of the authority having jurisdiction.

(122) **Storable swimming or wading pool.** A pool with a maximum dimension of fifteen feet and a maximum wall height of three feet and is so constructed that it may be readily disassembled for storage and reassembled to its original integrity.

(123) **Switchboard.** A large single panel, frame, or assembly of panels which have switches, buses, instruments, overcurrent and other protective devices mounted on the face or back or both. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets. (See "panelboard.")

(124) **Switches.**

(a) **General–use switch.** A switch intended for use in general distribution and branch circuits. It is rated in amperes, and it is capable of interrupting its rated current at its rated voltage.

(b) **General–use snap switch.** A form of general–use switch so constructed that it can be installed in flush device boxes or on outlet box covers, or otherwise used in conjunction with wiring systems recognized by this subpart.

(c) **Isolating switch.** A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating, and it is intended to be operated only after the circuit has been opened by some other means.

(d) **Motor–circuit switch.** A switch, rated in horsepower, capable of interrupting the maximum operating overload current of a motor of the same horsepower rating as the switch at the rated voltage.

(125) **Switching devices.** (Over 600 volts, nominal.) Devices designed to close and/or open one or more electric circuits. Included in this category are circuit breakers, cutouts, disconnecting (or isolating) switches, disconnecting means, interrupter switches, and oil (filled) cutouts.

(126) **Transportable x–ray.** X–ray equipment installed in a vehicle or that may readily be disassembled for transport in a vehicle.

(127) **Utilization equipment.** Utilization equipment means equipment which utilizes electric energy for mechanical, chemical, heating, lighting, or similar useful purpose.

(128) **Utilization system.** A utilization system is a system which provides electric power and light for employee workplaces, and includes the premises wiring system and utilization equipment.

(129) **Ventilated.** Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors.

(130) **Volatile flammable liquid.** A flammable liquid having a flash point below 38 degrees C (100 degrees F) or whose temperature is above its flash point.

(131) **Voltage (of a circuit).** The greatest root-mean-square (effective) difference of potential between any two conductors of the circuit concerned.

(132) **Voltage, nominal.** A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240, 480Y/277, 600, etc.). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

(133) **Voltage to ground.** For grounded circuits, the voltage between the given conductor and that point or conductor of the circuit that is grounded; for ungrounded circuits, the greatest voltage between the given conductor and any other conductor of the circuit.

(134) **Watertight.** So constructed that moisture will not enter the enclosure.

(135) **Weatherproof.** So constructed or protected that exposure to the weather will not interfere with successful operation. Rainproof, raintight, or watertight equipment can fulfill the requirements for weatherproof where varying weather conditions other than wetness, such as snow, ice, dust, or temperature extremes, are not a factor.

(136) **Wet location.** See "location."

(137) **Wireways.** Wireways are sheet-metal troughs with hinged or removable covers for housing and protecting electric wires and cable and in which conductors are laid in place after the wireway has been installed as a complete system.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-24-95601, filed 11/14/88; 87-24-051 (Order 87-24), § 296-24-95601, filed 11/30/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-24-95601, filed 3/30/82.]

WAC 296-24-95603 Electric utilization systems. (1) **Scope.**

(a) **Covered.** The provisions of WAC 296-24-95603 through 296-24-95617 cover electrical installations and utilization equipment installed or used within or on buildings, structures, and other premises including:

(i) Yards;

(ii) Carnivals;

(iii) Parking and other lots;

(iv) Mobile homes;

(v) Recreational vehicles;

(vi) Industrial substations under 750 volts. Chapter 296-44 WAC, Safety standards—Electrical Construction Code, shall apply to industrial substations of 750 volts or more;

(vii) Conductors that connect the installations to a supply of electricity; and

(viii) Other outside conductors on the premises.

(b) **Not covered.** The provisions of WAC 296-24-95603 through 296-24-95617 do not cover:

(i) Installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.

(ii) Installations underground in mines.

(iii) Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communication purposes.

(iv) Installations of communication equipment under the exclusive control of communication utilities, located outdoors or in building spaces used exclusively for such installations.

(v) Installations under the exclusive control of electric utilities for the purpose of communication or metering; or for the generation, control, transformation, transmission, and distribution of electric energy located in buildings used exclusively by utilities for such purposes or located outdoors on property owned or leased by the utility or on public highways, streets, roads, etc., or outdoors by established rights on private property.

(2) **Extent of application.**

(a) The requirements contained in the sections listed below shall apply to all electrical installations and utilization equipment, regardless of when they were designed or installed:

Sections:

WAC 296-24-95605(2)	Examination, installation, and use of equipment.
" " (3)	Splices.
" " (4)	Arcing parts.
" " (5)	Marking.
" " (6)	Identification of disconnecting means.
" " (7)(b)	Guarding of live parts.
WAC 296-24-95607 (5)(a)(i)	Protection of conductors and equipment.
" " (5)(a)(iv)	Location in or on premises.
" " (5)(a)(v)	Arcing or suddenly moving parts.
" " (6)(a)(ii)	2-Wire DC systems to be grounded.
" " (6)(a)(iii) and (iv)	AC systems to be grounded.
" " (6)(a)(v)	AC systems 50 to 1000 volts not required to be grounded.
" " (6)(c)	Grounding connections.
" " (6)(d)	Grounding path.
WAC 296-24-95607 (6)(e)(iv)(A) through (D)	Fixed equipment required to be grounded.
" " (6)(e)(v)	Grounding of equipment connected by cord and plug.
" " (6)(e)(vi)	Grounding or nonelectrical equipment.
" " (6)(f)(i)	Methods of grounding fixed equipment.
WAC 296-24-95609 (7)(a)(i) and (ii)	Flexible cords and cables, uses.
" " (7)(a)(iii)	Flexible cords and cables prohibited.
" " (7)(b)(ii)	Flexible cords and cables, splices.

Sections:

" " (7)(b)(iii)	Pull at joints and terminals of flexible cords and cables.
WAC 296-24-95613	Hazardous (classified) locations.

(b) Every electric utilization system and all utilization equipment installed after March 15, 1972, and every major replacement, modification, repair, or rehabilitation, after March 15, 1972, of any part of any electric utilization system or utilization equipment installed before March 15, 1972, shall comply with the provisions of WAC 296-24-956 through 296-24-95617.

Note: "Major replacements, modifications, repairs, or rehabilitations" include work similar to that involved when a new building or facility is built, a new wing is added, or an entire floor is renovated.

(c) The following provisions apply to electric utilization systems and utilization equipment installed after April 16, 1981:

WAC 296-24-95605 (8)(d)(i) and (ii)	Entrance and access to work space (over 600 volts).
WAC 296-24-95607 (5)(a)(vi)(B)	Circuit breakers operated vertically.
" " (5)(a)(vi)(C)	Circuit breakers used as switches.
" " (6)(g)(ii)	Grounding of systems of 1000 volts or more supplying portable or mobile equipment.
WAC 296-24-95609 (10)(f)(ii)(B)	Switching series capacitors over 600 volts.
WAC 296-24-95611 (3)(b)	Warning signs for elevators and escalators.
" " (9)	Electrically controlled irrigation machines.
" " (10)(e)	Ground-fault circuit interrupters for fountains.
WAC 296-24-95615 (1)(a)(ii)	Physical protection of conductors over 600 volts.
" " (3)(b)	Marking of Class 2 and Class 3 power supplies.
" " (4)	Fire protective signaling circuits.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-24-95603, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-24-95603, filed 3/30/82.]

WAC 296-24-95605 General requirements. (1) **Approval.** The conductors and equipment required or permitted by this section shall be acceptable only if approved.

(2) **Examination, installation, and use of equipment.**

(a) **Examination.** Electrical equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees. Safety of equipment shall be determined using the following considerations:

(i) Suitability for installation and use in conformity with the provisions of this subpart. Suitability of equipment for an identified purpose may be evidenced by listing or labeling for that identified purpose.

(ii) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided.

(iii) Electrical insulation.

(iv) Heating effects under conditions of use.

(v) Arcing effects.

(vi) Classification by type, size, voltage, current capacity, specific use.

(vii) Other factors which contribute to the practical safeguarding of employees using or likely to come in contact with the equipment.

(b) **Installation and use.** Listed or labeled equipment shall be used or installed in accordance with any instructions included in the listing or labeling.

(3) **Splices.** Conductors shall be spliced or joined with splicing devices suitable for the use or by brazing, welding, or soldering with a fusible metal or alloy. Soldered splices shall first be so spliced or joined as to be mechanically and electrically secure without solder and then soldered. All splices and joints and the free ends of conductors shall be covered with an insulation equivalent to that of the conductors or with an insulating device suitable for the purpose.

(4) **Arcing parts.** Parts of electric equipment which in ordinary operation produce arcs, sparks, flames, or molten metal shall be enclosed or separated and isolated from all combustible material.

(5) **Marking.** Electrical equipment may not be used unless the manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified is placed on the equipment. Other markings shall be provided giving voltage, current, wattage, or other ratings as necessary. The marking shall be of sufficient durability to withstand the environment involved.

(6) **Identification of disconnecting means and circuits.** Each disconnecting means required by this subpart for motors and appliances shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident. Each service, feeder, and branch circuit, at its disconnecting means or overcurrent device, shall be legibly marked to indicate its purpose, unless located and arranged so the purpose is evident. These markings shall be of sufficient durability to withstand the environment involved.

(7) **600 volts, nominal, or less.**

(a) **Working space about electric equipment.** Sufficient access and working space shall be provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment.

(i) **Working clearances.** Except as required or permitted elsewhere in this chapter, the dimension of the working space in the direction of access to live parts operating at 600 volts or less and likely to require examination, adjustment, servicing, or maintenance while alive may not be less than indicated in Table S-1. In addition to the dimensions shown in Table S-1, workspace may not be less than 30 inches wide in front of the electric equipment. Distances shall be measured from the live parts if they are exposed, or from the enclosure front or opening if the live parts are enclosed.

Concrete, brick, or tile walls are considered to be grounded. Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.

TABLE S-1—*Working clearances*

Nominal voltage to ground	Minimum clear distance for condition[2] (ft)		
	(a)	*(b)*	*(c)*
0–150	[1]3	[1]3	3
151–600	[1]3	3 1/2	4

[1]Minimum clear distances may be 2 feet 6 inches for installations built prior to effective date of this section.

[2]Conditions *(a)*, *(b)*, *(c)*, are as follows: *(a)* Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts. *(b)* Exposed live parts on one side and grounded parts on the other side *(c)* Exposed live parts on both sides of the workspace (not guarded as provided in condition *(a)*) with the operator between.

(ii) **Clear spaces.** Working space required by this subpart may not be used for storage. When normally enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded.

(iii) **Access and entrance to working space.** At least one entrance of sufficient area shall be provided to give access to the working space about electric equipment.

(iv) **Front working space.** Where there are live parts normally exposed on the front of switchboards or motor control centers, the working space in front of such equipment may not be less than 3 feet.

(v) **Illumination.** Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, and motor control centers installed indoors.

(vi) **Headroom.** The minimum headroom of working spaces about service equipment, switchboards, panelboards, or motor control centers shall be 6 feet 3 inches.

Note: As used in this section, a motor control center is an assembly of one or more enclosed sections having a common power bus and principally containing motor control units.

(b) **Guarding of live parts.**

(i) Except as required or permitted elsewhere in this section, live parts of electric equipment operating at 50 volts or more shall be guarded against accidental contact by approved cabinets or other forms of approved enclosures, or by any of the following means:

(A) By location in a room, vault, or similar enclosure that is accessible only to qualified persons.

(B) By suitable permanent, substantial partitions or screens so arranged that only qualified persons will have access to the space within reach of the live parts. Any openings in such partitions or screens shall be so sized and located that persons are not likely to come into accidental contact with live parts or to bring conducting objects into contact with them.

(C) By location on a suitable balcony, gallery, or platform so elevated and arranged as to exclude unqualified persons.

(D) By elevation of 8 feet or more above the floor or other working surface.

(ii) In locations where electric equipment would be exposed to physical damage, enclosures or guards shall be so arranged and of such strength as to prevent such damage.

(iii) Entrances to rooms and other guarded locations containing exposed live parts shall be marked with conspicuous warning signs forbidding unqualified persons to enter.

(8) **Over 600 volts, nominal.**

(a) **General.** Conductors and equipment used on circuits exceeding 600 volts, nominal, shall comply with all applicable provisions of subsections (1) through (7) of this section and with the following provisions which supplement or modify those requirements. The provisions of (b), (c) and (d) of this subsection do not apply to equipment on the supply side of the service conductors.

(b) **Enclosure for electrical installations.** Electrical installations in a vault, room, closet or in an area surrounded by a wall, screen, or fence, access to which is controlled by lock and key or other approved means, are considered to be accessible to qualified persons only. A wall, screen, or fence less than 8 feet in height is not considered to prevent access unless it has other features that provide a degree of isolation equivalent to an 8 foot fence. The entrances to all buildings, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 volts, nominal, shall be kept locked or shall be under the observation of a qualified person at all times.

(i) **Installations accessible to qualified persons only.** Electrical installations having exposed live parts shall be accessible to qualified persons only and shall comply with the applicable provisions of (c) of this subsection.

(ii) **Installations accessible to unqualified persons.** Electrical installations that are open to unqualified persons shall be made with metal-enclosed equipment or shall be enclosed in a vault or in an area, access to which is controlled by a lock. If metal-enclosed equipment is installed so that the bottom of the enclosure is less than 8 feet above the floor, the door or cover shall be kept locked. Metal-enclosed switchgear, unit substations, transformers, pull boxes, connection boxes, and other similar associated equipment shall be marked with appropriate caution signs. If equipment is exposed to physical damage from vehicular traffic, suitable guards shall be provided to prevent such damage. Ventilating or similar openings in metal-enclosed equipment shall be designed so that foreign objects inserted through these openings will be deflected from energized parts.

(c) **Workspace about equipment.** Sufficient space shall be provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment. Where energized parts are exposed, the

minimum clear workspace may not be less than 6 feet 6 inches high (measured vertically from the floor or platform), or less than 3 feet wide (measured parallel to the equipment). The depth shall be as required in Table S–2. The workspace shall be adequate to permit at least a 90–degree opening of doors or hinged panels.

(i) **Working space.** The minimum clear working space in front of electric equipment such as switchboards, control panels, switches, circuit breakers, motor controllers, relays, and similar equipment may not be less than specified in Table S–2 unless otherwise specified in this subpart. Distances shall be measured from the live parts if they are exposed, or from the enclosure front or opening if the live parts are enclosed. However, working space is not required in back of equipment such as deadfront switchboards or control assemblies where there are no renewable or adjustable parts (such as fuses or switches) on the back and where all connections are accessible from locations other than the back. Where rear access is required to work on deenergized parts on the back of enclosed equipment, a minimum working space of 30 inches horizontally shall be provided.

TABLE S–2—*Minimum Depth of Clear Working Space in Front of Electric Equipment*

Nominal voltage to ground	Conditions[2](ft)		
	(a)	*(b)*	*(c)*
601 to 2,500	3	4	5
2,501 to 9,000	4	5	6
9,001 to 25,000	5	6	9
25,001 to 75kV[1]	6	8	10
Above 75kV[1]	8	10	12

[1]Minimum depth of clear working space in front of electric equipment with a nominal voltage to ground above 25,000 volts may be the same as for 25,000 volts under conditions *(a)*, *(b)* and *(c)* for installations built prior to April 16, 1981. (2) Conditions *(a)*, *(b)* and *(c)* are as follows: *(a)* Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts. *(b)* Exposed live parts on one side and grounded parts on the other side. Concrete, brick, or tile walls will be considered as grounded surfaces. *(c)* Exposed live parts on both sides of the workspace not guarded as provided in condition (a) with the operator between.

(ii) **Illumination.** Adequate illumination shall be provided for all working spaces about electric equipment. The lighting outlets shall be so arranged that persons changing lamps or making repairs on the lighting system will not be endangered by live parts or other equipment. The points of control shall be so located that persons are not likely to come in contact with any live part or moving part of the equipment while turning on the lights.

(iii) **Elevation of unguarded live parts.** Unguarded live parts above working space shall be maintained at elevations not less than specified in Table S–3.

TABLE S–3—*Elevation of Unguarded Energized Parts Above Working Space*

Nominal voltage between phases	Minimum elevation
601 to 7,500	*8 feet 6 inches.
7,501 to 35,000	9 feet.
Over 35kV	9 feet + 0.37 inches per kV above 35kV.

Note: Minimum elevation may be 8 feet 0 inches for installations built prior to April 16, 1981, if the nominal voltage between phases is in the range of 601–6600 volts.

(d) **Entrance and access to workspace.** (See WAC 296–24–95603 (2)(c).)

(i) At least one entrance not less than 24 inches wide and 6 feet 6 inches high shall be provided to give access to the working space about electric equipment. On switchboard and control panels exceeding 48 inches in width, there shall be one entrance at each end of such board where practicable. Where bare energized parts at any voltage or insulated energized parts above 600 volts are located adjacent to such entrance, they shall be suitably guarded.

(ii) Permanent ladders or stairways shall be provided to give safe access to the working space around electric equipment installed on platforms, balconies, mezzanine floors, or in attic or roof rooms or spaces.

[Statutory Authority: Chapter 49.17 RCW. 87–24–051 (Order 87–24), § 296–24–95605, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82–08–026 (Order 82–10), § 296–24–95605, filed 3/30/82.]

WAC 296–24–95607 Wiring design and protection.

(1) **Use and identification of grounded and grounding conductors.**

(a) **Identification of conductors.** A conductor used as a grounded conductor shall be identifiable and distinguishable from all other conductors. A conductor used as an equipment grounding conductor shall be identifiable and distinguishable from all other conductors.

(b) **Polarity of connections.** No grounded conductor may be attached to any terminal or lead so as to reverse designated polarity.

(c) **Use of grounding terminals and devices.** A grounding terminal or grounding–type device on a receptacle, cord connector, or attachment plug may not be used for purposes other than grounding.

(2) **Branch circuits.**

(a) **Ground–fault protection for personnel on construction sites.** The employer shall use either ground–fault circuit interrupters as specified in item (a)(i) of this subsection or an assured equipment grounding conductor program as specified in item (a)(ii) of this subsection, to protect employees on construction sites. These requirements are in addition to any other requirements for equipment grounding conductors.

(i) **Ground–fault circuit interrupters.** All 120–volt, single–phase, 15–ampere and 20–ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and which are in

use by employees, shall have approved ground-fault circuit interrupters for personnel protection. Receptacles on a two-wire, single-phase portable or vehicle-mounted generator rated not more than 5 kW, where the circuit conductors of the generator are insulated from the generator frame and all other grounded surfaces, need not be protected with ground-fault circuit interrupters.

(ii) **Assured equipment grounding conductor program.** The employer shall establish and implement an assured equipment grounding conductor program on construction sites covering all cord sets, receptacles which are not a part of the permanent wiring of the building or structure, and equipment connected by cord and plug, which are available for use or used by employees. This program shall comply with the following minimum requirements:

(A) A written description of the program, including the specific procedures adopted by the employer, shall be available at the jobsite for inspection and copying by the director and any affected employee.

(B) The employer shall designate one or more competent persons (as defined in WAC 296-24-012) to implement the program.

(C) Each cord set, attachment cap, plug and receptacle of cord sets, and any equipment connected by cord and plug, except cord sets and receptacles which are fixed and not exposed to damage, shall be visually inspected before each day's use for external defects, such as deformed or missing pins or insulation damage, and for indication of possible internal damage. Equipment found damaged or defective may not be used until repaired.

(D) The following tests shall be performed on all cord sets, receptacles which are not a part of the permanent wiring of the building or structure, and cord-connected and plug-connected equipment required to be grounded:

(I) All equipment grounding conductors shall be tested for continuity and shall be electrically continuous.

(II) Each receptacle and attachment cap or plug shall be tested for correct attachment of the equipment grounding conductor. The equipment grounding conductor shall be connected to its proper terminal.

(E) All required tests shall be performed:

(I) Before first use;

(II) Before equipment is returned to service following any repairs;

(III) Before equipment is used after any incident which can be reasonably suspected to have caused damage (for example, when a cord set is run over); and

(IV) At intervals not to exceed 3 months, except that cord sets and receptacles which are fixed and not exposed to damage shall be tested at intervals not exceeding 6 months.

(F) The employer may not make available or permit the use by employees of any equipment which has not met the requirements of this item (a)(ii) of this subsection.

(G) Tests performed as required in this section shall be recorded. This test record shall identify each receptacle, cord set, and cord-connected and plug-connected equipment that passed the test, and shall indicate the last date it was tested or the interval for which it was tested. This record shall be kept by means of logs, color coding, or other effective means, and shall be maintained until replaced by a more current record. The record shall be made available on the jobsite for inspection by the director and any affected employee.

(b) **Outlet devices.** Outlet devices shall have an ampere rating not less than the load to be served.

(3) **Outside conductors, 600 volts, nominal, or less.** Subdivisions (a), (b), (c) and (d) of this subsection apply to branch circuit, feeder, and service conductors rated 600 volts, nominal, or less and run outdoors as open conductors. Subdivision (e) of this subsection applies to lamps installed under such conductors.

(a) **Conductors on poles.** Conductors supported on poles shall provide a horizontal climbing space not less than the following:

(i) Power conductors below communication conductors—30 inches.

(ii) Power conductors alone or above communication conductors: 300 volts or less—24 inches; more than 300 volts—30 inches.

(iii) Communication conductors below power conductors with power conductors 300 volts or less—24 inches; more than 300 volts—30 inches.

(b) **Clearance from ground.** Open conductors shall conform to the following minimum clearances:

(i) 10 feet—above finished grade, sidewalks, or from any platform or projection from which they might be reached.

(ii) 12 feet—over areas subject to vehicular traffic other than truck traffic.

(iii) 15 feet—over areas other than those specified in item (b)(iv) of this subsection that are subject to truck traffic.

(iv) 18 feet—over public streets, alleys, roads, and driveways.

(c) **Clearance from building openings.** Conductors shall have a clearance of at least 3 feet from windows, doors, porches, fire escapes, or similar locations. Conductors run above the top level of a window are considered to be out of reach from that window and, therefore, do not have to be 3 feet away.

(d) **Clearance over roofs.** Conductors shall have a clearance of not less than 8 feet from the highest point of roofs over which they pass, except that:

(i) Where the voltage between conductors is 300 volts or less and the roof has a slope of not less than 4 inches in 12, the clearance from the roofs shall be at least 3 feet; or

(ii) Where the voltage between conductors is 300 volts or less and the conductors do not pass over more than 4 feet of the overhang portion of the roof and they are terminated at a through-the-roof raceway or approved support, the clearance from the roofs shall be at least 18 inches.

(e) **Location of outdoor lamps.** Lamps for outdoor lighting shall be located below all live conductors, transformers, or other electric equipment, unless such equipment is controlled by a disconnecting means that can be locked in the open position or unless adequate clearances

or other safeguards are provided for relamping operations.

(4) **Services.**

(a) **Disconnecting means.**

(i) **General.** Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors. The disconnecting means shall plainly indicate whether it is in the open or closed position and shall be installed at a readily accessible location nearest the point of entrance of the service-entrance conductors.

(ii) **Simultaneous opening of poles.** Each service disconnecting means shall simultaneously disconnect all ungrounded conductors.

(b) **Services over 600 volts, nominal.** The following additional requirements apply to services over 600 volts, nominal.

(i) **Guarding.** Service-entrance conductors installed as open wires shall be guarded to make them accessible only to qualified persons.

(ii) **Warning signs.** Signs warning of high voltage shall be posted where other than qualified employees might come in contact with live parts.

(5) **Overcurrent protection.**

(a) **600 volts, nominal, or less.** The following requirements apply to overcurrent protection of circuits rated 600 volts, nominal, or less.

(i) **Protection of conductors and equipment.** Conductors and equipment shall be protected from overcurrent in accordance with their ability to safely conduct current.

(ii) **Grounded conductors.** Except for motor running overload protection, overcurrent devices may not interrupt the continuity of the grounded conductor unless all conductors of the circuit are opened simultaneously.

(iii) **Disconnection of fuses and thermal cutouts.** Except for service fuses, all cartridge fuses which are accessible to other than qualified persons and all fuses and thermal cutouts on circuits over 150 volts to ground shall be provided with disconnecting means. This disconnecting means shall be installed so that the fuse or thermal cutout can be disconnected from its supply without disrupting service to equipment and circuits unrelated to those protected by the overcurrent device.

(iv) **Location in or on premises.** Overcurrent devices shall be readily accessible to each employee or authorized building management personnel. These overcurrent devices may not be located where they will be exposed to physical damage nor in the vicinity of easily ignitible material.

(v) **Arcing or suddenly moving parts.** Fuses and circuit breakers shall be so located or shielded that employees will not be burned or otherwise injured by their operation.

(vi) **Circuit breakers.**

(A) Circuit breakers shall clearly indicate whether they are in the open (off) or closed (on) position.

(B) Where circuit breaker handles on switchboards are operated vertically rather than horizontally or rotationally, the up position of the handle shall be the closed (on) position. (See WAC 296-24-95603 (2)(c).)

(C) If used as switches in 120-volt, fluorescent lighting circuits, circuit breakers shall be approved for the purpose and marked "SWD." (See WAC 296-24-95603 (2)(c).)

(b) **Over 600 volts, nominal.** Feeders and branch circuits over 600 volts, nominal, shall have short-circuit protection.

(6) **Grounding.** Subdivisions (a) through (g) of this subsection contain grounding requirements for systems, circuits, and equipment.

(a) **Systems to be grounded.** The following systems which supply premises wiring shall be grounded:

(i) All 3-wire DC systems shall have their neutral conductor grounded.

(ii) Two-wire DC systems operating at over 50 volts through 300 volts between conductors shall be grounded unless:

(A) They supply only industrial equipment in limited areas and are equipped with a ground detector; or

(B) They are rectifier-derived from an AC system complying with items (a)(iii), (a)(iv), and (a)(v) of this subsection; or

(C) They are fire-protective signaling circuits having a maximum current of 0.030 amperes.

(iii) AC circuits of less than 50 volts shall be grounded if they are installed as overhead conductors outside of buildings or if they are supplied by transformers and the transformer primary supply system is ungrounded or exceeds 150 volts to ground.

(iv) AC systems of 50 volts to 1000 volts shall be grounded under any of the following conditions, unless exempted by item (a)(v) of this subsection:

(A) If the system can be so grounded that the maximum voltage to ground on the ungrounded conductors does not exceed 150 volts;

(B) If the system is nominally rated 480Y/277 volt, 3-phase, 4-wire in which the neutral is used as a circuit conductor;

(C) If the system is nominally rated 240/120 volt, 3-phase, 4-wire in which the midpoint of one phase is used as a circuit conductor; or

(D) If a service conductor is uninsulated.

(v) AC systems of 50 volts to 1000 volts are not required to be grounded under any of the following conditions:

(A) If the system is used exclusively to supply industrial electric furnaces for melting, refining, tempering, and the like.

(B) If the system is separately derived and is used exclusively for rectifiers supplying only adjustable speed industrial drives.

(C) If the system is separately derived and is supplied by a transformer that has a primary voltage rating less than 1000 volts, provided all of the following conditions are met:

(I) The system is used exclusively for control circuits;

(II) The conditions of maintenance and supervision assure that only qualified persons will service the installation;

(III) Continuity of control power is required; and

(IV) Ground detectors are installed on the control system.

(D) If the system is an isolated power system that supplies circuits in health care facilities.

(b) **Conductors to be grounded.** For AC premises wiring systems the identified conductor shall be grounded.

(c) **Grounding connections.**

(i) For a grounded system, a grounding electrode conductor shall be used to connect both the equipment grounding conductor and the grounded circuit conductor to the grounding electrode. Both the equipment grounding conductor and the grounding electrode conductor shall be connected to the grounded circuit conductor on the supply side of the service disconnecting means, or on the supply side of the system disconnecting means or overcurrent devices if the system is separately derived.

(ii) For an ungrounded service-supplied system, the equipment grounding conductor shall be connected to the grounding electrode conductor at the service equipment. For an ungrounded separately derived system, the equipment grounding conductor shall be connected to the grounding electrode conductor at, or ahead of, the system disconnecting means or overcurrent devices.

(iii) On extensions of existing branch circuits which do not have an equipment grounding conductor, grounding-type receptacles may be grounded to a grounded cold water pipe near the equipment.

(d) **Grounding path.** The path to ground from circuits, equipment, and enclosures shall be permanent and continuous.

(e) **Supports, enclosures, and equipment to be grounded.**

(i) **Supports and enclosures for conductors.** Metal cable trays, metal raceways, and metal enclosures for conductors shall be grounded, except that:

(A) Metal enclosures such as sleeves that are used to protect cable assemblies from physical damage need not be grounded; or

(B) Metal enclosures for conductors added to existing installations of open wire, knob-and-tube wiring, and nonmetallic-sheathed cable need not be grounded if all of the following conditions are met:

(I) Runs are less than 25 feet;

(II) Enclosures are free from probable contact with ground, grounded metal, metal laths, or other conductive materials; and

(III) Enclosures are guarded against employee contact.

(ii) **Service equipment enclosures.** Metal enclosures for service equipment shall be grounded.

(iii) **Frames of ranges and clothes dryers.** Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and metal outlet or junction boxes which are part of the circuit for these appliances shall be grounded.

(iv) **Fixed equipment.** Exposed noncurrent-carrying metal parts of fixed equipment which may become energized shall be grounded under any of the following conditions:

(A) If within 8 feet vertically or 5 feet horizontally of ground or grounded metal objects and subject to employee contact.

(B) If located in a wet or damp location and not isolated.

(C) If in electrical contact with metal.

(D) If in a hazardous (classified) location.

(E) If supplied by a metal-clad, metal-sheathed, or grounded metal raceway wiring method.

(F) If equipment operates with any terminal at over 150 volts to the ground; however, the following need not be grounded:

(I) Enclosures for switches or circuit breakers used for other than service equipment and accessible to qualified persons only;

(II) Metal frames of electrically heated appliances which are permanently and effectively insulated from ground; and

(III) The cases of distribution apparatus such as transformers and capacitors mounted on wooden poles at a height exceeding 8 feet above ground or grade level.

(v) **Equipment connected by cord and plug.** Under any of the conditions described in subitems (e)(v)(A) through (e)(v)(C) of this subsection, exposed noncurrent-carrying metal parts of cord-connected and plug-connected equipment which may become energized shall be grounded.

(A) If in hazardous (classified) locations (see WAC 296-24-95613).

(B) If operated at over 150 volts to ground, except for guarded motors and metal frames of electrically heated appliances if the appliance frames are permanently and effectively insulated from ground.

(C) If the equipment is of the following types:

(I) Refrigerators, freezers, and air conditioners;

(II) Clothes-washing, clothes-drying and dishwashing machines, sump pumps, and electrical aquarium equipment;

(III) Hand-held motor-operated tools;

(IV) Motor-operated appliances of the following types: Hedge clippers, lawn mowers, snow blowers, and wet scrubbers;

(V) Cord-connected and plug-connected appliances used in damp or wet locations or by employees standing on the ground or on metal floors or working inside of metal tanks or boilers;

(VI) Portable and mobile x-ray and associated equipment;

(VII) Tools likely to be used in wet and conductive locations; and

(VIII) Portable hand lamps. Tools likely to be used in wet and conductive locations need not be grounded if supplied through an isolating transformer with an ungrounded secondary of not over 50 volts. Listed or labeled portable tools and appliances protected by an approved system of double insulation, or its equivalent, need not be grounded. If such a system is employed, the equipment shall be distinctively marked to indicate that the tool or appliance utilizes an approved system of double insulation.

(vi) **Nonelectrical equipment.** The metal parts of the following nonelectrical equipment shall be grounded: Frames and tracks of electrically operated cranes; frames of nonelectrically driven elevator cars to which electric conductors are attached; hand operated metal shifting ropes or cables of electric elevators, and metal partitions, grill work, and similar metal enclosures around equipment of over 750 volts between conductors.

(f) **Methods of grounding fixed equipment.**

(i) Noncurrent–carrying metal parts of fixed equipment, if required to be grounded by this section, shall be grounded by an equipment grounding conductor which is contained within the same raceway, cable, or cord, or runs with or encloses the circuit conductors. For DC circuits only, the equipment grounding conductor may be run separately from the circuit conductors.

(ii) Electric equipment is considered to be effectively grounded if it is secured to, and in electrical contact with, a metal rack or structure that is provided for its support and the metal rack or structure is grounded by the method specified for the noncurrent–carrying metal parts of fixed equipment in item (f)(i) of this subsection. For installations made before May 30, 1982, only, electric equipment is also considered to be effectively grounded if it is secured to, and in metallic contact with, the grounded structural metal frame of a building. Metal car frames supported by metal hoisting cables attached to or running over metal sheaves or drums of grounded elevator machines are also considered to be effectively grounded.

(g) **Grounding of systems and circuits of 1000 volts and over (high voltage).**

(i) **General.** If high voltage systems are grounded, they shall comply with all applicable provisions of subdivisions (a) through (f) of this subsection as supplemented and modified by the subdivision (g) of this subsection.

(ii) **Grounding of systems supplying portable or mobile equipment.** (See WAC 296–24–95603 (2)(c).) Systems supplying portable or mobile high voltage equipment, other than substations installed on a temporary basis, shall comply with the following:

(A) Portable and mobile high voltage equipment shall be supplied from a system having its neutral grounded through an impedance. If a delta–connected high voltage system is used to supply the equipment, a system neutral shall be derived.

(B) Exposed noncurrent–carrying metal parts of portable and mobile equipment shall be connected by an equipment grounding conductor to the point at which the system neutral impedance is grounded.

(C) Ground–fault detection and relaying shall be provided to automatically deenergize any high voltage system component which has developed a ground fault. The continuity of the equipment grounding conductor shall be continuously monitored so as to deenergize automatically the high voltage feeder to the portable equipment upon loss of continuity of the equipment grounding conductor.

(D) The grounding electrode to which the portable or mobile equipment system neutral impedance is connected shall be isolated from and separated in the ground by at least 20 feet from any other system or equipment grounding electrode, and there shall be no direct connection between the grounding electrodes, such as buried pipe, fence, etc.

(iii) **Grounding of equipment.** All noncurrent–carrying metal parts of portable equipment and fixed equipment including their associated fences, housings, enclosures, and supporting structures shall be grounded. However, equipment which is guarded by location and isolated from ground need not be grounded. Additionally, pole–mounted distribution apparatus at a height exceeding 8 feet above ground or grade level need not be grounded.

[Statutory Authority: Chapter 49.17 RCW. 87–24–051 (Order 87–24), § 296–24–95607, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82–08–026 (Order 82–10), § 296–24–95607, filed 3/30/82.]

WAC 296–24–95609 Wiring methods, components, and equipment for general use. (1) **Wiring methods.** The provisions of this section do not apply to the conductors that are an integral part of factory–assembled equipment.

(a) **General requirements.**

(i) **Electrical continuity of metal raceways and enclosures.** Metal raceways, cable armor, and other metal enclosures for conductors shall be metallically joined together into a continuous electric conductor and shall be so connected to all boxes, fittings, and cabinets as to provide effective electrical continuity.

(ii) **Wiring in ducts.** No wiring systems of any type shall be installed in ducts used to transport dust, loose stock or flammable vapors. No wiring system of any type may be installed in any duct used for vapor removal or for ventilation of commercial–type cooking equipment, or in any shaft containing only such ducts.

(b) **Temporary wiring.** Temporary electrical power and lighting wiring methods may be of a class less than would be required for a permanent installation. Except as specifically modified in this paragraph, all other requirements of this subpart for permanent wiring shall apply to temporary wiring installations.

(i) **Uses permitted, 600 volts, nominal or less.** Temporary electrical power and lighting installations 600 volts, nominal, or less may be used only:

(A) During and for remodeling, maintenance, repair, or demolition of buildings, structures, or equipment, and similar activities;

(B) For experimental or development work; and

(C) For a period not to exceed 90 days for Christmas decorative lighting, carnivals, and similar purposes.

(ii) **Uses permitted, over 600 volts, nominal.** Temporary wiring over 600 volts, nominal, may be used only during periods of tests, experiments, or emergencies.

(iii) **General requirements for temporary wiring.**

(A) Feeders shall originate in an approved distribution center. The conductors shall be run as multiconductor cord or cable assemblies, or, where not subject to physical damage, they may be run as open conductors on insulators not more than 10 feet apart.

(B) Branch circuits shall originate in an approved power outlet or panelboard. Conductors shall be

multiconductor cord or cable assemblies or open conductors. If run as open conductors they shall be fastened at ceiling height every 10 feet. No branch-circuit conductor may be laid on the floor. Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor if run as open conductors.

(C) Receptacles shall be of the grounding type. Unless installed in a complete metallic raceway, each branch circuit shall contain a separate equipment grounding conductor and all receptacles shall be electrically connected to the grounding conductor.

(D) No bare conductors nor earth returns may be used for the wiring of any temporary circuit.

(E) Suitable disconnecting switches or plug connectors shall be installed to permit the disconnection of all ungrounded conductors of each temporary circuit.

(F) Lamps for general illumination shall be protected from accidental contact or breakage. Protection shall be provided by elevation of at least 7 feet from normal working surface or by a suitable fixture or lampholder with a guard.

(G) Flexible cords and cables shall be protected from accidental damage. Sharp corners and projections shall be avoided. Where passing through doorways or other pinch points, flexible cords and cables shall be provided with protection to avoid damage.

(c) **Cable trays.**

(i) **Uses permitted.**

(A) Only the following may be installed in cable tray systems:

(I) Mineral-insulated metal-sheathed cable (Type MI);

(II) Armored cable (Type AC);

(III) Metal-clad cable (Type MC);

(IV) Power-limited tray cable (Type PLTC);

(V) Nonmetallic-sheathed cable (Type NM or NMC);

(VI) Shielded nonmetallic-sheathed cable (Type SNM);

(VII) Multiconductor service-entrance cable (Type SE or USE);

(VIII) Multiconductor underground feeder and branch-circuit cable (Type UF);

(IX) Power and control tray cable (Type TC);

(X) Other factory-assembled, multiconductor control, signal, or power cables which are specifically approved for installation in cable trays; or

(XI) Any approved conduit or raceway with its contained conductors.

(B) In industrial establishments only, where conditions of maintenance and supervision assure that only qualified persons will service the installed cable tray system, the following cables may also be installed in ladder, ventilated trough, or 4 inch ventilated channel-type cable trays:

(I) Single conductor cables which are 250 MCM or larger and are Types RHH, RHW, MV, USE, or THW, and other 250 MCM or larger single conductor cables if specifically approved for installation in cable trays. Where exposed to direct rays of the sun, cables shall be sunlight-resistant.

(II) Type MV cables, where exposed to direct rays of the sun, shall be sunlight-resistant.

(C) Cable trays in hazardous (classified) locations shall contain only the cable types permitted in such locations.

(ii) **Uses not permitted.** Cable tray systems may not be used in hoistways or where subjected to severe physical damage.

(d) **Open wiring on insulators.**

(i) **Uses permitted.** Open wiring on insulators is only permitted on systems of 600 volts, nominal, or less for industrial or agricultural establishments and for services.

(ii) **Conductor supports.** Conductors shall be rigidly supported on noncombustible, nonabsorbent insulating materials and may not contact any other objects.

(iii) **Flexible nonmetallic tubing.** In dry locations where not exposed to severe physical damage, conductors may be separately enclosed in flexible nonmetallic tubing. The tubing shall be in continuous lengths not exceeding 15 feet and secured to the surface by straps at intervals not exceeding 4 feet 6 inches.

(iv) **Through walls, floors, wood cross members, etc.** Open conductors shall be separated from contact with walls, floors, and wood cross members, or partitions through which they pass by tubes or bushings of noncombustible, nonabsorbent insulating material. If the bushing is shorter than the hole, a waterproof sleeve of nonconductive material shall be inserted in the hole and an insulating bushing slipped into the sleeve at each end in such a manner as to keep the conductors absolutely out of contact with the sleeve. Each conductor shall be carried through a separate tube or sleeve.

(v) **Protection from physical damage.** Conductors within 7 feet from the floor are considered exposed to physical damage. Where open conductors cross ceiling joints and wall studs and are exposed to physical damage, they shall be protected.

(2) **Cabinets, boxes, and fittings.**

(a) **Conductors entering boxes, cabinets, or fittings.** Conductors entering boxes, cabinets, or fittings shall be protected from abrasion, and openings through which conductors enter shall be effectively closed. Unused openings in cabinets, boxes, and fittings shall also be effectively closed.

(b) **Covers and canopies.** All pull boxes, junction boxes, and fittings shall be provided with covers approved for the purpose. If metal covers are used they shall be grounded. In completed installations each outlet box shall have a cover, faceplate, or fixture canopy. Covers of outlet boxes having holes through which flexible cord pendants pass shall be provided with bushings designed for the purpose or shall have smooth, well-rounded surfaces on which the cords may bear.

(c) **Pull and junction boxes for systems over 600 volts, nominal.** In addition to other requirements in this section for pull and junction boxes, the following shall apply to these boxes for systems over 600 volts, nominal:

(i) Boxes shall provide a complete enclosure for the contained conductors or cables.

(ii) Boxes shall be closed by suitable covers securely fastened in place. Underground box covers that weight over 100 pounds meet this requirement. Covers for boxes shall be permanently marked "HIGH VOLTAGE." The marking shall be on the outside of the box cover and shall be readily visible and legible.

(3) **Switches.**

(a) **Knife switches.** Single–throw knife switches shall be so connected that the blades are dead when the switch is in the open position. Single–throw knife switches shall be so placed that gravity will not tend to close them. Single–throw knife switches approved for use in the inverted position shall be provided with a locking device that will ensure that the blades remain in the open position when so set. Double–throw knife switches may be mounted so that the throw will be either vertical or horizontal. However, if the throw is vertical a locking device shall be provided to ensure that the blades remain in the open position when so set.

(b) **Faceplates for flush–mounted snap switches.** Flush snap switches that are mounted in ungrounded metal boxes and located within reach of conducting floors or other conducting surfaces shall be provided with faceplates of nonconducting, noncombustible material.

(4) **Switchboards and panelboards.** Switchboards that have any exposed live parts shall be located in permanently dry locations and accessible only to qualified persons. Panelboards shall be mounted in cabinets, cutout boxes, or enclosures approved for the purpose and shall be dead front. However, panelboards other than the dead front externally–operable type are permitted where accessible only to qualified persons. Exposed blades of knife switches shall be dead when open.

(5) **Enclosures for damp or wet locations.**

(a) Cabinets, cutout boxes, fittings, boxes, and panelboard enclosures in damp or wet locations shall be installed so as to prevent moisture or water from entering and accumulating within the enclosures. In wet locations the enclosures shall be weatherproof.

(b) Switches, circuit breakers, and switchboards installed in wet locations shall be enclosed in weatherproof enclosures.

(6) **Conductors for general wiring.** All conductors used for general wiring shall be insulated unless otherwise permitted in this section. The conductor insulation shall be of a type that is approved for the voltage, operating temperature, and location of use. Insulated conductors shall be distinguishable by appropriate color or other suitable means as being grounded conductors, ungrounded conductors, or equipment grounding conductors.

(7) **Flexible cords and cables.**

(a) **Use of flexible cords and cables.**

(i) Flexible cords and cables shall be approved and suitable for conditions of use and location. Flexible cords and cables shall be used only for:

(A) Pendants;

(B) Wiring of fixtures;

(C) Connection of portable lamps or appliances;

(D) Elevator cables;

(E) Wiring of cranes and hoists;

(F) Connection of stationary equipment to facilitate their frequent interchange;

(G) Prevention of the transmission of noise or vibration;

(H) Appliances where the fastening means and mechanical connections are designed to permit removal for maintenance and repair; or

(I) Data processing cables approved as a part of the data processing system.

(ii) If used as permitted in subitem (a)(i)(C), (a)(i)(F) or (a)(i)(H) of this subsection, the flexible cord shall be equipped with an attachment plug and shall be energized from an approved receptacle outlet.

(iii) Unless specifically permitted in item (a)(i) of this subsection, flexible cords and cables may not be used:

(A) As a substitute for the fixed wiring of a structure;

(B) Where run through holes in walls, ceilings, or floors;

(C) Where run through doorways, windows, or similar openings;

(D) Where attached to building surfaces; or

(E) Where concealed behind building walls, ceilings, or floors.

(iv) Flexible cords used in show windows and showcases shall be Type S, SO, SJ, SJO, ST, STO, SJT, SJTO, or AFS except for the wiring of chain–supported lighting fixtures and supply cords for portable lamps and other merchandise being displayed or exhibited.

(b) **Identification, splices, and terminations.**

(i) A conductor of a flexible cord or cable that is used as a grounded conductor or an equipment grounding conductor shall be distinguishable from other conductors. Types SJ, SJO, SJT, SJTO, S, SO, ST, and STO shall be durably marked on the surface with the type designation, size, and number of conductors.

(ii) Flexible cords shall be used only in continuous lengths without splice or tap. Hard service flexible cords No. 12 or larger may be repaired if spliced so that the splice retains the insulation, outer sheath properties, and usage characteristics of the cord being spliced.

(iii) Flexible cords shall be connected to devices and fittings so that strain relief is provided which will prevent pull from being directly transmitted to joints or terminal screws.

(8) **Portable cables over 600 volts, nominal.** Multiconductor portable cable for use in supplying power to portable or mobile equipment at over 600 volts, nominal, shall consist of No. 8 or larger conductors employing flexible stranding. Cables operated at over 2,000 volts shall be shielded for the purpose of confining the voltage stresses to the insulation. Grounding conductors shall be provided. Connectors for these cables shall be of a locking type with provisions to prevent their opening or closing while energized. Strain relief shall be provided at connections and terminations. Portable cables may not be operated with splices unless the splices are of the permanent molded, vulcanized, or other approved type. Termination enclosures shall be suitably marked with a high voltage hazard warning, and terminations shall be accessible only to authorized and qualified personnel.

(9) **Fixture wires.**

(a) **General.** Fixture wires shall be approved for the voltage, temperature, and location of use. A fixture wire which is used as a grounded conductor shall be identified.

(b) **Uses permitted.** Fixture wires may be used:

(i) For installation in lighting fixtures and in similar equipment where enclosed or protected and not subject to bending or twisting in use; or

(ii) For connecting lighting fixtures to the branch-circuit conductors supplying the fixtures.

(c) **Uses not permitted.** Fixture wires may not be used as branch-circuit conductors except as permitted for Class 1 power limited circuits.

(10) **Equipment for general use.**

(a) **Lighting fixtures, lampholders, lamps, and receptacles.**

(i) Fixtures, lampholders, lamps, rosettes, and receptacles may have no live parts normally exposed to employee contact. However, rosettes and cleat-type lampholders and receptacles located at least 8 feet above the floor may have exposed parts.

(ii) Handlamps of the portable type supplied through flexible cords shall be equipped with a handle of molded composition or other material approved for the purpose, and a substantial guard shall be attached to the lampholder or the handle.

(iii) Lampholders of the screw-shell type shall be installed for use as lampholders only. Lampholders installed in wet or damp locations shall be of the weatherproof type.

(iv) Fixtures installed in wet or damp locations shall be approved for the purpose and shall be so constructed or installed that water cannot enter or accumulate in wireways, lampholders, or other electrical parts.

(b) **Receptacles, cord connectors, and attachment plugs (caps).**

(i) Receptacles, cord connectors, and attachment plugs shall be constructed so that no receptacle or cord connector will accept an attachment plug with a different voltage or current rating than that for which the device is intended. However, a 20-ampere T-slot receptacle or cord connector may accept a 15-ampere attachment plug of the same voltage rating.

(ii) A receptacle installed in a wet or damp location shall be suitable for the location.

(c) **Appliances.**

(i) Appliances, other than those in which the current-carrying parts at high temperatures are necessarily exposed, may have no live parts normally exposed to employee contact.

(ii) A means shall be provided to disconnect each appliance.

(iii) Each appliance shall be marked with its rating in volts and amperes or volts and watts.

(d) **Motors.** This paragraph applies to motors, motor circuits, and controllers.

(i) **In sight from.** If specified that one piece of equipment shall be "in sight from" another piece of equipment, one shall be visible and not more than 50 feet from the other.

(ii) **Disconnecting means.**

(A) A disconnecting means shall be located in sight from the controller location. However, a single disconnecting means may be located adjacent to a group of coordinated controllers mounted adjacent to each other or a multimotor continuous process machine. The controller disconnecting means for motor branch circuits over 600 volts, nominal, may be out of sight of the controller, if the controller is marked with a warning label giving the location and identification of the disconnecting means which is to be locked in the open position.

(B) The disconnecting means shall disconnect the motor and the controller from all ungrounded supply conductors and shall be so designed that no pole can be operated independently.

(C) If a motor and the driven machinery are not in sight from the controller location, the installation shall comply with one of the following conditions:

(I) The controller disconnecting means shall be capable of being locked in the open position.

(II) A manually operable switch that will disconnect the motor from its source of supply shall be placed in sight from the motor location.

(D) The disconnecting means shall plainly indicate whether it is in the open (off) or closed (on) position.

(E) The disconnecting means shall be readily accessible. If more than one disconnect is provided for the same equipment, only one need be readily accessible.

(F) An individual disconnecting means shall be provided for each motor, but a single disconnecting means may be used for a group of motors under any one of the following conditions:

(I) If a number of motors drive special parts of a single machine or piece of apparatus, such as a metal or woodworking machine, crane, or hoist;

(II) If a group of motors is under the protection of one set of branch-circuit protective devices; or

(III) If a group of motors is in a single room in sight from the location of the disconnecting means.

(iii) **Motor overload, short-circuit, and ground-fault protection.** Motors, motor-control apparatus, and motor branch-circuit conductors shall be protected against overheating due to motor overloads or failure to start, and against short-circuits or ground faults. These provisions shall not require overload protection that will stop a motor where a shutdown is likely to introduce additional or increased hazards, as in the case of fire pumps, or where continued operation of a motor is necessary for a safe shutdown of equipment or process and motor overload sensing devices are connected to a supervised alarm.

(iv) **Protection of live parts--all voltages.**

(A) Stationary motors having commutators, collectors, and brush rigging located inside of motor end brackets and not conductively connected to supply circuits operating at more than 150 volts to ground need not have such parts guarded. Exposed live parts of motors and controllers operating at 50 volts or more between terminals shall be guarded against accidental contact by any of the following:

(I) By installation in a room or enclosure that is accessible only to qualified persons;

(II) By installation on a suitable balcony, gallery, or platform, so elevated and arranged as to exclude unqualified persons; or

(III) By elevation 8 feet or more above the floor.

(B) Where live parts of motors or controllers operating at over 150 volts to ground are guarded against accidental contact only by location, and where adjustment or other attendance may be necessary during the operation of the apparatus, suitable insulating mats or platforms shall be provided so that the attendant cannot readily touch live parts unless standing on the mats or platforms.

(e) **Transformers.**

(i) The following paragraphs cover the installation of all transformers except the following:

(A) Current transformers;

(B) Dry–type transformers installed as a component part of other apparatus;

(C) Transformers which are an integral part of an x–ray, high frequency, or electrostatic–coating apparatus;

(D) Transformers used with Class 2 and Class 3 circuits, sign and outline lighting, electric discharge lighting, and power–limited fire–protective signalling circuits; and

(E) Liquid–filled or dry–type transformers used for research, development, or testing, where effective safeguard arrangements are provided.

(ii) The operating voltage of exposed live parts of transformer installations shall be indicated by warning signs or visible markings on the equipment or structure.

(iii) Dry–type, high fire point liquid–insulated, and askarel–insulated transformers installed indoors and rated over 35kV shall be in a vault.

(iv) If they present a fire hazard to employees, oil–insulated transformers installed indoors shall be in a vault.

(v) Combustible material, combustible buildings and parts of buildings, fire escapes, and door and window openings shall be safeguarded from fires which may originate in oil–insulated transformers attached to or adjacent to a building or combustible material.

(vi) Transformer vaults shall be constructed so as to contain fire and combustible liquids within the vault and to prevent unauthorized access. Locks and latches shall be so arranged that a vault door can be readily opened from the inside.

(vii) Any pipe or duct system foreign to the vault installation may not enter or pass through a transformer vault.

(viii) Materials may not be stored in transformer vaults.

(f) **Capacitors.**

(i) All capacitors, except surge capacitors or capacitors included as a component part of other apparatus, shall be provided with an automatic means of draining the stored charge after the capacitor is disconnected from its source of supply.

(ii) Capacitors rated over 600 volts, nominal, shall comply with the following additional requirements:

(A) Isolating or disconnecting switches (with no interrupting rating) shall be interlocked with the load interrupting device or shall be provided with prominently displayed caution signs to prevent switching load current.

(B) For series capacitors (see WAC 296–24–95603 (2)(c)), the proper switching shall be assured by use of at least one of the following:

(I) Mechanically sequenced isolating and bypass switches;

(II) Interlocks; or

(III) Switching procedure prominently displayed at the switching location.

(g) **Storage batteries.** Provisions shall be made for sufficient diffusion and ventilation of gases from storage batteries to prevent the accumulation of explosive mixtures.

[Statutory Authority: Chapter 49.17 RCW. 87–24–051 (Order 87–24), § 296–24–95609, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82–08–026 (Order 82–10), § 296–24–95609, filed 3/30/82.]

WAC 296–24–95611 Specific purpose equipment and installations. (1) **Electric signs and outline lighting.**

(a) **Disconnecting means.** Signs operated by electronic or electromechanical controllers located outside the sign shall have a disconnecting means located inside the controller enclosure or within sight of the controller location, and it shall be capable of being locked in the open position. Such disconnecting means shall have no pole that can be operated independently, and it shall open all ungrounded conductors that supply the controller and sign. All other signs, except the portable type, and all outline lighting installations shall have an externally operable disconnecting means which can open all ungrounded conductors and is within the sight of the sign or outline lighting it controls.

(b) Doors or covers giving access to uninsulated parts of indoor signs or outline lighting exceeding 600 volts and accessible to other than qualified persons shall either be provided with interlock switches to disconnect the primary circuit or shall be so fastened that the use of other than ordinary tools will be necessary to open them.

(2) **Cranes and hoists.** This subsection applies to the installation of electric equipment and wiring used in connection with cranes, monorail hoists, hoists, and all runways.

(a) **Disconnecting means.**

(i) A readily accessible disconnecting means shall be provided between the runway contact conductors and the power supply.

(ii) Another disconnecting means, capable of being locked in the open position, shall be provided in the leads from the runway contact conductors or other power supply on any crane or monorail hoist.

(A) If this additional disconnection means is not readily accessible from the crane or monorail hoist operating station means shall be provided at the operating station, to open the power circuit to all motors of the crane or monorail hoist.

(B) The additional disconnect may be omitted if a monorail hoist or hand–propelled crane bridge installation meets all of the following:

(I) The unit is floor controlled;

(II) The unit is within view of the power supply disconnecting means; and

(III) No fixed work platform has been provided for servicing the unit.

(b) **Control.** A limit switch or other device shall be provided to prevent the load block from passing the safe upper limit of travel of any hoisting mechanism.

(c) **Clearance.** The dimension of the working space in the direction of access to live parts which may require examination, adjustment, servicing, or maintenance while alive shall be a minimum of 2 feet 6 inches. Where controls are enclosed in cabinets, the door(s) shall either open at least 90 degrees or be removable.

(3) **Elevators, dumbwaiters, escalators, and moving walks.**

(a) **Disconnecting means.** Elevators, dumbwaiters, escalators, and moving walks shall have a single means for disconnecting all ungrounded main power supply conductors for each unit.

(b) **Warning signs.** If interconnections between control panels are necessary for operation of the system on a multicar installation that remains energized from a source other than the disconnecting means, a warning sign shall be mounted on or adjacent to the disconnecting means. The sign shall be clearly legible and shall read "Warning—Parts of the control panel are not de–energized by this switch." (See WAC 296–24–95603 (2)(c).)

(c) **Control panels.** If control panels are not located in the same space as the drive machine, they shall be located in cabinets with doors or panels capable of being locked closed.

(4) **Electric welders—disconnecting means.**

(a) A disconnecting means shall be provided in the supply circuit for each motor–generator arc welder, and for each AC transformer and DC rectifier arc welder which is not equipped with a disconnect mounted as an integral part of the welder.

(b) A switch or circuit breaker shall be provided by which each resistance welder and its control equipment can be isolated from the supply circuit. The ampere rating of this disconnecting means may not be less than the supply conductor ampacity.

(5) **Data processing systems—disconnecting means.** A disconnecting means shall be provided to disconnect the power to all electronic equipment in data processing or computer rooms. This disconnecting means shall be controlled from locations readily accessible to the operator at the principal exit doors. There shall also be a similar disconnecting means to disconnect the air conditioning system serving this area.

(6) **X–ray equipment.** This subsection applies to x–ray equipment for other than medical or dental use.

(a) **Disconnecting means.**

(i) A disconnecting means shall be provided in the supply circuit. The disconnecting means shall be operable from a location readily accessible from the x–ray control. For equipment connected to a 120–volt branch circuit of 30 amperes or less, a grounding–type attachment plug cap and receptacle of proper rating may serve as a disconnecting means.

(ii) If more than one piece of equipment is operated from the same high–voltage circuit, each piece or each group of equipment as a unit shall be provided with a high–voltage switch or equivalent disconnecting means. This disconnecting means shall be constructed, enclosed, or located so as to avoid contact by employees with its live parts.

(b) **Control.**

(i) **Radiographic and fluoroscopic types.** Radiographic and fluoroscopic–type equipment shall be effectively enclosed or shall have interlocks that de–energize the equipment automatically to prevent ready access to live current–carrying parts.

(ii) **Diffraction and irradiation types.** Diffraction–type and irradiation–type equipment shall be provided with a means to indicate when it is energized unless the equipment or installation is effectively enclosed or is provided with interlocks to prevent access to live current–carrying parts during operation.

(7) **Induction and dielectric heating equipment.**

(a) **Scope.** Subdivisions (b) and (c) of this subsection cover induction and dielectric heating equipment and accessories for industrial and scientific applications, but not for medical dental applications or for appliances.

(b) **Guarding and grounding.**

(i) **Enclosures.** The converting apparatus (including the DC line) and high–frequency electric circuits (excluding the output circuits and remote–control circuits) shall be completely contained within enclosures of noncombustible material.

(ii) **Panel controls.** All panel controls shall be of dead–front construction.

(iii) **Access to internal equipment.** Where doors are used for access to voltages from 500 to 1000 volts AC or DC, either door locks or interlocks shall be provided. Where doors are used for access to voltages of over 1000 volts AC or DC, either mechanical lockouts with a disconnecting means to prevent access until voltage is removed from the cubicle, or both door interlocking and mechanical door locks, shall be provided.

(iv) **Warning labels.** "Danger" labels shall be attached on the equipment and shall be plainly visible even when doors are open or panels are removed from compartments containing voltages of over 250 volts AC or DC.

(v) **Work applicator shielding.** Protective cages or adequate shielding shall be used to guard work applicators other than induction heating coils. Induction heating coils shall be protected by insulation and/or refractory materials. Interlock switches shall be used on all hinged access doors, sliding panels, or other such means of access to the applicator. Interlock switches shall be connected in such a manner as to remove all power from the applicator when any one of the access doors or panels is open. Interlocks on access doors or panels are not required if the applicator is an induction heating coil at DC ground potential or operating at less than 150 volts AC.

(vi) **Disconnecting means.** A readily accessible disconnecting means shall be provided by which each unit of heating equipment can be isolated from its supply circuit.

(c) **Remote control.** If remote controls are used for applying power, a selector switch shall be provided and interlocked to provide power from only one control point at a time. Switches operated by foot pressure shall be provided with a shield over the contact button to avoid accidental closing the switch.

(8) **Electrolytic cells.**

(a) **Scope.** These provisions for electrolytic cells apply to the installation of the electrical components and accessory equipment of electrolytic cells, electrolytic cell lines, and process power supply for the production of aluminum, cadmium, chlorine, copper, fluorine, hydrogen peroxide, magnesium, sodium, sodium chlorate, and zinc. Cells used as a source of electric energy and for electroplating processes and cells used for production of hydrogen are not covered by these provisions.

(b) **Definitions applicable to this subsection.**

Cell line: An assembly of electrically interconnected electrolytic cells supplied by a source of direct-current power.

Cell line attachments and auxiliary equipment: Cell line attachments and auxiliary equipment include, but are not limited to: Auxiliary tanks; process piping; duct work; structural supports; exposed cell line conductors; conduits and other raceways; pumps; positioning equipment and cell cutout or bypass electrical devices. Auxiliary equipment also includes tools, welding machines, crucibles, and other portable equipment used for operation and maintenance within the electrolytic cell line working zone. In the cell line working zone, auxiliary equipment includes the exposed conductive surfaces of ungrounded cranes and crane-mounted cell-servicing equipment.

Cell line working zone: The cell line working zone is the space envelope wherein operation or maintenance is normally performed on or in the vicinity of exposed energized surfaces of cell lines or their attachments.

Electrolytic cells: A receptacle or vessel in which electrochemical reactions are caused by applying energy for the purpose of refining or producing usable materials.

(c) **Application.** Installations covered by subsection (8) of this section shall comply with all applicable provisions of this section except as follows:

(i) Overcurrent protection of electrolytic cell DC process power circuits need not comply with the requirements of WAC 296-24-95607(5).

(ii) Equipment located or used within the cell line working zone or associated with the cell line DC power circuits need not comply with the provisions of WAC 296-24-95607(6).

(iii) Electrolytic cells, cell line conductors, cell line attachments, and the wiring of auxiliary equipment and devices within the cell line working zone need not comply with the provisions of WAC 296-24-95605 and 296-24-95607 (2) and (3).

(d) **Disconnecting means.**

(i) If more than one DC cell line process power supply serves the same cell line, a disconnecting means shall be provided on the cell line circuit side of each power supply to disconnect it from the cell line circuit.

(ii) Removable links or removable conductors may be used as the disconnecting means.

(e) **Portable electric equipment.**

(i) The frames and enclosures of portable electric equipment used within the cell line working zone may not be grounded. However, these frames and enclosures may be grounded if the cell line circuit voltage does not exceed 200 volts DC or if the frames are guarded.

(ii) Ungrounded portable electric equipment shall be distinctively marked and may not be interchangeable with grounded portable electric equipment.

(f) **Power supply circuits and receptacles for portable electric equipment.**

(i) Circuits supplying power to ungrounded receptacles for hand-held, cord-and plug-connected equipment shall be electrically isolated from any distribution system supplying areas other than the cell line working zone and shall be ungrounded. Power for these circuits shall be supplied through isolating transformers.

(ii) Receptacles and their mating plugs for ungrounded equipment may not have provision for a grounding conductor and shall be of a configuration which prevents their use for equipment required to be grounded.

(iii) Receptacles on circuits supplied by an isolating transformer with an ungrounded secondary shall have a distinctive configuration, shall be distinctively marked, and may not be used in any other location in the plant.

(g) **Fixed and portable electric equipment.**

(i) AC systems supplying fixed and portable electric equipment within the cell line working zone need not be grounded.

(ii) Exposed conductive surfaces, such as electric equipment housings, cabinets, boxes, motors, raceways and the like that are within the cell line working zone need not be grounded.

(iii) Auxiliary electrical devices, such as motors, transducers, sensors, control devices, and alarms, mounted on an electrolytic cell or other energized surface, shall be connected by any of the following means:

(A) Multiconductor hard usage or extra hard usage flexible cord;

(B) Wire or cable in suitable raceways; or

(C) Exposed metal conduit, cable tray, armored cable, or similar metallic systems installed with insulating breaks such that they will not cause a potentially hazardous electrical condition.

(iv) Fixed electric equipment may be bonded to the energized conductive surfaces of the cell line, its attachments, or auxiliaries. If fixed electric equipment is mounted on an energized conductive surface, it shall be bonded to that surface.

(h) **Auxiliary nonelectric connections.** Auxiliary nonelectric connections, such as air hoses, water hoses, and

the like, to an electrolytic cell, its attachments, or auxiliary equipment may not have continuous conductive reinforcing wire, armor, braids, and the like. Hoses shall be of a nonconductive material.

(i) **Cranes and hoists.**

(i) The conductive surfaces of cranes and hoists that enter the cell line working zone need not be grounded. The portion of an overhead crane or hoist which contacts an energized electrolytic cell or energized attachments shall be insulated from ground.

(ii) Remote crane or hoist controls which may introduce hazardous electrical conditions into the cell line working zone shall employ one or more of the following systems:

(A) Insulated and ungrounded control circuit;

(B) Nonconductive rope operator;

(C) Pendent pushbutton with nonconductive supporting means and having nonconductive surfaces or ungrounded exposed conductive surfaces; or

(D) Radio.

(9) **Electrically driven or controlled irrigation machines.** (See WAC 296-24-95603 (2)(c).)

(a) **Lightning protection.** If an electrically driven or controlled irrigation machines has a stationary point, a driven ground rod shall be connected to the machine at the stationary point for lightning protection.

(b) **Disconnecting means.** The main disconnecting means for a center pivot irrigation machine shall be located at the point of connection of electrical power to the machine and shall be readily accessible and capable of being locked in the open position. A disconnecting means shall be provided for each motor and controller.

(10) **Swimming pools, fountains, and similar installations.**

(a) **Scope.** Subdivisions (b) through (e) of this subsection apply to electric wiring for and equipment in or adjacent to all swimming, wading, therapeutic, and decorative pools and fountains, whether permanently installed or storable, and to metallic auxiliary equipment, such as pumps, filters, and similar equipment. Therapeutic pools in health care facilities are exempt from these provisions.

(b) **Lighting and receptacles.**

(i) **Receptacles.** A single receptacle of the locking and grounding type that provides power for a permanently installed swimming pool recirculating pump motor may be located not less than 5 feet from the inside walls of a pool. All other receptacles on the property shall be located at least 10 feet from the inside walls of a pool. Receptacles which are located within 15 feet of the inside walls of the pool shall be protected by ground-fault circuit interrupters.

Note: In determining these dimensions, the distance to be measured is the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, or ceiling of a building or other effective permanent barrier.

(ii) **Lighting fixtures and lighting outlets.**

(A) Unless they are 12 feet above the maximum water level, lighting fixtures and lighting outlets may not be installed over a pool or over the area extending 5 feet horizontally from the inside walls of a pool. However, a lighting fixture or lighting outlet which has been installed before April 16, 1981, may be located less than 5 feet measured horizontally from the inside walls of a pool if it is at least 5 feet above the surface of the maximum water level and shall be rigidly attached to the existing structure. It shall also be protected by a ground-fault circuit interrupter installed in the branch circuit supplying the fixture.

(B) Unless installed 5 feet above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool, lighting fixtures and lighting outlets installed in the area extending between 5 feet and 10 feet horizontally from the inside walls of a pool shall be protected by a ground-fault circuit interrupter.

(c) **Cord-connected and plug-connected equipment.** Flexible cords used with the following equipment may not exceed 3 feet in length and shall have a copper equipment grounding conductor with a grounding-type attachment plug.

(i) Cord-connected and plug-connected lighting fixtures installed within 16 feet of the water surface of permanently installed pools.

(ii) Other cord-connected and plug-connected, fixed or stationary equipment used with permanently installed pools.

(d) **Underwater equipment.**

(i) A ground-fault circuit interrupter shall be installed in the branch circuit supplying underwater fixtures operating at more than 15 volts. Equipment installed underwater shall be approved for the purpose.

(ii) No underwater lighting fixtures may be installed for operation at over 150 volts between conductors.

(e) **Fountains.** All electric equipment operating at more than 15 volts, including power supply cords, used with fountains shall be protected by ground-fault circuit interrupters. (See WAC 296-24-95603 (2)(c).)

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-24-95611, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-24-95611, filed 3/30/82.]

WAC 296-24-95613 Hazardous (classified) locations. (1) **Scope.** This section covers the requirements for electric equipment and wiring in locations which are classified depending on the properties of the flammable vapors, liquids or gases, or combustible dusts or fibers which may be present therein and the likelihood that a flammable combustible concentration or quantity is present. Hazardous (classified) locations may be found in occupancies such as, but not limited to, the following: Aircraft hangars, gasoline dispensing and service stations, bulk storage plants for gasoline or other volatile flammable liquids, paint-finishing process plants, health care facilities, agricultural or other facilities where excessive combustible dusts may be present, marinas, boat yards, and petroleum and chemical processing plants. Each room, section or area shall be considered individually in determining its classification. These hazardous (classified) locations are assigned six designations as follows:

Class I,	Division 1
Class I,	Division 2
Class II,	Division 1
Class II,	Division 2
Class III,	Division 1
Class III,	Division 2

For definitions of these locations see WAC 296-24-95601(1). All applicable requirements in this subpart shall apply to hazardous (classified) locations, unless modified by provisions of this section.

(2) **Electrical installations.** Equipment, wiring methods, and installations of equipment in hazardous (classified) locations shall be intrinsically safe, or approved for the hazardous (classified) location, or safe for the hazardous (classified) location. Requirements for each of these options are as follows:

(a) **Intrinsically safe.** Equipment and associated wiring approved as intrinsically safe shall be permitted in any hazardous (classified) location for which it is approved.

(b) **Approved for the hazardous (classified) location.**

(i) Equipment shall be approved not only for the class of location but also for the ignitible or combustible properties of the specific gas, vapor, dust, or fiber that will be present.

Note: NFPA 70, the National Electrical Code, lists or defines hazardous gases, vapors, and dusts by "groups" characterized by their ignitible or combustible properties.

(ii) Equipment shall be marked to show the class, group, and operating temperature or temperature range, based on operation in a 40 degrees C ambient, for which it is approved. The temperature marking may not exceed the ignition temperature of the specific gas or vapor to be encountered. However, the following provisions modify this marking requirement for specific equipment:

(A) Equipment of the nonheat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100 degrees C (212 degrees F) need not have a marked operating temperature or temperature range.

(B) Fixed lighting fixtures marked for use in Class I, Division 2 locations only, need not be marked to indicate the group.

(C) Fixed general-purpose equipment in Class I locations, other than lighting fixtures, which is acceptable for use in Class I, Division 2 locations need not be marked with the class, group, division, or operating temperature.

(D) Fixed dust-tight equipment, other than lighting fixtures, which is acceptable for use in Class II, Division 2 and Class III locations need not be marked with the class, group, division, or operating temperature.

(c) **Safe for the hazardous (classified) location.** Equipment which is safe for the location shall be of a type and design which the employer demonstrates will provide protection from the hazards arising from the combustibility and flammability of vapors, liquids, gases, dusts, or fibers.

Note: The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installations which will meet this requirement. The guidelines of this document address electric wiring, equipment, and systems installed in hazardous (classified) locations and contain specific provisions for the following: Wiring methods, wiring connections; conductor insulation, flexible cords, sealing and drainage, transformers, capacitors, switches, circuit breakers, fuses, motor controllers, receptacles, attachment plugs, meters, relays, instruments, resistors, generators, motors, lighting fixtures, storage battery charging equipment, electric cranes, electric hoists and similar equipment, utilization equipment, signaling systems, alarm systems, remote control systems, local loud speaker and communication systems, ventilation piping, live parts, lighting surge protection, and grounding. Compliance with these guidelines will constitute one means, but not the only means, of compliance with this subsection.

(3) **Conduits.** All conduits shall be threaded and shall be made wrench-tight. Where it is impractical to make a threaded joint tight, a bonding jumper shall be utilized.

(4) **Equipment in Division 2 locations.** Equipment that has been approved for a Division 1 location may be installed in a Division 2 location of the same class and group. General-purpose equipment or equipment in general-purpose enclosures may be installed in Division 2 locations if the equipment does not constitute a source of ignition under normal operating conditions.

(5) **Motors and generators.** Motors and generators shall conform to the following: Class I, Division 1. In Class I, Division 1 locations, motors, generators and other rotating electric machinery shall be: (a) Approved for Class I, Division 1 locations (explosion-proof); or (b) of the totally enclosed type supplied with positive-pressure ventilation from a source of clean air with discharge to a safe area, so arranged to prevent energizing of the machine until ventilation has been established and the enclosure has been purged with at least 10 volumes of air, and also arranged to automatically deenergize the equipment when the air supply fails; or (c) of the totally enclosed inert-gas-filled type supplied with a suitable reliable source of inert gas for pressuring the enclosure, with devices provided to ensure a positive pressure in the enclosure and arranged to automatically deenergize the equipment when the gas supply fails; or (d) of a type designed to be submerged in a liquid which is flammable only when vaporized and mixed with air, or in a gas or vapor at a pressure greater than atmospheric and which is flammable only when mixed with air; and the machine is so arranged to prevent energizing it until it has been purged with the liquid or gas to exclude air, and also arranged to automatically deenergize the equipment when the supply of liquid, or gas or vapor fails or the pressure is reduced to atmospheric. Totally enclosed motors of types (b) and (c) shall have no external surface with an operating temperature in degrees Celsius in excess of eighty percent of the ignition temperature of the gas or vapor involved, as determined by ASTM test procedure (Designation: D-2155-69). Appropriate devices shall be provided to detect any increase in temperature of the motor beyond design limits and automatically deenergize the equipment or provide an adequate alarm. Auxiliary equipment shall be of a type approved for the location in which it is installed.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-24-95613, filed 11/30/87. Statutory Authority: RCW 49-.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-24-95613, filed 3/30/82.]

WAC 296-24-95615 Special systems. (1) **Systems over 600 volts, nominal.** Subdivisions (a) through (d) of this subsection cover the general requirements for all circuits and equipment operated at over 600 volts.

(a) **Wiring methods for fixed installations.**

(i) Above-ground conductors shall be installed in rigid metal conduit, in intermediate metal conduit, in cable trays, in cablebus, in other suitable raceways, or as open runs of metal-clad cable suitable for the use and purpose. However, open runs of nonmetallic-sheathed cable or of bare conductors or busbars may be installed in locations accessible only to qualified persons. Metallic shielding components, such as tapes, wires, or braids for conductors, shall be grounded. Open runs of insulated wires and cables having a bare lead sheath or a braided outer covering shall be supported in a manner designed to prevent physical damage to the braid or sheath.

(ii) Conductors emerging from the ground shall be enclosed in approved raceways. (See WAC 296-24-95603 (2)(c).)

(b) **Interrupting and isolating devices.**

(i) Circuit breaker installations located indoors shall consist of metal-enclosed units or fire-resistant cell-mounted units. In locations accessible only to qualified personnel, open mounting of circuit breakers is permitted. A means of indicating the open and closed position of circuit breakers shall be provided.

(ii) Fused cutouts installed in buildings or transformer vaults shall be of a type approved for the purpose. They shall be readily accessible for fuse replacement.

(iii) A means shall be provided to completely isolate equipment for inspection and repairs. Isolating means which are not designed to interrupt the load current of the circuit shall be either interlocked with an approved circuit interrupter or provided with a sign warning against opening them under load.

(c) **Mobile and portable equipment.**

(i) **Power cable connections to mobile machines.** A metallic enclosure shall be provided on the mobile machine for enclosing the terminals of the power cable. The enclosure shall include provisions for a solid connection for the ground wire(s) terminal to effectively ground the machine frame. The method of cable termination used shall prevent any strain or pull on the cable from stressing the electrical connections. The enclosure shall have provision for locking so only authorized qualified persons may open it and shall be marked with a sign warning of the presence of energized parts.

(ii) **Guarding live parts.** All energized switching and control parts shall be enclosed in effectively grounded metal cabinets or enclosures. Circuit breakers and protective equipment shall have the operating means projecting through the metal cabinet or enclosure so these units can be reset without locked doors being opened. Enclosures and metal cabinets shall be locked so that only authorized qualified persons have access and shall be marked with a sign warning of the presence of energized parts. Collector ring assemblies on revolving-type machines (shovels, draglines, etc.) shall be guarded.

(d) **Tunnel installations.**

(i) **Application.** The provisions of this subsection apply to installation and use of high-voltage power distribution and utilization equipment which is portable and/or mobile, such as substations, trailers, cars, mobile shovels, draglines, hoists, drills, dredges, compressors, pumps, conveyors, and underground excavators.

(ii) **Conductors.** Conductors in tunnels shall be installed in one or more of the following:

(A) Metal conduit or other metal raceway,

(B) Type MC cable, or

(C) Other approved multiconductor cable.

Conductors shall also be so located or guarded as to protect them from physical damage. Multiconductor portable cable may supply mobile equipment. An equipment grounding conductor shall be run with circuit conductors inside the metal raceway or inside the multiconductor cable jacket. The equipment grounding conductor may be insulated or bare.

(iii) **Guarding live parts.** Bare terminals of transformers, switches, motor controllers, and other equipment shall be enclosed to prevent accidental contact with energized parts. Enclosures for use in tunnels shall be drip-proof, weatherproof, or submersible as required by the environmental conditions.

(iv) **Disconnecting means.** A disconnecting means that simultaneously opens all ungrounded conductors shall be installed at each transformer or motor location.

(v) **Grounding and bonding.** All nonenergized metal parts of electric equipment and metal raceways and cable sheaths shall be effectively grounded and bonded to all metal pipes and rails at the portal and at intervals not exceeding 1000 feet throughout the tunnel.

(2) **Emergency power systems.**

(a) **Scope.** The provisions for emergency systems apply to circuits, systems, and equipment intended to supply power for illumination and special loads, in the event of failure of the normal supply.

(b) **Wiring methods.** Emergency circuit wiring shall be kept entirely independent of all other wiring and equipment and may not enter the same raceway, cable, box, or cabinet as other wiring except either where common circuit elements suitable for the purpose are required, or for transferring power from the normal to the emergency source.

(c) **Emergency illumination.** Where emergency lighting is necessary, the system shall be so arranged that the failure of any individual lighting element, such as the burning out of a light bulb, cannot leave any space in total darkness.

(3) **Class 1, Class 2, and Class 3 remote control, signaling, and power-limited circuits.**

(a) **Classification.** Class 1, Class 2, or Class 3 remote control, signaling, or power-limited circuits are characterized by their usage and electrical power limitation which differentiates them from light and power circuits.

These circuits are classified in accordance with their respective voltage and power limitations as summarized in items (a)(i) through (a)(iii) of this subsection.

(i) **Class 1 circuits.**

(A) A Class 1 power–limited circuit is supplied from a source having a rated output of not more than 30 volts and 1000 volt–amperes.

(B) A Class 1 remote control circuit or a Class 1 signaling circuit has a voltage which does not exceed 600 volts; however, the power output of the source need not be limited.

(ii) **Class 2 and Class 3 circuits.**

(A) Power for Class 2 and Class 3 circuits is limited either inherently (in which no overcurrent protection is required) or by a combination of a power source and overcurrent protection.

(B) The maximum circuit voltage is 150 volts AC or DC for a Class 2 inherently limited power source, and 100 volts AC or DC for a Class 3 inherently limited power source.

(C) The maximum circuit voltage is 30 volts AC and 60 volts DC for a Class 2 power source limited by overcurrent protection, and 150 volts AC or DC for a Class 3 power source limited by overcurrent protection.

(iii) The maximum circuit voltages in items (a)(i) and (a)(ii) of this subsection apply to sinusoidal AC or continuous DC power sources, and where wet contact occurrence is not likely.

(b) **Marking.** A Class 2 or Class 3 power supply unit shall be durably marked where plainly visible to indicate the class of supply and its electrical rating. (See WAC 296–24–95603 (2)(c).)

(4) **Fire protective signaling systems.** (See WAC 296–24–95603 (2)(c).)

(a) **Classifications.** Fire protective signaling circuits shall be classified either as nonpower limited or power limited.

(b) **Power sources.** The power sources for use with fire protective signaling circuits shall be either power limited or nonlimited as follows:

(i) The power supply of nonpower–limited fire protective signaling circuits shall have an output voltage not in excess of 600 volts.

(ii) The power for power–limited fire protective signaling circuits shall be either inherently limited, in which no overcurrent protection is required, or limited by a combination of power source and overcurrent protection.

(c) **Nonpower–limited conductor location.** Nonpower–limited fire protective signaling circuits and Class 1 circuits may occupy the same enclosure, cable, or raceway provided all conductors are insulated for maximum voltage of any conductor within the enclosure, cable or raceway. Power supply and fire protective signaling circuit conductors are permitted in the same enclosure, cable, or raceway only if connected to the same equipment.

(d) **Power–limited conductor location.** Where open conductors are installed, power–limited fire protective signaling circuits shall be separated at least 2 inches from conductors of any light, power, Class 1, and nonpower–limited fire protective signaling circuits unless a special and equally protective method of conductor separation is employed. Cables and conductors of two or more power–limited fire protective signaling circuits or Class 3 circuits are permitted in the same cable, enclosure, or raceway. Conductors of one or more Class 2 circuits are permitted within the same cable, enclosure, or raceway with conductors of power–limited fire protective signaling circuits provided that the insulation of Class 2 circuit conductors in the cable, enclosure, or raceway is at least that needed for the power–limited fire protective signaling circuits.

(e) **Identification.** Fire protective signaling circuits shall be identified at terminal and junction locations in a manner which will prevent unintentional interference with the signaling circuit during testing and servicing. Power–limited fire protective signaling circuits shall be durably marked as such where plainly visible at terminations.

(5) **Communications systems.**

(a) **Scope.** These provisions for communication systems apply to such systems as central–station–connected and noncentral–station–connected telephone circuits, radio and television receiving and transmitting equipment, including community antenna television and radio distribution systems, telegraph, district messenger, and outside wiring for fire and burglar alarm, and similar central station systems. These installations need not comply with the provisions of WAC 296–24–95605 through 296–24–95615(4) except 296–24–95607 (3)(a) and 296–24–95613(2).

(b) **Protective devices.**

(i) Communication circuits so located as to be exposed to accidental contact with light or power conductors operating at over 300 volts shall have each circuit so exposed provided with a protector approved for the purpose.

(ii) Each conductor of a lead–in from an outdoor antenna shall be provided with an antenna discharge unit or other suitable means that will drain static charges from the antenna system.

(c) **Conductor location.**

(i) **Outside of buildings.**

(A) Receiving distribution lead–in or aerial–drop cables attached to buildings and lead–in conductors to radio transmitters shall be so installed as to avoid the possibility of accidental contact with electric light or power conductors.

(B) The clearance between lead–in conductors and any lightning protection conductors may not be less than 6 feet.

(ii) **On poles.** Where practicable, communication conductors on poles shall be located below the light or power conductors. Communications conductors may not be attached to a crossarm that carries light or power conductors.

(iii) **Inside of buildings.** Indoor antennas, lead–ins, and other communication conductors attached as open conductors to the inside of buildings shall be located at least 2 inches from conductors of any light or power or Class 1 circuits unless a special and equally protective method

of conductor separation, approved for the purpose, is employed.

(d) **Equipment location.** Outdoor metal structures supporting antennas, as well as self-supporting antennas such as vertical rods or dipole structures, shall be located as far away from overhead conductors of electric light and power circuits of over 150 volts to ground as necessary to avoid the possibility of the antenna or structure falling into or making accidental contact with such circuits.

(e) **Grounding.**

(i) **Lead-in conductors.** If exposed to contact with electric light and power conductors, the metal sheath of aerial cables entering buildings shall be grounded or shall be interrupted close to the entrance to the building by an insulating joint or equivalent device. Where protective devices are used, they shall be grounded in an approved manner.

(ii) **Antenna structures.** Masts and metal structures supporting antennas shall be permanently and effectively grounded without splice or connection in the grounding conductor.

(iii) **Equipment enclosures.** Transmitters shall be enclosed in a metal frame or grill or separated from the operating space by a barrier, all metallic parts of which are effectively connected to ground. All external metal handles and controls accessible to the operating personnel shall be effectively grounded. Unpowered equipment and enclosures shall be considered grounded where connected to an attached coaxial cable with an effectively grounded metallic shield.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-24-95615, filed 3/30/82.]

WAC 296-24-95617 Effective date. WAC 296-24-956 through 296-24-95617 shall become effective sixty days after filing with the code reviser.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-24-95617, filed 3/30/82.]

WAC 296-24-95699 Appendices. Appendix A - Reference documents. The following references provide information which can be helpful in understanding and complying with the requirements contained in WAC 296-24-956 through 296-24-95615.

ANSI A17.1-71 Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks.
ANSI B9.1-71 Safety Code for Mechanical Refrigeration.
ANSI B30.2-76 Safety Code for Overhead and Gantry Cranes.
ANSI B30.3-75 Hammerhead Tower Cranes.
ANSI B30.4-73 Safety Code for Portal, Tower, and Pillar Cranes.
ANSI B30.5-68 Safety Code for Crawler, Locomotive, and Truck Cranes.
ANSI B30.6-77 Derricks.
ANSI B30.7-77 Base Mounted Drum Hoists.
ANSI B30.8-71 Safety Code for Floating Cranes and Floating Derricks.
ANSI B30.11-73 Monorail Systems and Underhung Cranes.
ANSI B30.12-75 Handling Loads Suspended from Rotorcraft.
ANSI B30.13-77 Controlled Mechanical Storage Cranes.
ANSI B30.15-73 Safety Code for Mobile Hydraulic Cranes.
ANSI B30.16-73 Overhead Hoists.
ANSI C2-81 National Electrical Safety Code.
ANSI C33.27-74 Safety Standard for Outlet Boxes and Fittings for Use in Hazardous Locations, Class I, Groups A, B, C, and D, and Class II, Groups E, F, and G.
ANSI K61.1-72 Safety Requirements for the Storage and Handling of Anhydrous Ammonia.
ASTM D2155-66 Test Method for Autoignition Temperature of Liquid Petroleum Products.
ASTM D3176-74 Method for Ultimate Analysis of Coal and Coke.
ASTM D3180-74 Method for Calculating Coal and Coke Analyses from as Determined to Different Bases.
IEEE 463-77 Standard for Electrical Safety Practices in Electrolytic Cell Line Working Zones.
NFPA 20-76 Standard for the Installation of Centrifugal Fire Pumps.
NFPA 30-78 Flammable and Combustible Liquids Code.
NFPA 32-74 Standard for Drycleaning Plants.
NFPA 33-73 Standard for Spray Application Using Flammable and Combustible Materials.
NFPA 34-74 Standard for Dip Tanks Containing Flammable or Combustible Liquids.
NFPA 35-76 Standard for the Manufacture of Organic Coatings.
NFPA 36-74 Standard for Solvent Extraction Plants.
NFPA 40-74 Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film.
NFPA 56A-73 Standard for the Use of Inhalation Anesthetics (Flammable and Nonflammable).
NFPA 56F-74 Standard for Nonflammable Medical Gas Systems.
NFPA 58-76 Standard for the Storage and Handling of Liquefied Petroleum Gases.
NFPA 59-76 Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants.
NFPA 70-78 National Electrical Code.
NFPA 70C-74 Hazardous Locations Classification.
NFPA 70E Standard for the Electrical Safety Requirements for Employee Workplaces.
NFPA 71-77 Standard for the Installation, Maintenance, and Use of Central Station Signaling Systems.
NFPA 72A-75 Standard for the Installation, Maintenance, and Use of Local Protective Signaling Systems for Watchman, Fire Alarm, and Supervisory Service.
NFPA 72B-75 Standard for the Installation, Maintenance, and Use of Auxiliary Protective Signaling Systems for Fire Alarm Service.

NFPA 72C–75 Standard for the Installation, Maintenance, and Use of Remote Station Protective Signaling Systems.
NFPA 72D–75 Standard for the Installation, Maintenance, and Use of Proprietary Protective Signaling Systems for Watchman, Fire Alarm, and Supervisory Service.
NFPA 72E–74 Standard for Automatic Fire Detectors.
NFPA 74–75 Standard for Installation, Maintenance, and Use of Household Fire Warning Equipment.
NFPA 76A–73 Standard for Essential Electrical Systems for Health Care Facilities.
NFPA 77–72 Recommended Practice on Static Electricity.
NFPA 80–77 Standard for Fire Doors and Windows.
NFPA 86A–73 Standard for Ovens and Furnaces; Design, Location and Equipment.
NFPA 88A–73 Standard for Parking Structures.
NFPA 88B–73 Standard for Repair Garages.
NFPA 91–73 Standard for the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal, or Conveying.
NFPA 101–78 Code for Safety to Life from Fire in Buildings and Structures. (Life Safety Code.)
NFPA 325M–69 Fire–Hazard Properties of Flammable Liquids, Gases, and Volatile Solids.
NFPA 493–75 Standard for Intrinsically Safe Apparatus for Use in Class I Hazardous Locations and its Associated Apparatus.
NFPA 496–74 Standard for Purged and Pressurized Enclosures for Electrical Equipment in Hazardous Locations.
NFPA 497–75 Recommended Practice for Classification of Class I Hazardous Locations for Electrical Installations in Chemical Plants.
NFPA 505–75 Fire Safety Standard for Powered Industrial Trucks Including Type Designations and Areas of Use.
NMAB 353–1–79 Matrix of Combustion–Relevant Properties and Classification of Gases, Vapors, and Selected Solids.
NMAB 353–2–79 Test Equipment for Use in Determining Classifications of Combustible Dusts.
NMAB 353–3–80 Classification of Combustible Dusts in Accordance with the National Electrical Code.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82–08–026 (Order 82–10), § 296–24–95699, filed 3/30/82.]

WAC 296–24–960 Proximity to overhead power lines. (1) General requirements – high voltage lines.

(a) Minimum clearance.

(i) No work shall be performed, no material shall be piled, stored or otherwise handled, no scaffolding, commercial signs, or structures shall be erected or dismantled, nor any tools, machinery or equipment operated within the specified minimum distances from any energized high voltage electrical conductor capable of energizing the material or equipment; except where the electrical distribution and transmission lines have been deenergized and visibly grounded at point of work, or where insulating barriers not a part of or an attachment to the equipment have been erected, to prevent physical contact with the lines, equipment shall be operated proximate to, under, over, by, or near powerlines only in accordance with the following:

(ii) For lines rated 50 kv. or below, minimum clearance between the lines and any part of the equipment or load shall be 10 feet.

(iii) For lines rated over 50 kv. minimum, clearance between the lines and any part of the equipment or load shall be 10 feet plus 0.4 inch for each 1 kv. over 50 kv., or twice the length of the line insulator but never less than 10 feet.

(b) Overhead electric lines. Where overhead electric conductors are encountered in proximity to a work area, the employer shall be responsible for:

(i) Ascertaining the voltage and minimum clearance distance required, and

(ii) Maintaining the minimum clearance distance, and

(iii) Ensuring that the requirements of subsection (1) of this section are complied with.

(c) Not covered: Employees working under chapters 296–32 and 296–45 WAC.

(2) Low voltage lines. When work is being carried out in proximity to energized electrical service conductors operating at 750 volts or less, such work shall be performed in a manner to prevent contact by any worker with the energized conductors.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82–13–045 (Order 82–22), § 296–24–960, filed 6/11/82; 82–02–003 (Order 81–32), § 296–24–960, filed 12/24/81.]

Chapter 296–27 WAC
RECORDKEEPING AND REPORTING

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-27-16005 Objects of inspection. [Statutory Authority: RCW 49.17.040 and 49.17.050. 81-14-006 (Order 81-13), § 296-27-16005, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-16009 Follow-up inspections. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-27-16009, filed 1/17/86; 81-14-006 (Order 81-13), § 296-27-16009, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-16013 WISHA—Required investigations and inspections. [Statutory Authority: RCW 49.17.040 and 49.17.050. 81-14-006 (Order 81-13), § 296-27-16013, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-16015 WITS—In general. [Statutory Authority: RCW 49-.17.040 and 49.17.050. 81-14-006 (Order 81-13), § 296-27-16015, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-16017 WITS—Safety. [Statutory Authority: RCW 49.17-.040 and 49.17.050. 81-14-006 (Order 81-13), § 296-27-16017, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-16019 WITS—Safety. [Statutory Authority: RCW 49.17-.040 and 49.17.050. 81-14-006 (Order 81-13), § 296-27-16019, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-16021 WITS—Safety—Limit on number of inspections. [Statutory Authority: RCW 49.17.040 and 49.17.050. 81-14-006 (Order 81-13), § 296-27-16021, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-16023 Adjustment factors. [Statutory Authority: RCW 49-.17.040 and 49.17.050. 81-14-006 (Order 81-13), § 296-27-16023, filed 6/22/81.] Repealed by 87-03-011 (Order 86-48), filed 1/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-27-200 Posting of notice, availability of act regulations and applicable standards. [Order 74-22, § 296-27-200, filed 5/6/74.] Repealed by Order 75-14, filed 4/14/75. See WAC 296-350-400.

WAC 296-27-010 Purpose and scope. The regulations of this chapter implement sections RCW 49.17.050(5), 49.17.220(1), 49.17.220(2), 49.17.230, and 49.17.260 of the Washington Industrial Safety and Health Act of 1973. These sections provide for recordkeeping and reporting by employers covered under the act as necessary or appropriate for enforcement of the act, for developing information regarding the causes and prevention of occupational accidents and illnesses, and for maintaining a program of collection, compilation, and analysis of industrial safety and health statistics.

Pursuant to the provisions of 29 CFR 1904.10, records maintained by an employer and reports submitted pursuant to, and in accordance with the requirements of an approved state plan under section 18 of the Federal Occupational Safety and Health Act of 1970 (Public Law 91-596, 84 STAT. 1590) shall be regarded as compliance with 29 CFR Part 1904 – "Recording and reporting occupational injuries and illnesses."

Compliance with and requirements of this chapter, as recognized by the Washington industrial safety and health state plan, is regarded as compliance with the provisions of the above-cited federal requirements. Employers complying with the recordkeeping and reporting requirements of this chapter are not required to keep records as required by the federal recordkeeping and reporting regulations (Ref. 29 CFR 1904.10).

The recordkeeping and reporting requirements of this chapter are separate and distinct from the record keeping and reporting requirements under Title 51 RCW (the Industrial Insurance Act) unless otherwise noted in this chapter.

[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), § 296-27-010, filed 6/28/78; Order 74-22, § 296-27-010, filed 5/6/74.]

WAC 296-27-020 Definitions. (1) "Act" means the Washington Industrial Safety and Health Act of 1973, chapter 49.17 RCW, as now or hereafter amended.

(2) The definitions and interpretations included in RCW 49.17.020 shall be applicable to such terms when used in this chapter, unless a different interpretation is clearly required by the context.

(3) "Recordable occupational injuries or illnesses of employees" means any occupational injury or illness of employees which result in:

(a) Occupational fatalities, regardless of the length of time between injury and death, or the length of the illness preceding the time of death (no recording is required for fatalities occurring after a termination of employment, except when recording may otherwise be required by a specific industrial safety and health standard adopted pursuant to the act); or

(b) Lost workday cases, other than fatalities, that result in lost workdays (see subsection (7) of this section); or

(c) Occupational illnesses, or nonfatal cases without lost workdays which result in transfer to another job or termination of employment, or require medical treatment (other than first aid) or involve loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the employer but are not classified as fatalities or lost workday cases.

(4) "Medical treatment" means and includes treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered professional personnel.

(5) "First-aid treatment" means any one-time treatment, and any follow-up visit or visits for the purpose of observation of minor scratches, cuts, burns, splinters and so forth which do not ordinarily require professional medical care, the extent of treatment that could be expected to be given by a person trained in basic first-aid using supplies from a first-aid kit. Such one-time treatment and follow-up visit or visits for the purpose of observation are considered first aid even though provided by a physician or registered professional personnel. Tests, such as x-rays, shall not be confused with treatment.

(6) "Hospitalization" means to be sent to; to go to; or be admitted to a hospital or an equivalent medical facility and receive medical treatment beyond what would be generally classified as first-aid treatment.

(7) "Lost workdays":

(a) "Lost workdays – days away from work" means the number of days (consecutive or not) after the day of injury or illness which the employee would have worked but could not because of occupational injury or illness. The number of "lost workdays – days away from work," should not include the day of the injury, or the day the illness occurred, or any days which the employee was not scheduled to work; e.g. Saturday, Sunday, or holidays.

(b) "Lost workdays – days of restricted activity" means the number of workdays (consecutive or not) on which, because of the injury or illness:

(i) The employee was assigned to a temporary job; or

(ii) The employee worked at a permanent job less than full time; or

(iii) The employee worked at a permanently assigned job but could not perform all the duties normally assigned to that job.

The number of "lost workdays – days of restricted activity" should not include the day of the injury or the day the illness occurred, or any other days which the employee was not scheduled to work; e.g. Saturday, Sunday, or holidays, etc.

(8) "Establishment" means:

(a) A single physical location where business is conducted or where services or industrial operations are performed. (For example: A factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office.) Where distinctly separate activities are performed at a single physical location, such as contract construction activities operated from the same physical location as a lumber yard, each activity shall be treated as a separate establishment.

(b) For firms engaged in activities such as agriculture, construction, transportation, communications, electric, gas or sanitary services, which may be physically disbursed, "establishment" means a place to which employees report each day.

(c) For employees who do not primarily report or work at a single establishment, and who are generally not supervised in their daily work, such as travelling salesmen, technicians, engineers, etc., "establishment" means the location from which they are paid, or the base from which employees operate to carry out their activities.

(9) Establishments classified in standard industrial classification codes (SIC) 52 through 89.

(a) Establishments whose primary activity constitutes retail trade; finance, insurance, real estate and services are classified in SIC's 52 through 89.

(b) Retail trades are classified as SIC's 52 through 59 and for the most part include establishments engaged in selling merchandise to the general public for personal or household consumption. Some of the retail trades are: Automotive dealers, apparel and accessory stores, furniture and home furnishing stores, and eating and drinking places.

(c) Finance, insurance and real estate are classified as SIC's 60 through 67 and include establishments which are engaged in banking, credit other than banking, security dealings, insurance, and real estate.

(d) Services are classified as SIC's 70 through 89 and include establishments which provide a variety of services for individuals, businesses, government agencies, and other organizations. Some of the service industries are: Personal and business services, in addition to legal, education, social, and cultural; and membership organizations.

(e) The primary activity of an establishment is determined as follows: For finance, insurance, real estate, and services establishments, the value of receipts or revenue for services rendered by an establishment determines its primary activity. In establishments with diversified activities, the activities determined to account for the largest share of production, sales or revenue will identify the primary activity. In some instances these criteria will not adequately represent the relative economic importance of each of the varied activities. In such cases, employment or payroll should be used in place of the normal basis for determining the primary activity.

(10) "WISHERS" means Washington industrial safety and health evaluation and reporting system.

(11) "Occupational illness" means such illness as arises naturally and approximately out of employment under the provisions of the act.

Note: Examples of occupational illnesses appear on the instruction page of Form OSHA No. 200.

(12) "Occupational" means industrial and industrial means occupational.

(13) "OSHA" means occupational safety and health administration.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-27-020, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-15-017 (Order 83-19), § 296-27-020, filed 7/13/83, effective 9/12/83. 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), § 296-27-020, filed 6/28/78; Order 74-22, § 296-27-020, filed 5/6/74.]

WAC 296-27-030 Log and summary of occupational injuries and illnesses. (1) Except as provided in subsection (2) of this section, each employer shall:

(a) Maintain in each establishment a log and summary of all recordable occupational injuries and illnesses for that establishment; and

(b) Enter each recordable injury and illness on the log as early as practicable, but no later than six working days after receiving information that a recordable case has occurred. For this purpose Form OSHA No. 200 or an equivalent which is as readable and comprehensible to a person not familiar with it shall be used. The log and summary shall be completed in the detail provided in instructions on Form OSHA No. 200.

(2) Any employer may maintain the log and summary of all recordable occupational injuries and illnesses at a place other than the establishment or by means of data processing equipment, or both, if at each of the employer's establishments there is available a copy of the log and summary which reflects separately the injury and illness experience of that establishment complete and current to a date within forty-five calendar days.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-27-030, filed 7/31/79. 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), § 296-27-030, filed 6/28/78; Order 74-22, § 296-27-030, filed 5/6/74.]

WAC 296-27-040 Period covered by logs. Logs and summaries of occupational injuries and illnesses shall be established on a calendar year basis.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-27-040, filed 7/31/79; Order 74-22, § 296-27-040, filed 5/6/74.]

WAC 296-27-050 Supplementary record. In addition to the log and summary of occupational injuries and illnesses provided for under WAC 296-27-030, each employer shall have available for inspection at each establishment or other location as specified in WAC 296-27-020 within six working days after receiving information that a recordable case has occurred, a supplementary record for each occupational injury or illness for that establishment. The record shall be completed in the detail prescribed in the instructions accompanying Form OSHA No. 101. The department of labor and industries accident report Form LI-210-130 may be used as an alternative to the Form OSHA 101. Other reports are acceptable alternative records if they contain the information required by Form OSHA No. 101. If no acceptable alternative record is maintained for other purposes, Form OSHA No. 101 shall be used for the necessary information or shall be otherwise maintained in a convenient form.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-27-050, filed 7/31/79. 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), § 296-27-050, filed 6/28/78; Order 74-22, § 296-27-050, filed 5/6/74.]

WAC 296-27-060 Annual summary. (1) Each employer shall post an annual summary of occupational injuries and illnesses for each establishment. This summary shall consist of a copy of the year's totals from the Form OSHA No. 200 and the following information from that form: Calendar year covered, company name, establishment name, establishment address, certification signature, title, and date. A Form OSHA No. 200 shall be used in presenting the summary. If no injuries or illnesses occurred in the year, zeros must be entered on the totals line, and the form must be posted.

(2) The summary shall be completed by February 1 beginning with the calendar year 1979.

(3) Each employer, or the officer or employee of the employer who supervises the preparation of the log and summary of occupational injuries and illnesses, shall certify that the annual summary of occupational injuries and illnesses is true and complete. The certification shall be accomplished by affixing the signature of the employer, or the officer or employer who supervises the preparation of the annual summary of occupational injuries and illnesses, at the bottom of the last page of the log and summary, or by appending a separate statement to the log and summary certifying that the summary is true and complete.

(4)(a) Each employer shall post a copy of the establishment's summary in each establishment. The summary covering the previous calendar year shall be posted no later than February 1, and shall remain in place until March 1. For employees who do not primarily report or work at a single establishment, or who do not report to any fixed establishment on a regular basis, employers shall satisfy this posting requirement by presenting or mailing a copy of the summary portion of the log and summary during the month of February of the following year to each such employee who receives pay during that month. For multi-establishment employers where operations have closed down in some establishments during the calendar year, it will not be necessary to post summaries for those establishments.

(b) A failure to post a copy of the establishment's summary, or otherwise satisfy the posting requirements as specified in this section, may result in the issuance of citations and assessments of penalties pursuant to RCW 49.17.120 and 49.17.180.

[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), § 296-27-060, filed 6/28/78; Order 74-22, § 296-27-060, filed 5/6/74.]

WAC 296-27-070 Retention of records. Records provided for in WAC 296-27-030, 296-27-050, and 296-27-060 including Form OSHA No. 200 and its predecessor Forms WISHA No. 100 and WISHA No. 102 shall be retained in each establishment for five years following the end of the year to which they relate.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-27-070, filed 7/31/79; Order 74-22, § 296-27-070, filed 5/6/74.]

WAC 296-27-075 Employees not in fixed establishments. Employers of employees engaged in physically dispersed operations, such as occur in construction, installation, repair or service activities, who do not report to any fixed establishment on a regular basis, but are subject to common supervision, may satisfy the provisions of WAC 296-27-030, 296-27-050, and 296-27-070, with respect to such employees by:

(1) Maintaining the required records for each operation, or group of operations which is subject to common

supervision (field superintendent, field supervisor, etc.) in an established central place;

(2) Having the address and telephone number of the central place available at each worksite; and

(3) Having personnel available at the central place during normal business hours to provide information from the records maintained there by telephone or mail.

[Order 74-22, § 296-27-075, filed 5/6/74.]

WAC 296-27-077 Small employers. (1) An employer who had no more than ten employees at any time during the calendar year immediately preceding the current calendar year need not comply with any of the requirements of this chapter except the following:

(a) Obligation to report under WAC 296-27-090 concerning fatalities or multiple hospitalization accidents; and

(b) Obligation to maintain a log of occupational injuries and illnesses under WAC 296-27-030 and to make reports under WAC 296-27-140 upon being notified in writing by the bureau of labor statistics and the department of labor and industries that the employer has been selected to participate in a statistical survey of occupational injuries and illnesses.

[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), § 296-27-077, filed 6/28/78.]

WAC 296-27-078 Private employers classified in standard industrial classification codes (SIC) 52 through 89, (except 52 through 54, 76, 79 and 80). A private employer whose establishment is classified in SIC's 52 through 89, (excluding 52 through 54, 70, 75, 76, 79 and 80) need not comply, for such establishment, with the recordkeeping requirements of this chapter except the following:

(1) Obligation to report under WAC 296-27-090 concerning fatalities or multiple hospitalization accidents.

(2) Obligation to maintain a log of occupational injuries and illnesses under WAC 296-27-140, upon being notified in writing by the Bureau of Labor Statistics that the employer has been selected to participate in a statistical survey of occupational injuries and illnesses.

(3) The requirements of this section shall become effective January 1, 1984.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-27-078, filed 11/30/83; 83-15-017 (Order 83-19), § 296-27-078, filed 7/13/83, effective 9/12/83.]

WAC 296-27-080 Access to records. (1) Each employer shall provide upon request records provided for in WAC 296-27-030, 296-27-050, and 296-27-060, for inspection and copying by designated or authorized representatives of the department of labor and industries, compliance safety and health officers of the Occupational Safety and Health Administration, U.S. Department of Labor during any occupational safety and health inspection provided for under 29 CFR 1903 and section 8 of the Federal Occupational Safety and Health Act, by any representatives of the Bureau of Labor Statistics, U.S. Department of Labor, or by any representative of the Secretary of Health, Education and Welfare during any investigation under section 20(b) of the Federal Occupational Safety and Health Act.

(2)(a) The log and summary of all recordable occupational injuries and illnesses (OSHA No. 200) (the log) provided for in WAC 296-27-030 shall, upon request, be made available by the employer to any employee, former employee, and to their representatives for examination and copying in a reasonable manner and at reasonable times. The employee, former employee, and their representatives shall have access to the log for any establishment in which the employee is or has been employed.

(b) Nothing in this section shall be deemed to preclude employees and employee representatives from collectively bargaining to obtain access to information relating to occupational injuries and illnesses in addition to the information made available under this section.

(c) Access to the log provided under this section shall pertain to all logs retained under the requirements of WAC 296-27-070.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-27-080, filed 7/31/79; Order 74-22, § 296-27-080, filed 5/6/74.]

WAC 296-27-090 Reporting of fatality or multiple hospitalization accidents. (1) Within twenty-four hours after the occurrence of an employment accident which results in an immediate or probable fatality to one or more employees, or which results in hospitalization of two or more employees, the employer of any employee so injured or killed shall report the accident either orally or in writing to the nearest office of the department. The reporting may be by telephone or telegraph. The reporting shall relate the circumstances of the accident, the number of fatalities, and the extent of any injuries. The director may require such additional reports, in writing or otherwise, as he deems necessary, concerning the accident.

(2) Equipment involved in an accident resulting in an immediate fatality or in the hospitalization of two or more employees shall not be moved until a representative of the division of industrial safety and health investigates the accident and authorizes removal of such equipment, when removal of such equipment is necessary in order to prevent further accident or to remove the victim, such equipment may be moved as required.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-27-090, filed 1/17/86; Order 74-22, § 296-27-090, filed 5/6/74.]

WAC 296-27-100 Falsification, failure to keep records or reports. (1) RCW 49.17.190(2) of the act provides that "whoever knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained pursuant to this chapter shall, upon conviction, be guilty of a gross misdemeanor and

be punished by a fine of not more than $10,000, or by imprisonment of not more than six months, or by both."

(2) Failure to maintain records or file reports required by this chapter, or in the detail required by the forms and instructions issued under this chapter, may result in the issuance of citations and assessment of penalties as provided for in RCW 49.17.120, 49.17.140, 49.17.180, or 49.17.190.

[Order 74-22, § 296-27-100, filed 5/6/74.]

WAC 296-27-110 Change of ownership. Where an establishment has changed ownership, the employer shall be responsible for maintaining records and filing reports only for that period of the year during which he owned such establishment. However, in the case of any change of ownership, the employer shall preserve those records, if any, of the prior ownership which are required to be kept under this chapter. These records shall be retained at each establishment to which they relate, for the period, or the remainder thereof, required under WAC 296-27-070.

[Order 74-22, § 296-27-110, filed 5/6/74.]

WAC 296-27-120 Petitions for recordkeeping exceptions. (1)(a) In order to achieve a uniform, national system for the recordkeeping and reporting of occupational injuries and illnesses, the state of Washington and the United States Department of Labor have agreed that as applied to employers as defined by subsection 3(5) of the Occupational Safety and Health Act of 1970 (Public Law 91-596, 81 STAT 1950) the state shall not grant any variances or exceptions to the record keeping and reporting regulations of this chapter, with the exception of approval of forms to serve as the substitutes for OSHA 101 and OSHA 200 (see WAC 296-27-030 and 296-27-050), without prior approval of the bureau of labor statistics.

(b) Any public employer who wishes to maintain records in a manner different from that prescribed by this chapter may submit a petition containing the information specified in subsection (5) of this section to the director, Department of Labor and Industries, General Administration Building, Olympia, Washington 98504[.]

(2) All petitions for authorization to maintain records in a manner different than that required by this chapter shall be submitted to the director or directly to the bureau of labor statistics. The director, upon receipt of a petition submitted pursuant to the provisions of subsection (3) of this section, shall immediately forward copies of same to appropriate officials of the bureau of labor statistics. Should said federal officials inform the director of their belief in the desirability or necessity of additional notice or conferences pursuant to provisions of subsection (7) of this section, the director shall provide or cause to be provided such additional notice and/or afford an opportunity for interested parties for informal conferences or hearings concerning the petition. For the purposes of this section, the occupational safety and health administration and the bureau of labor statistics shall be considered interested parties.

The bureau of labor statistics shall be afforded the opportunity to review the petition and any comments submitted in regard thereto. The director shall not grant the petition prior to a finding by the said federal agency that the alternative procedure proposed will not hamper or interfere with the purposes of the Occupational Safety and Health Act of 1970.

(3) Submission of petition. Any employer, who for good cause wishes to maintain records in a manner different from that required by this chapter, may submit a petition containing the information specified in subsection (5) of this section to the director.

(4) Opportunity for comment. Affected employees, or their representatives shall have an opportunity to submit written data, views, or arguments concerning the petition to the director within ten working days following the receipt of notice under subdivision (5)(e) of this section.

(5) Contents of petition. A petition filed under subsection (3) of this section shall include:

(a) The name and address of the applicant;

(b) The address of the place or places (establishment or establishments) of the employment involved;

(c) Specifications of the reasons for seeking relief;

(d) A description of the different recordkeeping procedures which are proposed by the applicant;

(e) A statement that:

(i) The applicant has informed his affected employees of the petition by giving a copy thereof to them or to their authorized representative, posting a statement giving a summary of the petition and specifying where a copy of the petition may be obtained, at the place or places where notices to employees are normally posted, and by other appropriate means. A statement posted pursuant to these provisions shall be posted in each establishment identified in WAC 296-27-120 (4)(b).

(ii) The applicant has in the same manner informed affected employees and their representatives of their rights under subsection (3) of this section.

(6) Additional notice – conferences.

(a) In addition to the actual notice provided for in subdivision (5)(e) of this section, the director may provide, or cause to be provided, such additional notice of the petition as he may deem appropriate.

(b) The director may also afford an opportunity to interested parties for informational conferences or hearings concerning the petition.

(7) After review of the petition, and any comments submitted in regard thereto, and upon completion of any necessary appropriate investigation concerning the petition, if the director finds that the alternative procedure proposed will not hamper or interfere with the purposes of the act, and will provide equivalent information, he may grant the petition subject to such conditions as he may determine appropriate, subject to the provisions of WAC 296-200-120(2), and subject to revocation for cause.

(8) Publication. When any relief is granted to an applicant under this chapter, notice of such relief, and the reasons therefor, may be published in the federal register.

(9) Revocation. Whenever any relief under this section is sought to be revoked for any failure to comply with the conditions thereof, an opportunity for informal hearing or conference shall be afforded to the employers and effected employees, or their representatives, and other interested parties. Except in cases of willfulness or where public safety or health requires otherwise, before the commencement of any such informal proceeding, the employer shall:

(a) Be notified in writing of the facts of conduct which may warrant the action and,

(b) Be given an opportunity to demonstrate or achieve compliance.

(10) Compliance after submission of petitions. The submission of a petition or any delay by the director in acting upon a petition shall not relieve any employer from any obligation to comply with the provisions of this chapter.

(11) The director shall honor exceptions to the provisions of 29 CFR 1904 – RECORDING AND REPORTING OCCUPATIONAL INJURIES AND ILLNESSES, granted by the bureau of labor statistics to companies having establishments in states other than Washington, when such exceptions apply to the establishments within this state.

(12) There shall be consultation between the appropriate representatives of the department, the occupational safety and health administration, and the bureau of labor statistics in order to enjoy the effective implementation of this chapter.

[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), § 296-27-120, filed 6/28/78; Order 76-29, § 296-27-120, filed 9/30/76; Order 74-22, § 296-27-120, filed 5/6/74.]

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 296-27-121 Additional recordkeeping requirements. The director may require that additional records and reporting be kept and done in order to achieve the purposes of the act.

[Order 76-29, § 296-27-121, filed 9/30/76.]

WAC 296-27-130 Description of statistical program. RCW 49.17.260 directs the director to develop and maintain a program of collection, compilation and analysis of occupational safety and health statistics. The program shall include periodic surveys of occupational injuries and illnesses.

[Statutory Authority: RCW 49.17.040, 49.17.150, and 49.17.240. 79-08-115 (Order 79-9), § 296-27-130, filed 7/31/79; Order 74-22, § 296-27-130, filed 5/6/74.]

WAC 296-27-140 Duties of employers--Statistical program. Upon receipt of an occupational injuries and illnesses survey form, Form OSHA No. 200-S, the employer shall promptly complete the form in accordance with the instructions contained therein and return it in accordance with the aforesaid instructions.

[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), § 296-27-140, filed 6/28/78; Order 74-22, § 296-27-140, filed 5/6/74.]

WAC 296-27-150 Effective date of regulations. Pursuant to the finding of the director that additional time is needed to afford affected employers a reasonable opportunity to make changes in methods, means, or practices to meet the requirements of WAC 296-27-010 through 296-27-140, the effective date of these requirements shall be January 1, 1978.

[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), § 296-27-150, filed 6/28/78; Order 74-22, § 296-27-150, filed 5/6/74.]

WAC 296-27-15501 Division of industrial safety and health, public records. Requests for inspection or copies of records and documents in the custody of the division of industrial safety and health should be made to the division's designated records officer. The division's records are maintained at 805 Plum Street Southeast, P.O. Box 207, Olympia, WA 98504. General information can be obtained at service locations and field offices throughout the state.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-27-15501, filed 7/6/88. Statutory Authority: RCW 49.17-.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-27-15501, filed 1/17/86.]

WAC 296-27-15503 Confidential reports within the department's files. Whenever a divisional file contains any report or information from an independent source that has requested that the information contained in the department's file be protected as confidential, such information will not be released without court order. When such information is withheld the records officer shall clearly identify which information has been withheld and the information's source.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-27-15503, filed 1/17/86.]

WAC 296-27-15505 Accident investigation reports. Results of accident investigations and related reports are confidential and will not be freely released by the department, see RCW 49.17.260.

Accident investigation reports will be made available without the need of a court order only to the following:

(1) Employees of governmental agencies in the performance of their official duties;

(2) The injured worker, his legal representative, or his labor organization representative;

(3) The legal representative or labor organization representative of a deceased worker, including any beneficiary of a deceased worker actually receiving benefits under the terms of Title 51 RCW, the Industrial Insurance Act. The records officer may provide accident investigation reports to the closest surviving member of the deceased worker's immediate family;

(4) The employer of any injured or deceased workman;

(5) Any other employer or person whose actions or business operations are the subject of the report or investigation; or

(6) Any attorney representing a party in any pending legal action in which an investigative report constitutes material and relevant evidence.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-27-15505, filed 1/17/86.]

WAC 296-27-160 Safety and health inspections. The Washington Industrial Safety and Health Act (WISHA), chapter 49.17 RCW, authorizes the department of labor and industries (the department) to inspect work places to protect the health and safety of employees. The following sections describe the method, manner, and frequency of the department's safety and health inspections. The purposes of safety and health inspections are to:

(1) Determine if an employer is complying with WISHA safety and health standards; and

(2) Determine if an employer is furnishing a place of employment free from recognized hazards that are causing or are likely to cause death or serious physical harm to their employees.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-160, filed 1/12/87; 81-14-006 (Order 81-13), § 296-27-160, filed 6/22/81.]

WAC 296-27-16001 Definitions. For the purpose of these inspection rules:

(1) "Department" shall mean the department of labor and industries.

(2) "Industrial insurance modification factor" is based on a comparison of the actual incurred losses to the expected losses for the oldest three of the four fiscal years preceding the effective date of premium rates.

(a) A modification factor greater than 1.0000 indicates that an employer's actual incurred losses are greater than expected.

(b) A modification factor of less than 1.0000 indicates that an employer's actual incurred losses are less than expected.

(c) New firms and some firms qualifying for transition rating adjustments are assigned a base modification factor of 1.0000. Self-insured employers will be assigned a modification factor of less than 1.0000.

(3) "Industry" shall mean a group of businesses classified by standard industrial classification (SIC) code according to the type of activity in which they are engaged.

(4) "WISHA" shall mean the Washington Industrial Safety and Health Act.

(5) "Working hours" shall mean those times that an employer assigns an employee or employees to work at the work place.

(6) "Work place," "work site," and "job site" may be used interchangeably in the text of this chapter and shall mean 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. Work place shall include temporary labor camps.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16001, filed 1/12/87; 81-14-006 (Order 81-13), § 296-27-16001, filed 6/22/81.]

WAC 296-27-16002 Inspection hours. An inspection shall be made during the normal working hours of the work place being inspected, unless:

(1) The inspection is of a fatality;

(2) The inspection is of a catastrophe;

(3) The inspection is of a complaint alleging imminent danger;

(4) The inspector needs to remain at the work place outside of working hours to ensure that the inspection is effective.

Note: RCW 49.17.190(1) prohibits an employer from receiving advance notice of an inspection, except as authorized by the director or an authorized representative.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16002, filed 1/12/87.]

WAC 296-27-16003 Inspection format. (1) Upon arrival, the inspector shall present credentials to the highest available management official or designated company representative at the work place and explain the nature and purpose of the visit.

(a) The inspector may sign a visitors' register, plant pass or other book or form used to control the entry and movement of persons.

(b) If a governmental security clearance is required for entry, the inspector shall obtain it before the inspection.

(2) Before beginning an inspection, the inspector should conduct a joint opening conference with the employer and employee representatives.

(a) The employee representative is the employee designated by the union, safety committee, or employees to accompany the inspector during the inspection.

(b) If the inspector determines that an employee representative is not available at the work place, separate conferences with the employer and employee representatives may be held.

(3) A representative of the employer and a representative authorized by the employees shall have the opportunity to accompany the inspector during the inspection.

(4) During the inspection, the inspector may interview in private any employee who wants to discuss a possible violation.

(a) If the inspector determines that an interview would unduly hinder an employer's operations the inspector will interview the employee during a break or after working hours.

(b) To determine whether an interview would unduly hinder an employer's operations, the inspector may consider such factors as:

(i) The time the employee would spend away from the work station;

(ii) The effects on other workers;

(iii) The effect on the work process.

(5) If the inspector receives a complaint during an inspection, the alleged violation will be investigated during the inspection.

(6) The inspector may photograph a violation, take samples, conduct tests, use sampling devices worn by employees, and employ other reasonable investigative techniques. A technique shall not be used if it reasonably could be believed to cause a hazard.

(7) The inspector shall determine that the employer has posted the WISHA notice informing employees of their rights and obligations.

(8) Inspectors should examine the log and summary of recordable occupational injuries and illnesses, supplementary records of occupational injuries and illnesses, records of employee exposure to toxic chemicals and harmful physical agents, and other records relating to employee safety and health.

(9) An employer may correct violations during the inspection.

(10) A violation remains the basis for a citation and a penalty, if warranted, whether it is corrected immediately or at a later date.

(11) The inspector will record the conditions and corrections to help judge the employer's good faith and cooperation.

(12) At the end of the inspection, the inspector will conduct a joint closing conference with the employer and employee representatives. If it is impractical to hold a joint conference or at the request of the employer or employee representative, separate conferences will be held.

(13) Complaints.

(a) Complaints shall be reduced to writing or typing on complaint forms prior to the inspections.

(b) A copy of the complaint shall be provided to the employer at the time of inspection.

(c) The complainants name shall not appear on the employer's copy or on any record published, released, or made available without written and signed authorization by the complainant.

(14) The inspector and all concerned employees of the department shall preserve the confidentiality of trade secrets.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16003, filed 1/12/87; 81-14-006 (Order 81-13), § 296-27-16003, filed 6/22/81.]

WAC 296-27-16004 Interprogram referrals. (1) A safety inspector observing potential health hazards that indicate an industrial hygiene inspection is necessary, will report the hazards and request a health inspection.

(2) A health inspector observing potential safety hazards that indicate a safety inspection is necessary, will report the hazards and request a safety inspection.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16004, filed 1/12/87.]

WAC 296-27-16007 Citations, penalty assessments and notices of violations. (1) The inspector shall record the violations observed on a compliance worksheet.

(2) The compliance worksheet, the photographs, and sample tests, will be used to prepare:

(a) A citation; and

(b) A proposed penalty assessment; and

(c) A notice of violation.

(3) The citation and the proposed penalty assessment will be sent to the employer. The citation and notice will set an abatement date for each violation. This is the date by which the employer must correct the violation.

(4) The inspector may give a notice of violation at the end of inspection with the employers consent instead of the department issuing a citation and notice. The notice of violation sets short abatement dates and is issued only for general violations and contains no penalties. The notice of violation, shall be given to the highest available management official or designated company representative at the work place or sent to the employer.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16007, filed 1/12/87; 81-14-006 (Order 81-13), § 296-27-16007, filed 6/22/81.]

WAC 296-27-16011 Refusal or limitation of inspection. When the employer:

(1) Refuses to permit an inspection:

(a) The inspector will attempt to ascertain the reason(s) for refusal and report to their immediate supervisor.

(b) The department may seek an inspection warrant or other compulsory process from a court to gain entrance.

(i) If refusal to permit an inspection is anticipated, the department may seek a warrant prior to the inspection.

(ii) The department will not seek an inspection warrant in response to a complaint unless:

(A) The complaint is written and signed by a complainant; or,

(B) The complainant alleges a hazard which could cause serious injury or death.

(2) Permits an inspection but interferes with, or limits the process:

(a) The inspector will attempt to ascertain the reason for interference of limitation, report to their immediate supervisor, and will:

(i) End the inspection;

(ii) Continue the inspection noting areas of interferences or limitations.

(b) The department may seek an inspection warrant or other compulsory process from a court to revisit the areas where interference or limitation occurred. The department will not seek an inspection warrant in response to a complaint unless:

(i) The complaint is written and signed by a complainant;

(ii) The complaint alleges imminent danger to the safety or health of an individual.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16011, filed 1/12/87; 83-24-013 (Order 83-34), § 296-27-16011, filed 11/30/83; 81-14-006 (Order 81-13), § 296-27-16011, filed 6/22/81.]

WAC 296-27-16018 Compliance inspections. (1) Inspection types.

(a) Unprogrammed. Inspections are in response to suspected or alleged hazardous working conditions at a specific work site. This type of inspection addresses:

(i) Imminent danger;

(ii) Fatalities;

(iii) Catastrophies;

(iv) Complaints;

(v) Referrals;

(vi) Follow-up inspections;

(vii) "High hazard" industries.

(b) Programmed. Programmed inspections are inspections of worksites which have been selected based upon objective criteria. The worksites are selected and scheduled according to state-wide scheduling plans for:

(i) Safety compliance;

(ii) Health compliance;

(iii) Compliance special-emphasis programs.

(2) Inspection scope. Unprogrammed and programmed inspections may be:

(a) Comprehensive inspection. This category includes a complete walkaround inspection of the entire establishment.

(b) Partial. This category includes any inspection in which the walkaround is limited to specific areas, operations or conditions within the establishment but does not include all potentially hazardous areas of the establishment.

(3) Inspection priorities. The priority of inspections and assignment of resources within the inspection classifications shall be as follows:

(a) Imminent danger including complaints or referrals which allege imminent danger;

(b) Fatalities or catastrophies;

(c) Complaints not alleging imminent danger or referrals;

(d) "High hazard" industries;

(e) Programmed inspections.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16018, filed 1/12/87.]

WAC 296-27-16020 Inspection selection, scheduling criteria, and limit on number of inspections. (1) Inspection selection criteria.

(a) WISHA's priority system for inspection scheduling is intended to distribute available resources as efficiently as possible to ensure that the maximum protection is effectively provided to the working men and women of this state.

(b) The assistant director of the industrial safety and health division shall ensure that inspections are scheduled within the framework of this chapter and are consistent with the objectives of chapter 49.17 RCW, the Washington Industrial Safety and Health Act of 1973, as currently amended, or as amended in the future.

(c) The assistant director shall not permit more than two scheduled comprehensive inspections at the same fixed site location of an individual employer within any period of twelve consecutive months.

(2) Employer contacts. Employer requests for information or voluntary compliance services will not initiate compliance inspection.

(a) Such employer requests shall not protect the establishment from compliance inspections conducted pursuant to the guidelines established by this chapter.

(b) If an employer or their representative indicates that an imminent danger exists or that a fatality or catastrophe has occurred, the assistant director shall ensure that action is taken in accordance with the inspection priority procedures established by this chapter.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16020, filed 1/12/87.]

WAC 296-27-16022 Unprogrammed inspections, follow-up inspections, monitoring inspections, and "high hazard" inspections. (1) Unprogrammed inspections. Inspections conducted in response to evidence of hazardous conditions at a worksite are considered unprogrammed inspections. Unprogrammed inspections (excluding follow-ups) shall normally be scheduled according to the following priorities:

(a) Reports of alleged imminent danger situations from any source including referrals and complaints regardless of formality;

(b) Fatalities/catastrophies;

(c) Complaints;

(d) "High hazard" industries.

(2) "High hazard" industry. The following industries which have nonfixed worksites are all considered to be "high hazard": Construction, logging, maritime, and electrical utilities and communications.

(a) The "high hazard" industries require a distinctly different method of inspection scheduling, not only because of their nonfixed worksites but also because the work being performed is almost always inherently dangerous and because the worksite character, conditions and work functions are dynamically and frequently changing.

(b) Inspections within the "high hazard" industries will be conducted throughout the year, whenever such work activity becomes known to the department. Within the limits of WISHA jurisdiction, inspections will be conducted without regard to the size or scope of the activity of the employer being inspected.

(3) Follow-up inspections. The seriousness of the original hazards or conditions requiring action shall be considered in assigning a priority to follow-up inspections. Follow-up inspections normally shall be conducted within ten days following the abatement date and shall take priority over programmed inspections.

(a) Follow-up inspections shall be conducted in the following situations:

(i) Willful citations;

(ii) Citations related to an imminent danger situation;

(iii) Whenever an employer fails to respond to a request for notification of compliance action by letter or other means; and

(iv) Whenever the assistant director or designee believes that circumstances indicate the need for a follow-up inspection.

(b) Follow-up inspections shall be deemed optional if the following circumstances exist:

(i) When the inspecting compliance officer has observed and documented that abatement has been achieved before completing the inspection and leaving the premises;

(ii) When the employer or a knowledgeable source such as the complainant or referring party submits in writing that compliance has been achieved.

(4) Monitoring inspections. A monitoring inspection may be conducted for any reason including:

(a) An employer's request for a variance; or

(b) An employer's request for an extension of an abatement date.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16022, filed 1/12/87.]

WAC 296-27-16026 Programmed inspections. A programmed inspection generally is a comprehensive inspection of the worksite but may be a partial inspection if required by resource availability or other enforcement priorities. A programmed inspection shall be scheduled pursuant to one of the following general scheduling systems unless the establishment is within a "high hazard" industry.

(1) General scheduling system. The state-wide general scheduling system is not specific to any individual industry. Both safety and health general scheduling systems include the following factors:

(a) An objective criteria which includes but is not limited to one or more of the following:

(i) Available data concerning injuries or illnesses which could be reduced by an inspection which eliminates the hazards;

(ii) The industrial insurance modification factor of a particular business establishment;

(iii) The number or type of contaminants present at a worksite as well as the relative toxicity of those contaminants;

(iv) The degree of exposure to hazards;

(v) The number of employees exposed.

(b) A random selection process which utilizes a computer program to ensure statistical randomness;

(c) A regular evaluation and review including:

(i) A yearly analytical review comparing the current program with the objective criteria;

(ii) An annual comparison between compiled inspection results and reported injuries or illnesses.

(d) A general scheduling system programmed for no more than a twelve-month operating cycle with a maximum permissible extension of no more than one month before appropriate adjustments are implemented.

(2) Special emphasis targeting system. A special emphasis targeting system is a regional and/or industry-specific system which will be based on either one of the following:

(a) Scheduling system which includes:

(i) An objective criteria;

(ii) A random selection process;

(iii) An evaluation and review; or

(iv) An operating cycle.

(b) A scheduling program required of state plan states by the Federal Occupational Safety and Health Administration.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 87-03-011 (Order 86-48), § 296-27-16026, filed 1/12/87.]

Chapter 296-28 WAC
CLEARANCE RULES--RAILROADS IN PRIVATE YARDS AND PLANTS

WAC

WAC 296-28-001 Foreword. These clearance rules and regulations for common carrier railroads are issued under and by the authority of RCW 81.44.010. Formerly, certain portions of these rules were by law administered by the department of labor and industries. In 1955 jurisdiction over matters treated by these rules was placed in the Washington public service commission [now the Washington utilities and transportation commission] (RCW 43.53.055).

These rules and regulations are intended to prevent accidents which may result in either damage of equipment or injury to human beings. They are intended to protect the railroads and their employees and the general public.

[Foreword, filed 4/3/61.]

WAC 296-28-005 Beginning of order. (1) Hearing was originally held in this cause at Seattle, Washington, on the 7th day of September, 1950, pursuant to notice duly given before representatives of both the Washington public service commission and the department of labor and industries.

(2) At the time of the original hearing the Washington public service commission was vested by law with jurisdiction over the safety of railroad passengers, while jurisdiction over the safety of railroad employees was in the department of labor and industries. In 1955, as stated in the foreword, jurisdiction over the safety of railroad employees was also placed in the Washington public service commission.

(3) In order to bring the clearance rules up to date and to delete the various references to the department of labor and industries so that confusion may be avoided, these amended rules are being published.

(4) All interested parties were represented at the original hearing and their appearances are listed in our

original order in this cause dated and effective December 1, 1950.

(5) In pursuance of its rule-making power, the Washington public service commission hereby determines as follows:

(a) It is ordered that subsequent to December 1, 1950, in all construction and reconstruction of tracks or structures adjacent thereto, on all railroads over which freight cars are transported or proposed to be transported, the following minimum clearances shall be allowed.

(b) It is further ordered that a railroad company shall not operate freight cars, locomotives or other rolling equipment over tracks constructed subsequent to December 1, 1950, or tracks adjacent to buildings and structures constructed or reconstructed subsequent to that date, wherein the clearances are less than those prescribed in this order.

(c) It is further ordered that where specific authority has been issued for deviation from these clearances for construction occurring subsequent to December 1, 1950, but prior to the effective date of this order, authority so issued shall remain in effect.

(6) Overhead clearances authorized in this order are applicable to tracks on which freight cars having a height to running board of fifteen feet six inches or less are transported. In the case of cars or loads exceeding fifteen feet six inches, WAC 296-28-035 and 296-28-040 must be complied with.

(7) Side clearances authorized in this order are applicable to tracks on which freight cars having an overall width not greater than ten feet ten inches are transported. In the case of cars or loads exceeding ten feet ten inches, WAC 296-28-035 and 296-28-040 must be complied with.

[Opening paragraphs, filed 4/3/61.]

Reviser's note: As stated above, the control of safety of railroad employees is vested in the Washington public service commission (now the Washington utilities and transportation commission). However, many nonrailroad enterprises have railroad tracks and some railroad equipment. To safeguard employees of these enterprises, the department of labor and industries adopted the same railroad clearance rules enacted by the public service commission and filed the same with the code reviser's office. The filing date appears in the bracketed history note at the end of each section.

WAC 296-28-010 Exemptions. (1) When the overhead or side clearances between a track and any building, structure or facility are less than the minimum prescribed in this order, but where lawfully created prior to the effective date thereof, the minimum clearances prescribed herein shall be provided whenever the building, structure or facility is relocated or reconstructed; however, the public service commission will consider specific requests for the future continuance of heretofore lawful clearances at such reconstructed building, structure or facility when application thereof has been made as provided in subsection (3) of this section.

(2) Where restricted clearances are necessary nothing herein shall be construed as preventing the movement of material over tracks when such material is necessary in the construction or maintenance of such tracks, nor in the movement of special work equipment used in the construction, maintenance or operation of the railroad, provided such movements shall be carried on under the conditions as are necessary to provide for the safety of all concerned; nor shall these rules be applicable, provided reasonable safety precautions are observed, during periods of actual emergency due to wrecks, derailments, washouts and like conditions.

(3) If in any particular case, exemption from any of the requirements herein is deemed necessary by the carrier concerned, the public service commission will consider the application of such carrier for such exemption when accompanied by a full statement of the conditions existing and the reason why such exemption is asked. Any exemption so granted will be limited to the particular case covered by the application.

(4) The public service commission reserves the right to modify any of the provisions of these regulations in specific cases, when, in its opinion, safety of railroad employees, public safety, convenience or necessity would be served by so doing.

(5) Logging railroads, or any operation directly incident to logging, now subject to the provisions of the safety standards for logging operations, published by the division of safety of the department of labor and industries of the state of Washington, are exempted from this order.

[Exemptions section, filed 4/3/61.]

WAC 296-28-015 Definitions. (1) The overhead clearance is that distance measured along a line which is perpendicular to and joins a horizontal plane passing through the top of the highest rail and the lowest point of the overhead structure or obstruction.

(2) The side clearance is the shortest distance from centerline of track to a structure or obstruction at the side of the track.

(3) The track clearance is the shortest distance between the centerlines of adjacent tracks.

(4) Height of a freight car is the distance between the top of rail and the top of running board.

(5) Width of a freight car is twice the distance from the centerline of the car to the extreme outside part thereof.

(6) Icing platforms: The term "icing platform" shall include structures used in performing the service of icing, precooling, heating, ventilating and servicing of cars used in the handling of commodities requiring the above services.

(7) Constituted authority shall mean the public service commission.

(8) Overcrossing when used in this order means any point or place where a highway crosses a railroad by passing above the same. Clearances shall be as specified in WAC 296-28-020 (1) and (3).

(9) Undercrossing when used in this order means any point or place where a highway crosses a railroad by passing under the same. Existing laws pertaining to highways shall prevail.

[Section 1, filed 4/3/61.]

WAC 296-28-020 Overhead clearances.

(1) Overhead clearance in general 22' 6"
(2) Overhead clearance in buildings 18' 0"

The overhead clearance inside of entirely enclosed buildings may be reduced to eighteen feet, provided that this clearance shall apply only to tracks terminating within the building, and further provided, that when an overhead clearance of less than twenty-two feet six inches is established therein, all cars, locomotives or other equipment shall be brought to a stop before entering such enclosed building, the conditions provided to require such stop to be approved by constituted authority.

Note: Engine houses and car shops are exempt from these regulations.

(3) Overhead clearance in tunnels and bridges.

Minimum overhead clearance in tunnels and through bridges may be decreased to the extent defined by the half-circumference of a circle having a radius of eight feet and tangent to a horizontal line twenty-two feet six inches above top of rail at a point directly above the centerline of track.

(4) Overhead clearance - all other structures.

Minimum overhead clearance as prescribed in subsection (1) above may be decreased to the extent defined by the half-circumference of a circle having a radius of eight feet six inches and tangent to a horizontal line twenty-two feet six inches above top of rail at a point directly over the centerline of track.

(5) Overhead clearance of wires.

All wires in general shall have a minimum vertical clearance of not less than that specified by the safety rules for the installation and maintenance by electric supply and communication lines as provided by the rules for electrical construction and the electrical and communication workers safety rules of the state of Washington.

[Section 2, filed 4/3/61.]

WAC 296-28-025 Side clearances.

(1) Side clearance in general 8' 6"

Note: To further reduce operational hazards, it is recommended that, wherever practicable, all posts, pipes, warning signs and other small obstructions be given a side clearance of ten feet.

(2) Side clearance at platforms:
(a) Platforms—8" or less above top of rail 4' 8"
(b) Platforms—4' 0" or less above top of rails 5' 9"
(c) Platforms—4' 6" or less above top of rail—when used principally for loading or unloading refrigerator cars 8' 0"
(d) Icing platforms and supports 5' 9"
(e) Platforms—Other than above 8' 6"

Note: Retractable platforms, either sliding or hinged, which are attached to a permanent structure shall be so designed that when not in use no part of such retractable platform shall fall within the clearance limits herein prescribed for a platform of that height above the top of the rail.

(f) Platforms—Combinations of any above.

Note: Platforms defined under subsection (2)(a) above may be combined with either subsection (2)(c) or subsection (2)(b) provided that the lower platform presents a level surface from a point not more than four feet eight inches from centerline of track to the face of the wall of the platform with which it is combined. No other combinations will be permitted.

(g) Platforms—Extension of existing platforms.

Note: Platforms which were constructed at lawful clearances prior to the effective date of this order may be extended at existing clearances upon approval of constituted authority.

(3) Side clearance—Bridges and tunnels 8' 0"

(4) Bridges and tunnels—Upper section (see WAC 296-28-020(3))

Side clearance in through bridges and tunnels may be decreased to the extent defined by the half circumference of a circle having a radius of eight feet and tangent to a horizontal line twenty-two feet six inches above top of rail directly above centerline of track.

(5) Bridges—Lower section and structures 4' high or less.

Through bridges supporting track affected, hand rails, water barrels and refuge platforms on bridges and trestles, water columns, oil columns, block signals, cattle guards and cattle chutes, or portions thereof, four feet or less above top of rail may have clearances decreased to the extent defined by a line extending diagonally upward from a point level with the top of rail and five feet distant laterally from centerline of track to a point four feet above top of rail and eight feet distant laterally from centerline of track: *Provided*, That the minimum clearance for hand rails and water barrels shall be seven feet six inches and the minimum clearance for fences of cattle guards shall be six feet nine inches.

Note: Unless previously approved, the clearances authorized in this subsection, except as provided for hand rails and water barrels, are not permitted on through bridges where the work of trainmen or yardmen requires them to be upon the decks of such bridges for the purpose of coupling or uncoupling cars in the performance of switching service on a switching lead.

(6) Side clearance—Cattle guards and cattle chutes. (See subsection (5) above.)

(7) Side clearance—Engine house and car repair shop doors. 7' 6"

(8) Side clearance—Hand rails on bridges and trestles (see subsection (5)).

(9) Side clearance—Interlocking mechanism, switch boxes, etc. 3' 0"

Switch boxes, switch operating mechanism necessary for the control and operation of signals and interlockers projecting four inches or less above top of rail.

(10) Side clearance—Mail cranes and train order stands when not in operative position. 8' 6"

(11) Side clearance—Oil columns (see subsection (5)). 8' 0"

(12) Side clearance—Poles supporting trolley contact. 8' 3"

Conductors supplying motive power to track affected—of bracket construction.

(13) Side clearance—Poles other than trolley poles. 8' 6"

(14) Side clearance—Signals and switch stands 3' high or less when located between tracks where not practicable to provide clearances otherwise prescribed in this order 6' 0"

(15) Side clearance—Signals and switch stands other than above 8' 0"

(16) Side clearance—Tunnels (see subsection (4)). 8' 0"

(17) Side clearance—Water barrels on bridges (see subsection (5)).

(18) Side clearance—Water columns (see subsection (5)). 8' 0"

(19) Side clearances on curved track.

Note: Side clearances on all structures adjacent to curved track shall be increased as necessary to give the equivalent of tangent track clearances.

(20) Side clearances—Material or merchandise adjacent to tracks. 8' 6"

Note: No merchandise, material or other articles shall be placed or stored on ground or platforms adjacent to any track at a distance less than eight feet six inches from the centerline of track, except in cases of maintenance or emergency when such material is to be used within a reasonable period of time or where local conditions make compliance with this note impossible.

[Section 3, filed 4/3/61.]

WAC 296-28-030 Track clearances.

(1) Track clearances—In general 14' 0"

The minimum distance between the centerlines of parallel standard gauge railroad tracks, which are used or proposed to be used for transporting cars, engines, motors or like equipment, shall be fourteen feet, except as hereinafter prescribed.

(2) Track clearances—Main and subsidiary tracks 15' 0"

The centerline of any standard gauge track, except a main track or a passing track, parallel and adjacent to a main track or a passing track, shall be at least fifteen feet from the centerline of such main track or passing track: *Provided, however,* That where a passing track is adjacent to and at least fifteen feet distant from the main track, any other track may be constructed adjacent to such passing track with clearance prescribed in subsection (1) above.

(3) Track clearances—Parallel team, house or industry tracks. 13' 0"

Minimum clearances between centerlines of parallel team, house or industry tracks shall be thirteen feet.

(4) Track clearances—Parallel ladder or ladder and other track 20' 0"

The centerline of any standard gauge ladder track, constructed parallel to any other track, shall have a clearance of not less that twenty feet from the centerline of such other track.

(5) Track clearances—Existing tracks

Note: Existing tracks may be extended at clearances lawfully prescribed prior to the effective date of this order.

[Section 4, filed 4/3/61.]

WAC 296-28-035 Marking of cars. (1) Cars exceeding 15' 6" in height.

Each car of a height exceeding fifteen feet six inches from top of rail to top of running board, the movement of which is hereby authorized, shall be marked, stenciled or placarded, and such markings maintained in a legible condition to read:

"This car
EXCESS
HEIGHT"

The words "EXCESS HEIGHT" to occupy the greater portion of a rectangular space 7" x 10" enclosed within a 3/4" solid border. The markings required shall be made permanent on owned cars as soon as practicable. Lettering and border of signs shall be of colors contrasting to that of the car body. All such required marking and placarding shall be placed on the side adjacent to the ladder or handholds near the floor line of the car at each of the four corners.

(2) Cars exceeding 10' 10" in width.

Each car of a width exceeding ten feet ten inches, the movement of which is hereby authorized, shall be marked, stenciled or placarded, and such markings maintained in a legible condition to read:

"This car
EXCESS
WIDTH"

The words "EXCESS WIDTH" to occupy the greater portion of a rectangular space 7" x 10" enclosed within 3/4" solid border. The markings required shall be made permanent on owned cars as soon as practicable. Lettering and border of signs shall be of colors contrasting to that of the car body. All such required marking and placarding shall be placed on the side adjacent to the ladder or handholds near the floor line of the car at each of the four corners.

[Section 5, filed 4/3/61.]

WAC 296-28-040 Operation of excess dimension loads. (1) Cars containing lading in excess of 15' 6" high and/or 5' 5" from centerline of car.

Each open top car containing lading of a height exceeding fifteen feet six inches above top of rail, or which extends laterally more than five feet five inches from the centerline of the car, the movement of which is hereby authorized, shall be marked, stenciled or placarded, and such markings maintained in a legible condition to read:

"This car
EXCESS
HEIGHT"

or

"This car
EXCESS
WIDTH"

The words "EXCESS HEIGHT" or "EXCESS WIDTH" to occupy the greater portion of a space 7" x 10" enclosed within a 3/4" solid border. Letters and border to be of contrasting colors. All such required markings and placarding shall be placed on the side adjacent to the ladder or handholds near the floor line of the car at each of the four corners where practicable, and in addition one each

of such signs shall be placed on each side of the load in a conspicuous position.

(2) Cars containing lading which extends laterally in excess of 5' 5".

The movement of open top cars containing lading which extends laterally in excess of five feet five inches is hereby authorized only if the lading is of such a nature that it cannot practically be reduced in dimensions.

(3) Lading higher than 15' 6" or extending laterally more than 5' 5 1/2".

(a) The movement of all open top cars having lading in excess of fifteen feet six inches in height, or which extends laterally in excess of five feet five and one-half inches from centerline of car will be authorized by written notice stating the total number of such cars and advising that no member of the train crew is required to ride on top of such high car or the side of any such wide car.

(b) A written notice shall be delivered to every train containing any car, the lading of which extends laterally in excess of 5' 5 1/2" from the centerline of the car or in excess of 15' 6" in height above top of rails, informing the crew of the train that the train includes such car or cars, stating the total number thereof and advising that no member of the train crew is required to ride on the side of any such wide car or top of any such high car.

(4) Notice to yard supervisors.

Yard supervisors shall be given notification sufficiently in advance of the arrival of such wide loads as described in subsection (3)(a) above as to enable them to take necessary precautions to safeguard employees in yard.

(5) Loads which cannot be passed over by employees.

Open top cars containing lading having an overall height in excess of fifteen feet six inches above top of rail, if otherwise in compliance with these requirements, and the nature of which precludes the possibility of employees passing over the cars, are exempt from the provisions of subsections (3)(a), (3)(b) and (4), but written notice must be given to all members of train crew informing them of the presence of such loads.

(6) Exemptions.

The common carrier railroads are hereby authorized to move excess height loads and width loads, as described in subsection (1) over roads or portions thereof, without complying with the provisions of WAC 296-28-040, provided that clearances equivalent to the minimum herein prescribed for cars having a height of fifteen feet six inches and width of ten feet ten inches are maintained.

[Section 6, filed 4/3/61.]

WAC 296-28-045 Narrow gauge railroads transporting freight cars. (1) Overhead and side clearances.

For the operation of equipment on narrow gauge tracks, the minimum overhead clearance shall provide a distance above the top of the highest car operated not less than that provided in this order for cars fifteen feet six inches in height operated on standard gauge tracks; the side clearances and distances between centerlines of tracks shall provide a distance from the sides of, or between the widest cars operated not less than those distances herein provided for cars ten feet ten inches in width operated on standard gauge tracks.

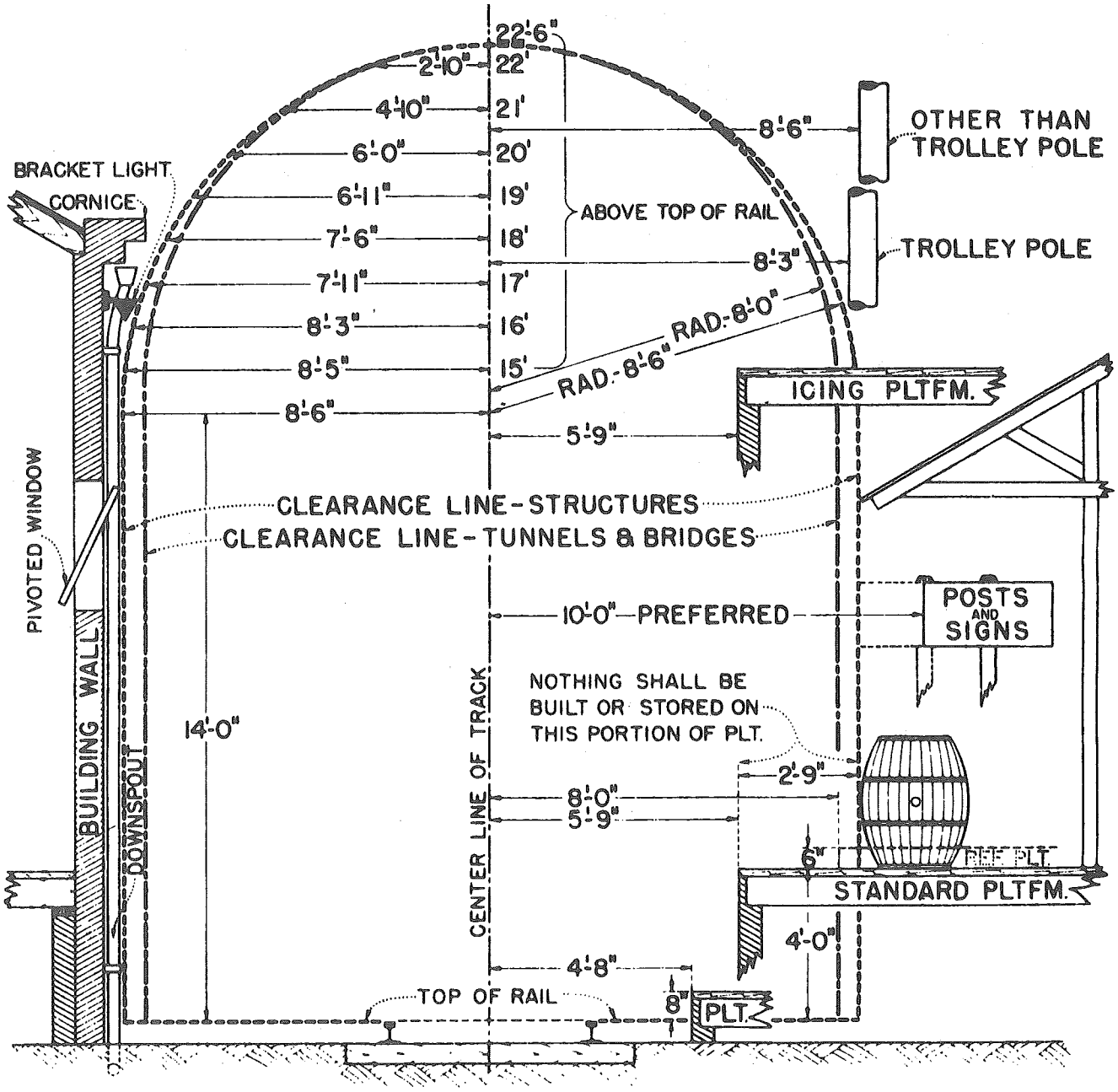
(2) All other requirements of this order where applicable shall be observed by narrow gauge railroads.

[Section 7, filed 4/3/61.]

WAC 296-28-050 Illustrations.

(1)

TYPICAL CLEARANCE
OF STRUCTURES FROM RAILROAD TRACKS

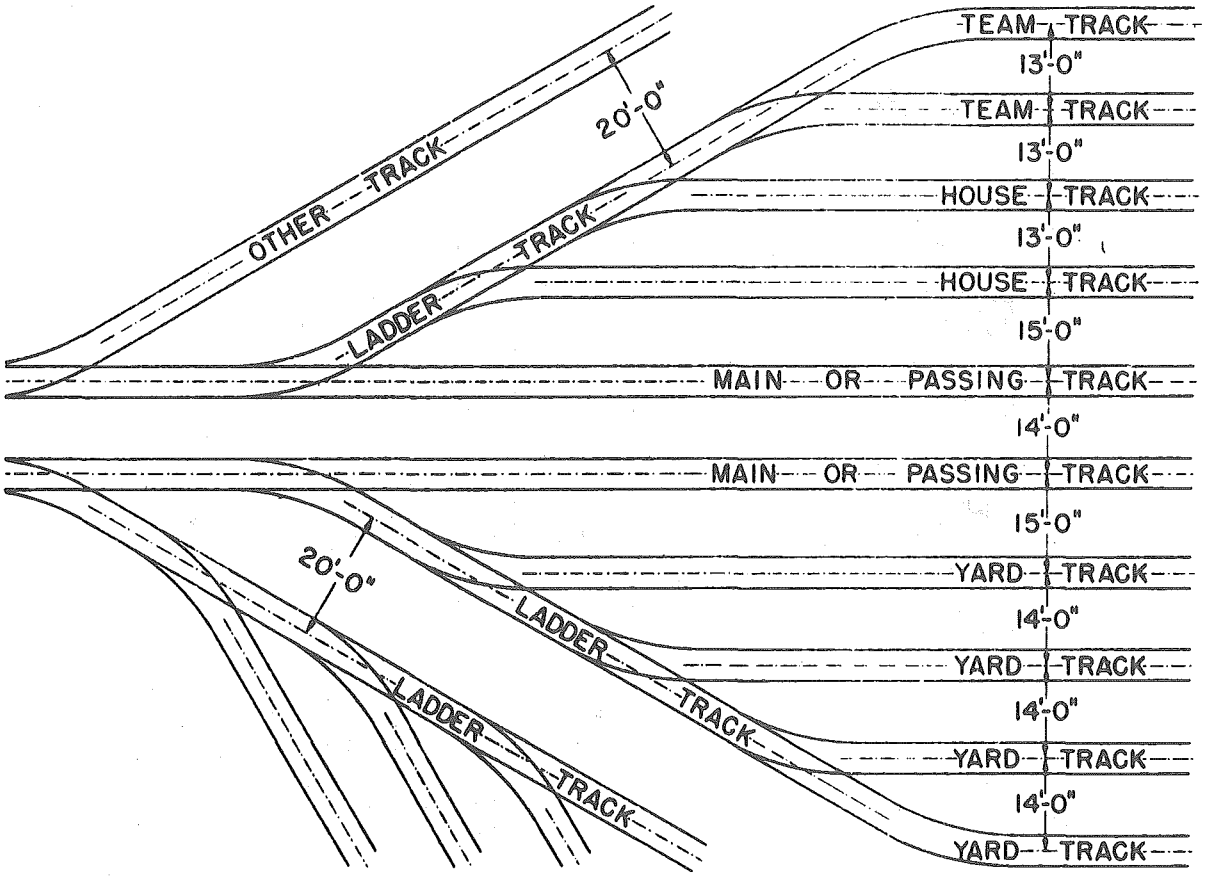


NOTES

OVERHEAD WIRE CLEARANCES SHALL CONFORM TO THE ELECTRICAL AND COMMUNICATION WORKERS SAFETY RULES OF THE STATE OF WASHINGTON

SIDE CLEARANCES ON ALL STRUCTURES ADJACENT TO CURVED TRACK SHALL BE INCREASED TO GIVE THE EQUIVALENT OF TANGENT TRACK CLEARANCES

(2) TYPICAL TRACK SPACING



NOTE

EXISTING TRACKS MAY BE EXTENDED AT CLEARANCES LAWFULLY PRESCRIBED PRIOR TO THE EFFECTIVE DATE OF THIS ORDER.

(3)

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CLASS OF HIGHWAY

	CLASS I			CLASS II			CLASS III			CLASS IV			CLASS V			CLASS VI		FRONTAGE ROADS (c)		
																		CLASS 1F	CLASS 2F	CLASS 3F
TERRAIN	LEVEL	ROLLING	MOUNT.	LEVEL	ROLLING	MOUNT.	LEVEL	ROLLING	MOUNT.	LEVEL	ROLLING	MOUNT.	LEVEL	ROLLING	MOUNT.	LEVEL & ROLLING	MOUNT.			
ADT IN 20 YEARS	OVER 18,000	OVER 15,000	OVER 12,000	18,000 MAX	15,000 MAX	12,000 MAX	Refer to Design Capacity Table			Refer to Design Capacity Table			600 TO 200			UNDER 200		1,000 TO 600	600 TO 100	UNDER 100
DHV IN 20 YEARS	OVER 2,700	OVER 2,250	OVER 1,800	2,700 MAX	2,250 MAX	1,800 MAX							90 TO 30			UNDER 30		150 TO 90	90 TO 15	UNDER 15
TRUCK ADT IN 20 YEARS							OVER 600	OVER 450	OVER 300	UNDER 600	UNDER 450	UNDER 300								
SEPARATION OF ALL CROSS TRAFFIC REQUIRED	YES			Separate Where Cross Traffic Warrants			Separate Where Cross Traffic Warrants			NO			NO			NO		NO		
CONTROL OF ACCESS REQUIRED	FULL			According to Master Plan			According to Master Plan			According to Master Plan			NO			NO		NO		
NUMBER OF TRAFFIC LANES	4 or more (Divided)			4 (Divided)			2			2			2			2		2	2	1
DESIGN SPEED M.P.H.	70	60	50	70	60	50	70	60	50	70	60	50	60	50	40	35	25	40	30	25
CURVATURE Desirable	3°	4°	6°	3°	4°	6°	3°	4°	6°	3°	4°	6°	4°	6°	9°-30'	13°	13°	9°-30'	13°	20°
CURVATURE Maximum	4°	5°	8°	4°	5°	8°	4°	5°	8°	4°	5°	8°	5°	8°	13°	18°	30°	13°	20°	56°
GRADIENT Desirable	2.5%	3%	4%	2.5%	3%	4%	2.5%	3%	4%	2.5%	4%	5%	3%	5%	6%	7%	7%	6%	7%	7%
GRADIENT Maximum	3%	5%	5%	3%	5%	5%	3%	5%	5%	3%	5%	6%	5%	6%	7%	10%	10%	7%	10%	10%
SIGHT DISTANCE Min Safe Stopping	600'	475	350'	600'	475'	350'	600'	475'	350'	600'	475'	350'	475'	350'	275'	225'	150'	275'	200'	150'
SIGHT DISTANCE Min Safe Passing	—	—	—	—	—	—	2,300'	2,000'	1,700'	2,300'	2,000'	1,700'	2,000'	1,700'	1,300'	1,000'	600'	—	—	—
TRAFFIC LANE WIDTH	12'			12'			12'			11'			10'			9'		10'	9'	12'
SHOULDER WIDTH	10'		10' (a)	10'		10' (a)	10'		10' (a)	8'		8' (a)	4'			3'		4	3'	3'
MIN. MEDIAN WIDTH	15'		4'	15'		4'														
PAVEMENT TYPE (b)	High			High			High			Intermediate or (High)			Low or (Intermediate)			Low or (None)		Low or (Inter.)	Low or (None)	Low or (None)
MIN. RIGHT OF WAY WIDTH	65' from outer edge of roadway 200' min			65' from outer edge of roadway 200' min			150'			150'			100'			60'		60'	60'	40'
ILLUMINATION	As Required			As Required			As Required at Intersections													
STRUCTURES (Minimum Standards)																				
Load Capacity	H20 - S16			H20 - S16			H20 - S16			H15 - S12			H15 - S12			H15 - S12		H15 - S12	H15	H15
Vertical Clearance	14'-6" Minimum 15'-0" Desirable																			
Bridge Width (0 to 80' Long)	69'			69'			42'			36'			26'			24'		26'	24'	18'
Bridge Width (Over 80' Long)	56'			56'			28'			26'			26'			24'		26'	24'	18'

NOTES:

(a) Shoulder width may be reduced to 4 feet for short sections in heavy rock excavation.

(b) Definitions of Pavement Types:

*High - Cem. Conc. - 8" Min. on Adequate Base; Asph. Conc. - 3" Min. on Cem. Treated Base

Inter. - Asph. Conc. - Under 3"; Bit. Penet. Mac. - 2" Min.; Road Mix. - 2" Min. } On Adequate Base

Low - L.B.S.T. - 3/4" Min.

*Exceptions are possible in arid areas.

Types in ( ) should be secondary choice.

(c) Frontage Roads: For volumes over 1,000 ADT, use Class IV Highway for 50 mph design speed.

Interstate Routes: Interstate Standards will apply.

DESIGN CAPACITY TABLE

TERRAIN	PER CENT SIGHT DIST. RESTRICTED	MAXIMUM DHV FOR CLASS OF HIGHWAY SHOWN													
		0% TRUCKS		5% TRUCKS		10% TRUCKS		15% TRUCKS		20% TRUCKS		25% TRUCKS		30% TRUCKS	
		CLASS III	CLASS IV	CLASS III	CLASS IV	CLASS III	CLASS IV	CLASS III	CLASS IV	CLASS III	CLASS IV	CLASS III	CLASS IV	CLASS III	CLASS IV
LEVEL	0	900	770	840	720	780	670	740	630	690	590	660	560	620	530
	20	860	740	800	690	750	640	700	610	660	570	630	540	590	510
	40	800	690	740	640	700	600	650	560	620	530	580	500	550	480
	60	720	620	670	580	630	540	590	510	550	480	530	450	500	430
ROLLING	0	900	770	750	640	640	550	560	480	500	430	450	390	410	350
	20	860	740	720	620	610	530	510	460	480	410	430	370	390	340
	40	800	690	670	580	570	490	500	430	450	380	400	250	360	310
	60	720	620	600	520	510	440	450	390	400	340	360	310	330	280
MOUNT.	0	900	770	620	530	470	410	380	330	320	280	280	240	240	210
	20	860	740	590	510	450	390	370	320	310	260	270	230	230	200
	40	800	690	550	480	420	360	340	290	290	250	250	210	220	190
	60	720	620	500	430	380	330	310	260	260	220	220	190	190	170

NOTES ON DESIGN CAPACITY TABLE:

Procedure in use of table:

1. Determine: (a) type of terrain, (b) % of length that sight distance is restricted to less than 1500 feet, (c) % of trucks, (d) DHV estimated for 20 years hence.
2. Select the class of highway required from the table using the above four conditions.
3. When the truck ADT requires a higher class of highway than the findings from this table indicate, the truck ADT shall govern.

Ratio of ADT to DHV varies with every case. DHV generally averages 10% to 15% of ADT.

Consideration should be given to climbing lanes as compared with going to a higher class of highway

Reference: Highway Capacity Manual.

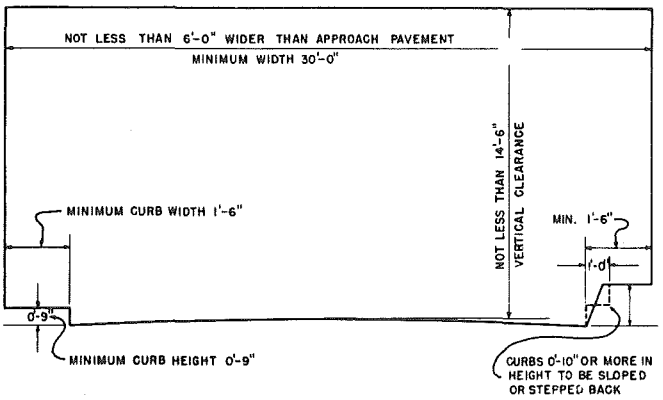
STANDARD
GEOMETRIC DESIGN STANDARDS
FOR RURAL STATE HIGHWAYS
WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS
OLYMPIA, WASHINGTON

APPROVED FEB 1, 19[illegible]

K-2

(4)

CLEARANCE DIAGRAM FOR UNDERPASSES
TWO-WAY HIGHWAY TRAFFIC



REFERENCE:

STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES – THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.

[Illustrations, filed 4/3/61.]

Chapter 296-30 WAC
RULES FOR THE ADMINISTRATION OF THE CRIME VICTIM COMPENSATION PROGRAM

WAC

WAC 296-30-010 Definitions. Whenever used in these rules, the following words mean:

(1) "Innocent victim" means any person whose injury was not the direct, proximate result of his or her consenting to, provoking, or inciting the criminal act that resulted in the injury.

(2) "Bodily injury" means any harmful or offensive touching, and includes severe emotional distress where no touching takes place when:

(a) Claimant is not the object of the criminal act and:

(i) The distress is intentionally or recklessly inflicted;

(ii) The distress is inflicted by extreme or outrageous conduct;

(iii) The claimant has a reasonable apprehension of imminent bodily harm;

(iv) The claimant is in the immediate vicinity of the criminal act at the time the criminal act takes place.

(b) Claimant is the victim of the criminal act and:

(i) The distress is intentionally inflicted;

(ii) The distress is inflicted by outrageous or extreme conduct; and

(iii) The claimant had a reasonable apprehension of imminent bodily harm.

(3) "Private insurance" means sources of recompense available by contract, such as life or disability insurance.

(4) "Public insurance" means any state or federal statutory welfare and insurance plan that compensates victims or their beneficiaries as a result of the claimed injury or death. This does not include state, federal, or private deferred income retirement plans.

(5) The test used to define "the result of" as used in RCW 7.68.070 (3)(a) and (b) is two pronged. First, it must be determined that cause in fact exists, and second, it must then be determined that proximate cause exists.

(a) Cause in fact exists if "but for" the acts of the victim the crime that produced the injury would not have occurred.

(b) Proximate cause exists if, once cause in fact is found, it is determined that the acts of the victim:

(i) Resulted in a foreseeable injury to the victim;

(ii) Played a substantial role in the injury; and

(iii) Were the direct cause of the injury.

(6) "Institutions maintained and operated by department of social and health services" means those institutions in which the department of social and health services assumes responsibility for medical coverage of the institution's residents.

(7) "Reasonable cooperation" generally exists when the claimant is:

(a) Willing to talk to police and give information to aid in the investigation; and

(b) Willing to assist in the prosecution of the alleged criminal.

(8) A person is "unjustly enriched" within the meaning of RCW 7.68.070(15) when it would be deficient in justice and fairness, or inequitable, to allow that person to obtain, or have control of or access to, benefits or compensation paid as a result of an injury to a victim of crime.

(9) "Department" means the department of labor and industries.

(10) "Services provided" means services covered under chapter 74.09 RCW or Title XIX of the Federal Social Security Act that are: (a) Provided by health services providers with credentials recognized by the department for purposes of payment under chapter 51.36 or 7.68 RCW; and (b) available and equivalent to those services covered by the department under Title 51 or chapter 7.68 RCW.

[Statutory Authority: RCW 7.68.030, 7.68.070 (12) and (16) and 51-.04.030. 89-23-004, § 296-30-010, filed 11/3/89, effective 11/10/89. Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-010, filed 12/11/85; 85-03-060 (Order 85-3), § 296-30-010, filed 1/15/85.]

WAC 296-30-020 Vehicular assault and vehicular homicide. Chapter 7.68 RCW shall cover those people killed or injured as a result of a vehicular homicide or

vehicular assault that occurred after July 24, 1983 if there has been a conviction for the vehicular assault or vehicular homicide. Eligibility occurs when the claimant's injury results in the assailant's conviction for vehicular assault or vehicular homicide, or when the claimant's injury is a direct result of the collision that led to the vehicular assault or vehicular homicide conviction. The claimant's injury need not be the one that led to the conviction.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-020, filed 12/11/85; 85-03-060 (Order 85-3), § 296-30-020, filed 1/15/85.]

WAC 296-30-025 Medical assistance eligibility. The benefits provided under chapter 7.68 RCW that are available and equivalent to those services provided under chapter 74.09 RCW or Title XIX of the Federal Social Security Act are not available to persons eligible for services provided under chapter 74.09 RCW or Title XIX of the Federal Social Security Act, except to the extent that costs for such services exceed service limits established by the department of social and health services. Accordingly:

(1) Applicants for benefits provided under chapter 7.68 RCW shall provide, concurrent with their application for crime victims' benefits, information requested by the department to determine the applicant's probable eligibility for services provided under chapter 74.09 RCW and Title XIX of the Federal Social Security Act. The applicant, or a person on behalf of the applicant, shall send the application and other requested information to the offices of the crime victims' compensation program in Olympia.

(2) The department shall provide application forms for crime victims' benefits, any forms used to determine probable eligibility for services provided under chapter 74.09 RCW or Title XIX of the Federal Social Security Act, and a pamphlet describing the crime victims' compensation program to hospitals, law enforcement agencies, community organizations, prosecutor based victim/witness units and, as requested, to other service groups. The pamphlet shall (a) explain the limitations of benefits provided under chapter 7.68 RCW; (b) provide assistance for an applicant in completing the forms; and (c) provide an applicant information about where additional assistance is available if the instructions for completing the forms are not understood or if unusual circumstances exist.

(3) Any claimant who is eligible for benefits provided under chapter 7.68 RCW and who the department determines may be eligible for services provided under chapter 74.09 RCW and Title XIX of the Federal Social Security Act, based upon the completed eligibility form referenced above, shall apply to the department of social and health services for a conclusive determination of eligibility for such services.

(4) Because a claimant's circumstances can change and in order to assure that the department provides crime victims' benefits secondary to other available public and private insurance, persons receiving benefits provided under chapter 7.68 RCW but not initially eligible to receive services provided under chapter 74.09 RCW or Title XIX of the Federal Social Security Act shall annually provide information requested by the department to determine the applicant's probable eligibility for services provided under chapter 74.09 RCW and Title XIX of the Federal Social Security Act in order to continue receiving benefits under chapter 7.68 RCW.

(5) The department shall not provide benefits for services provided under chapter 74.09 RCW and Title XIX of the Federal Social Security Act to persons who refuse or who otherwise fail to cooperate or comply in good faith with the requirements of this section, except to the extent that the costs for such services exceed service limits established by the department of social and health services.

(6)(a) Except for claims submitted pursuant to RCW 7.68.170 for sexual assault examinations, or as provided in (b) of this subsection the department shall not consider applications for benefits under chapter 7.68 RCW until the information requested to determine probable eligibility for services provided under chapter 74.09 RCW and Title XIX of the Federal Social Security Act is received by the department.

(b) If the applicant seeks only services that are covered under chapter 7.68 RCW but are not services provided under chapter 74.09 RCW or Title XIX of the Federal Social Security Act, such as appropriate counseling provided by a health care provider pursuant to WAC 296-30-080, the department shall consider applications for benefits under chapter 7.68 RCW without requiring information to determine probable eligibility for other services.

[Statutory Authority: RCW 7.68.030, 7.68.070 (12) and (16) and 51-.04.030. 89-23-004, § 296-30-025, filed 11/3/89, effective 11/10/89.]

WAC 296-30-050 Distribution of third party recoveries. (1) Before July, 1977. Any claimant who receives crime victim's benefits is required to reimburse fully the department for all benefits paid to the claimant under chapter 7.68 RCW if the claimant recovers damages from the person or persons who committed the criminal act. The reimbursement is limited to the amount recovered by the victim.

(2) After July, 1977 and before April 1, 1980. Any claimant who receives crime victim's benefits is required to reimburse fully the department for all benefits paid to the claimant under chapter 7.68 RCW if the claimant recovers damages from any liable party. The reimbursement is limited to that amount recovered by the victim.

(3) An injury or death that occurred on or after April 1, 1980, for which recovery was made before July 24, 1983. This amendment incorporated the industrial insurance third party recovery statutes RCW 51.24.050 through 51.24.100 into chapter 7.68 RCW. The amendment changed the department's entitlement to reimbursement. For those victims injured or killed on or after April 1, 1980, and for which any recovery was made before July 24, 1983, disbursement of an award or settlement is as follows:

(a) Reasonable attorney's fees.

(b) Victim receives 25% of the balance.

(c) The department shall receive the balance to the extent necessary to reimburse the department for benefits paid.

(d) Any remaining balance is paid to the victim.

(e) If any remaining balance is paid to the victim, no further crime victim benefits will be paid to the victim until the amount of benefits she or he continued to be eligible for equals the remaining balance paid at the time of settlement or award.

(4) Recoveries made on or after July 24, 1983. This subsection applies to all claimants who receive an award or settlement from a liable third party on or after July 24, 1983. These awards shall be disbursed as follows:

(a) Costs and reasonable attorney's fees paid proportionately by the victim and the department.

(b) Victim then receives 25% of the balance.

(c) Department receives the balance to the extent necessary to reimburse the department for its lien minus its share of attorney's fees.

(d) Any remaining balance goes to the victim.

(e) The department may compromise its lien for injuries that were sustained on or after April 1, 1980.

(5) Steps for determining proportionate attorney's fees:

(a) Determine the amount of the settlement or award obtained by the claimant.

(b) Determine attorney's fees and costs.

(c) For an open claim, determine the amount of the department's lien at the time of settlement or award. If the claim is closed at the time of the recovery, determine the claimant's full entitlement from the department.

(6) Calculate what percent of the total recovery equals the department's lien for open cases, and the claimant's entitlement for closed claims. This percent is the department's proportionate share.

Ex. in a nondeficiency judgment

$ 1,000	Gross recovery
$ 200	Attorney fees
$ 100	Entitlement or claim costs
$ 20	Department's proportionate share of attorney's fees and costs. The $100 claim costs equals 10% of the total recovery. Thus, the department's proportionate share of attorney's fees are equal to 10% of $200 or $20

Ex. in deficiency judgments/recoveries

$ 1,000	Gross recovery
$ 200	Attorney fees
$ 2,000	Claim costs
$ 1,000	
$ -200	Attorney fees
$ 800	Claimant receives 25% of this figure = 200
$ -200	Claimant 25% share
$ 600	Balance remaining goes to the department and is used to determine if settlement/judgment is deficient. If this balance is deficient, as it is here, this figure is used to calculate the department's proportionate share of attorney's fees and costs.
60%	Department percent of attorney fees ($6.00 = 60% of $1,000 recovery)
$ 120	Department's share of attorney fees
$ +200	Claimant's 25% share
$ 320	Claimant's total recovery
$ 600	Balance
$ -120	Attorney fees, department
$ 480	Department's recovery

(7) Once the claim is closed, the department shall reexamine its proportionate share. If the claimant's final entitlement is greater than the amount of the department's lien at the time of recovery, the department shall reimburse the claimant for the department's increased percentage of the attorney's fees and costs.

Ex.:

$ 1,000	Recovery.
$ 200	Attorney's fees and costs.
$ 100	Department's lien at time of recovery.
$ 20	Attorney's fees and costs paid at time of recovery.
$ 500	Claimant's total entitlement (50% of total recovery).
$ 100	Department's full proportionate share of attorney's fees and costs (50%, that amount determined by the claimant's entitlement).
$ 80	The amount that the department must reimburse the claimant for attorney's fees and costs.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-050, filed 12/11/85; 85-03-060 (Order 85-3), § 296-30-050, filed 1/15/85.]

WAC 296-30-060 Requirement to report criminal acts. (1) The following are examples under which the seventy-two hour reporting requirement in RCW 7.68.060(2) may be tolled:

(a) Unconsciousness or coma of victim.

(b) Youth of victim (because of age the victim is unaware that a crime has been committed against her).

(c) Rape trauma syndrome.

(d) A report of an assault against a child made to children's protective services when the report is made within seventy-two hours of when it reasonably could have been made.

(2) This list is not and should not be considered exhaustive but is for illustrative purposes.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-060, filed 12/11/85; 85-03-060 (Order 85-3), § 296-30-060, filed 1/15/85.]

WAC 296-30-080 Counseling for sexual assault. (1) Pursuant to RCW 7.68.070(12), the department shall pay for counseling for victims of sexual assault and, when appropriate, for members of a victim's immediate family. An immediate family member shall be defined as the victim's parents, spouse, child(ren), siblings, grandparents, and those members of the same household who have assumed the rights and duties commonly associated with a family and who hold themselves out as a family unit.

(2) Counseling for the above defined family members is appropriate when:

(a) The counseling is for the spouse, child, parent, or sibling of the victim who suffers psychological trauma as a result of the sexual assault; or

(b) The family member and victim live in the same household and the family member suffers psychological trauma as a result of the sexual assault; or

(c) The family member sees the assault; or

(d) Counseling of the family member will aid in the victim's recovery.

(3) Evaluation and counseling must be done by a counselor with a MSW or equivalent degree, a PhD psychologist, or a psychiatrist. The fee for an MSW or equivalent degree for 45-50 minutes with report . . . . 40 units.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-080, filed 12/11/85; 85-03-060 (Order 85-3), § 296-30-080, filed 1/15/85.]

WAC 296-30-081 Acceptance of rules and fees. Providing medical or counseling services to an injured crime victim whose claim for crime victims benefits has been accepted by the department constitutes acceptance of the department's medical aid rules and compliance with its rules and fees. Maximum allowable fees shall be those fees contained in WAC 296-21-010 through 296-23-9408 and in WAC 296-30-080 less any available benefits of public or private collateral resources.

An injured victim shall not be billed for his or her accepted injury. The department shall be billed only after available benefits of public or private insurance have been determined.

If the medical provider has billed the injured victim and is later notified that the department has accepted the victim's claim, the provider shall refund to the injured victim any amounts paid that are in excess of the amounts that the victim is entitled to from public or private insurers, and bill the department for services rendered at fee schedule rates if such rates are in excess of the public or private insurance entitlements.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-081, filed 12/11/85.]

WAC 296-30-120 Factors considered in order to modify debt due department. RCW 7.68.120 allows the department in the interest of justice or rehabilitation, to waive, modify, or adjust the debt owed to the department by any person found to have committed the criminal act for which crime victim benefits were paid. To determine whether or not the debt should be modified, waived or adjusted, the department shall consider the following factors:

(1) The gravity of the offense;
(2) Extent of injury to victim;
(3) Type of crime;
(4) circumstances surrounding the criminal act;
(5) The assailant's attempts at rehabilitation:
(a) Rehabilitation program involvement;
(b) Employment efforts;
(c) Community involvement;
(6) Ability to pay:
(a) Income;
(b) Necessary expenses;
(c) Number and ages of dependents;
(7) Sentence imposed by the court.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-120, filed 12/11/85.]

WAC 296-30-130 Lump sum benefits. (1) Lump sum benefits paid to the survivor(s) of an unemployed victim shall be paid on a monthly basis if the survivor(s) is entitled to private or public death benefits. The death benefit payments shall be deducted each month from the crime victim's death benefits. Crime victim's benefit payments shall continue until the combined public or private death benefits and the crime victim's death benefits equal the total amount that the survivor(s) is eligible for under chapter 7.68 RCW.

(2) The amount of the monthly payments is based on the state's average monthly wage and are determined by the percentages established in RCW 51.32.050.

(3) This lump sum payment shall be adjusted upward by a factor of 8% to reflect the present and future value of the money.

(4) The survivor(s) of an employed victim are entitled to a maximum of ten thousand dollars in death benefits. These benefits shall be paid in the same manner as the benefits paid to the survivor(s) of an unemployed victim except that the monthly rate shall be determined by the deceased's regular rate of pay.

(5) This procedure was adopted to ensure equal treatment of survivor(s) in like circumstances.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-130, filed 12/11/85; 85-03-060 (Order 85-3), § 296-30-130, filed 1/15/85.]

WAC 296-30-170 Payment for medical examination of victims of sexual assault. A victim of sexual assault is entitled to payment for the costs of a medical examination under RCW 7.68.170 regardless of whether she or he qualifies for benefits under chapter 7.68 RCW, if the hospital or emergency medical facility proves to the department that:

(1) The care was provided; and

(2) The examination was performed at least in part to gather medical evidence for possible prosecution of the assailant.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-170, filed 12/11/85; 85-03-060 (Order 85-3), § 296-30-170, filed 1/15/85.]

WAC 296-30-180 Payment of benefits to prevent unjust enrichment. RCW 7.68.070(15) prohibits the department from paying any benefits or compensation to the person who caused a crime victims injuries, or to any other person if that person would be unjustly enriched by the benefits. In some situations, as when a child is injured by a parent or a spouse by the other spouse, there is a danger that the injuring person will divert to her own use the benefits or compensation intended for the victim.

To prevent this possibility, the department may on its own motion or the motion of the victim or his or her guardian, request that the victim or other responsible adult establish (1) a trust for which the trustee shall be a neutral third person; or (2) a savings or checking account for which a neutral third person must cosign all withdrawals or checks. Crime victims compensation benefits shall then be deposited in the established account.

The department shall continue to pay medical providers directly.

[Statutory Authority: Chapter 7.68 RCW. 86-01-028 (Order 85-37), § 296-30-180, filed 12/11/85.]

WAC 296-30-900 Effective date of amendatory acts. (1) The statute in effect at the time the criminally caused injury occurred is the controlling law.

[Statutory Authority: Chapter 7.68 RCW. 85-03-060 (Order 85-3), § 296-30-900, filed 1/15/85.]

Chapter 296-32 WAC
SAFETY STANDARDS FOR TELECOMMUNICATIONS

WAC

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 above 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 linemen 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 his 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 he may be connected. In case of dispute, competency shall be established by a committee appointed by the assistant director of the division of industrial safety and health 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) "Foreman or man–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 GH_z (gigahertz) and 300 GH_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 his training and experience has demonstrated his ability to safely perform his 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 his ability to perform his duties safely at his 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 men, 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), operating 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.

[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.

(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(1).

(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 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.

(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) Workmen 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.

[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 his 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 assistant director of industrial safety and health, or his 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 WAC 296-62-054 through 296-62-05427 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. 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. Head protection meeting the requirements of ANSI Z89.2-1971, "Safety Requirements for Industrial Protective Helmets for Electrical Workers, Class B" 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. These helmets shall meet the specifications contained in American National Standards Institute, Z89.1-1969, Safety Requirements for Industrial Head Protection.

(b) The employer shall insure that the head protection is used by the employee.

(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.

(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: 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. This equipment shall meet the electrical and physical requirements contained in ANSI J6.6-1971 "Standard Specifications for Rubber Insulating Gloves," and ANSI J6.4-1971 "Standard Specifications for Rubber Insulating Blankets," with the exception that the maximum proof test current for a 14-inch Class I glove shall be no more than 14mA, and with the further exception that existing 14-inch Class I rubber gloves that meet a maximum proof test current of 14 mA and a minimum breakdown voltage of 10,000 volts (RMS) acquired prior to January 1, 1976, may be used as long as these gloves comply with the retest requirements of subsection (2) of this section.

(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) Protective equipment fabricated of material other than rubber shall provide electrical and mechanical protection at least equal to that of the rubber equipment.

(5)(a) 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.

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

(6) Insulating gloves and blankets shall be stored away from direct sunlight, steampipes, radiators and other sources of excessive heat.

(7) Gloves and blankets shall not be folded while in storage. A separate container shall be provided for rubber blankets and blankets shall be wiped clean and rolled before placing in container.

(8) Inspect rubber goods. Before using a pair of rubber gloves or rubber blankets, workers shall personally inspect each glove for defects and give an air test, and the blanket shall be visually inspected for cracks or cuts before using.

Note: Grasp the cuff at opposite sides and twirl the gloves so as to roll it up the cuff and produce air pressure within the glove, then look for leaks and thin places in the rubber.

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

(10) 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.

(b) Rubber gloves when not in use shall be carried in a bag provided and designed for that purpose.

[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.

(a) General requirements.

(i) 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.

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

(b) 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.

(c) 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.

(d) 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.

[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. Spacing 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 used in telecommunication centers shall have a width between the side rails, inside to inside, of at least 12 inches.

(a) 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."

[Order 76–38, § 296–32–280, filed 12/30/76; Order 75–41, § 296–32–280, filed 12/19/75.]

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.

(a) 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 workman 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.

[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.

(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 his 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.

[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 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 his 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.

[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 considered 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 platforms, 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.

(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 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 he knows 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 foreman 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-Trimmer 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.

[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.]

Chapter 296-36 WAC
SAFETY STANDARDS--COMPRESSED AIR WORK

WAC

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 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 passageway 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' experience 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 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:

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.

[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.**

(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 40 minutes

Total time 43 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) Elapsed time 110 minutes

Total time 117 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

Working Chamber Pressure	Working Period	Decompression Data						
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
14	1/2	1	14	4	2	0.20	
		2	4	0	4	1.00	6
	1	1	14	4	2	0.20	
		2	4	0	4	1.00	6
	1–1/2	1	14	4	2	0.20	
		2	4	0	4	1.00	6
	2	1	14	4	2	0.20	
		2	4	0	4	1.00	6
	3	1	14	4	2	0.20	
		2	4	0	4	1.00	6

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data						
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	4	1	14	4	2	0.20	
		2	4	0	4	1.00	6
	5	1	14	4	2	0.20	
		2	4	0	4	1.00	6
	6	1	14	4	2	0.20	
		2	4	0	4	1.00	6
	7	1	14	4	2	0.20	
		2	4	0	14	3.50	16
	8	1	14	4	2	0.20	
		2	4	0	14	3.50	16
	Over 8	1	14	4	2	0.20	
		2	4	0	30	7.50	32
16	1/2	1	16	4	3	0.20	
		2	4	0	4	1.00	7
	1	1	16	4	3	0.20	
		2	4	0	4	1.00	7
	1–1/2	1	16	4	3	0.20	
		2	4	0	4	1.00	7
	2	1	16	4	3	0.20	
		2	4	0	4	1.00	7
	3	1	16	4	3	0.20	
		2	4	0	4	1.00	7
	4	1	14	4	3	0.20	
		2	4	0	4	1.00	7
	5	1	14	4	3	0.20	
		2	4	0	14	3.50	17
	6	1	14	4	3	0.20	
		2	4	0	30	7.50	33
	7	1	14	4	3	0.20	
		2	4	0	45	11.25	48
	8	1	14	4	3	0.20	
		2	4	0	45	11.25	48
	Over 8	1	14	4	3	0.20	
		2	4	0	60	15.00	63
18	1/2	1	18	4	3	0.20	
		2	4	0	4	1.00	7
	1	1	18	4	3	0.20	
		2	4	0	4	1.00	7
	1–1/2	1	18	4	3	0.20	
		2	4	0	4	1.00	7
	2	1	18	4	3	0.20	
		2	4	0	5	1.25	8
	3	1	18	4	3	0.20	
		2	4	0	8	2.00	11

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
			Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	Stage No.	From	To	Minutes	Min/Pound	Minutes
	4	1	18	4	3	0.20	
		2	4	0	14	3.50	17
	5	1	18	4	3	0.20	
		2	4	0	45	11.25	48
	6	1	18	4	3	0.20	
		2	4	0	60	15.00	63
	7	1	18	4	3	0.20	
		2	4	0	60	15.00	63
	8	1	18	4	3	0.20	
		2	4	0	70	17.50	73
	Over 8	1	18	4	3	0.20	
		2	4	0	84	21.00	87
20	1/2	1	20	4	3	0.20	
		2	4	0	4	1.00	7
	1	1	20	4	3	0.20	
		2	4	0	4	1.00	7
	1-1/2	1	20	4	3	0.20	
		2	4	0	5	1.25	8
	2	1	20	4	3	0.20	
		2	4	0	12	3.00	15
	3	1	20	4	3	0.20	
		2	4	0	12	3.00	15
	4	1	20	4	3	0.20	
		2	4	0	40	10.00	43
	5	1	20	4	3	0.20	
		2	4	0	60	15.00	63
	6	1	20	4	3	0.20	
		2	4	0	70	17.50	73
	7	1	20	4	3	0.20	
		2	4	0	80	20.00	83
	8	1	20	4	3	0.20	
		2	4	0	100	25.00	103
	Over 8	1	20	4	3	0.20	
		2	4	0	110	27.50	113
22	1/2	1	22	6	3	0.20	
		2	6	0	6	1.00	9
	1	1	22	6	3	0.20	
		2	6	0	6	1.00	9
	1-1/2	1	22	6	3	0.20	
		2	6	0	13	2.20	16
	2	1	22	6	3	0.20	
		2	6	0	21	3.50	24
	3	1	22	6	3	0.20	
		2	6	0	35	5.85	38

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
			Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	Stage No.	From	To	Minutes	Min/Pound	Minutes
	4	1	22	6	3	0.20	
		2	6	0	65	10.83	68
	5	1	22	6	3	0.20	
		2	6	0	90	15.00	93
	6	1	22	6	3	0.20	
		2	6	0	100	16.67	103
	7	1	22	6	3	0.20	
		2	6	0	110	18.35	113
	8	1	22	6	3	0.20	
		2	6	0	125	20.80	128
	Over 8	1	22	6	3	0.20	
		2	6	0	130	21.70	133
24	1/2	1	24	3	3	0.20	
		2	8	4	4	1.00	
		3	4	0	4	1.00	11
	1	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	5	1.25	12
	1-1/2	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	16	4.00	23
	2	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	20	5.00	27
	3	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	45	11.25	52
	4	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	85	21.25	92
	5	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	110	27.50	117
	6	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	115	28.80	122
	7	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	120	30.00	127
	8	1	24	8	3	0.20	
		2	8	4	4	1.00	
		3	4	0	130	32.50	137
	Over 8	1	24	8	3	0.20	
		2	8	4	8	1.00	
		3	4	0	140	35.00	151
26	1/2	1	26	10	3	0.20	
		2	10	4	6	1.00	
		3	4	0	4	1.00	13

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	1	1	26	10	3	0.20	
		2	10	4	6	1.00	
		3	4	0	5	1.25	14
	1–1/2	1	26	10	3	0.20	
		2	10	4	6	1.00	
		3	4	0	20	5.00	29
	2	1	26	10	3	0.20	
		2	10	4	6	1.00	
		3	4	0	25	6.25	34
	3	1	26	10	3	0.20	
		2	10	4	6	1.00	
		3	4	0	60	15.00	69
	4	1	26	10	3	0.20	
		2	10	4	6	1.00	
		3	4	0	95	23.75	104
	5	1	26	10	3	0.20	
		2	10	4	8	1.33	
		3	4	0	115	28.80	126
	6	1	26	10	3	0.20	
		2	10	4	8	1.33	
		3	4	0	130	32.50	141
	7	1	26	10	3	0.20	
		2	10	4	9	1.50	
		3	4	0	130	32.50	142
	8	1	26	10	3	0.20	
		2	10	4	9	1.50	
		3	4	0	130	32.50	142
	Over 8	1	26	10	3	0.20	
		2	10	4	30	5.00	
		3	4	0	130	32.50	163
28	1/2	1	28	12	3	0.20	
		2	12	4	8	1.00	
		3	4	0	4	1.00	15
	1	1	28	12	3	0.20	
		2	12	4	8	1.00	
		3	4	0	12	3.00	23
	1–1/2	1	28	12	3	0.20	
		2	12	4	8	1.00	
		3	4	0	20	5.00	31
	2	1	28	12	3	0.20	
		2	12	4	8	1.00	
		3	4	0	30	7.50	41
	3	1	28	12	3	0.20	
		2	12	4	10	1.25	
		3	4	0	85	21.20	98
	4	1	28	12	3	0.20	
		2	12	4	14	1.75	
		3	4	0	110	27.50	127

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	5	1	28	12	3	0.20	
		2	12	4	20	2.50	
		3	4	0	120	30.00	143
	6	1	28	12	3	0.20	
		2	12	4	20	2.50	
		3	4	0	130	32.50	153
	7	1	28	12	3	0.20	
		2	12	4	20	2.50	
		3	4	0	130	32.50	153
	8	1	28	12	3	0.20	
		2	12	4	32	4.00	
		3	4	0	130	32.50	165
	Over 8	1	28	12	3	0.20	
		2	12	4	50	6.25	
		3	4	0	130	32.50	183
30	1/2	1	30	14	3	0.20	
		2	14	4	10	1.00	
		3	4	0	4	1.00	17
	1	1	30	14	3	0.20	
		2	14	4	10	1.00	
		3	4	0	15	3.75	28
	1–1/2	1	30	14	3	0.20	
		2	14	4	10	1.00	
		3	4	0	25	6.25	38
	2	1	30	14	3	0.20	
		2	14	4	14	1.40	
		3	4	0	45	11.25	62
	3	1	30	14	3	0.20	
		2	14	4	17	1.70	
		3	4	0	85	21.20	105
	4	1	30	14	3	0.20	
		2	14	4	30	3.00	
		3	4	0	110	27.50	143
	5	1	30	14	3	0.20	
		2	14	4	35	3.50	
		3	4	0	130	32.50	165
	6	1	30	14	3	0.20	
		2	14	4	35	3.50	
		3	4	0	130	32.50	168
	7	1	30	14	3	0.20	
		2	14	4	45	4.50	
		3	4	0	130	32.50	178
	8	1	30	14	3	0.20	
		2	14	4	55	5.50	
		3	4	0	130	32.50	188
	Over 8	1	30	14	3	0.20	
		2	14	4	71	7.10	
		3	4	0	130	32.50	204

DECOMPRESSION TABLE NO. 2

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

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	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

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	Over 8	1	36	20	3	0.20	
		2	20	4	140	8.75	
		3	4	0	130	32.50	273
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

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	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
	4	1	40	24	3	0.20	
		2	24	8	45	2.81	
		3	8	4	35	8.75	
		4	4	0	130	32.50	213
	5	1	40	24	3	0.20	
		2	24	8	47	2.94	
		3	8	4	53	13.25	
		4	4	0	130	32.50	233
	6	1	40	24	3	0.20	
		2	24	8	55	3.44	
		3	8	4	60	15.00	
		4	4	0	130	32.50	248
	7	1	40	24	3	0.20	
		2	24	8	65	4.06	
		3	8	4	60	15.00	
		4	4	0	130	32.50	258
	8	1	40	24	3	0.20	
		2	24	8	75	4.70	
		3	8	4	60	15.00	
		4	4	0	130	32.50	268
	Over 8	1	40	24	3	0.20	
		2	24	8	95	5.93	
		3	8	4	60	15.00	
		4	4	0	130	32.50	288
42	1/2	1	42	26	3	0.20	
		2	26	10	16	1.00	
		3	10	4	6	1.00	
		4	4	0	12	3.00	37
	1	1	42	26	3	0.20	
		2	26	10	16	1.00	
		3	10	4	12	2.00	
		4	4	0	25	6.25	56
	1-1/2	1	42	26	3	0.20	
		2	26	10	16	1.00	
		3	10	4	23	3.83	
		4	4	0	60	15.00	102
	2	1	42	26	3	0.20	
		2	26	10	16	1.00	
		3	10	4	30	5.00	
		4	4	0	95	23.75	144
	3	1	42	26	3	0.20	
		2	26	10	16	1.00	
		3	10	4	50	8.34	
		4	4	0	120	30.00	189

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	4	1	42	26	3	0.20	
		2	26	10	17	1.06	
		3	10	4	65	10.83	
		4	4	0	130	32.50	215
	5	1	42	26	3	0.20	
		2	26	10	27	1.69	
		3	10	4	85	14.18	
		4	4	0	130	32.50	245
	6	1	42	26	3	0.20	
		2	26	10	27	1.69	
		3	10	4	100	16.67	
		4	4	0	130	32.50	260
	7	1	42	26	3	0.20	
		2	26	10	30	1.88	
		3	10	4	100	16.67	
		4	4	0	130	32.50	263
	8	1	42	26	3	0.20	
		2	26	10	35	2.19	
		3	10	4	100	16.67	
		4	4	0	130	32.50	268
	Over 8	1	42	26	3	0.20	
		2	26	10	60	3.75	
		3	10	4	100	16.67	
		4	4	0	130	32.50	293
44	1/2	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	8	1.00	
		4	4	0	16	4.00	43
	1	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	20	2.50	
		4	4	0	25	6.25	64
	1-1/2	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	27	3.38	
		4	4	0	72	18.00	118
	2	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	40	5.00	
		4	4	0	95	23.75	154
	3	1	44	23	3	0.20	
		2	28	12	16	1.00	
		3	12	4	60	7.50	
		4	4	0	120	30.00	199
	4	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	85	10.62	
		4	4	0	130	32.50	234
	5	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	105	13.13	
		4	4	0	130	32.50	254

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	6	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	115	14.38	
		4	4	0	130	32.50	264
	7	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	120	15.00	
		4	4	0	130	32.50	269
	8	1	44	28	3	0.20	
		2	28	12	16	1.00	
		3	12	4	120	15.00	
		4	4	0	130	32.50	269
	Over 8	1	44	28	3	0.20	
		2	28	12	40	2.50	
		3	12	4	120	15.00	
		4	4	0	130	32.50	293
46	1/2	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	10	1.00	
		4	4	0	15	3.75	44
	1	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	25	2.50	
		4	4	0	30	7.50	74
	1-1/2	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	35	3.50	
		4	4	0	85	21.20	139
	2	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	47	4.70	
		4	4	0	105	26.25	171
	3	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	65	6.50	
		4	4	0	130	32.50	214
	4	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	95	9.50	
		4	4	0	130	32.50	244
	5	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	120	12.00	
		4	4	0	130	32.50	269
	6	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	125	12.50	
		4	4	0	130	32.50	274
	7	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	140	14.00	
		4	4	0	130	32.50	289

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	8	1	46	30	3	0.20	
		2	30	14	16	1.00	
		3	14	4	150	15.00	
		4	4	0	130	32.50	299
	Over 8	1	46	30	3	0.20	
		2	30	14	25	1.56	
		3	14	4	160	16.00	
		4	4	0	130	32.50	318
48	1/2	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	12	1.00	
		4	4	0	20	5.00	51
	1	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	35	2.92	
		4	4	0	35	8.75	89
	1-1/2	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	45	3.75	
		4	4	0	80	20.00	144
	2	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	60	5.00	
		4	4	0	110	27.50	189
	3	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	90	7.50	
		4	4	0	120	30.00	229
	4	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	120	10.00	
		4	4	0	130	32.50	269
	5	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	140	11.67	
		4	4	0	130	32.50	299
	6	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	160	13.33	
		4	4	0	130	32.50	309
	7	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	170	14.17	
		4	4	0	130	32.50	319
	8	1	48	32	3	0.20	
		2	32	16	16	1.00	
		3	16	4	170	14.17	
		4	4	0	130	32.50	319
50	1/2	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	14	1.00	
		4	4	0	25	6.25	58

DECOMPRESSION TABLE NO. 2

Working Chamber Pressure	Working Period	Decompression Data					
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Total Time Decompress
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	1	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	40	2.86	
		4	4	0	35	8.75	94
	1-1/2	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	55	3.93	
		4	4	0	90	22.50	164
	2	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	70	5.00	
		4	4	0	120	30.00	209
	3	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	100	7.15	
		4	4	0	130	32.50	249
	4	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	130	8.58	
		4	4	0	130	32.50	279
	5	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	160	11.42	
		4	4	0	130	32.50	309
	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.

(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;

(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. 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 areas 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.

[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.

(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 noncombustible 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.

(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.

(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 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 upgrade 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 separated 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 shall have in their possession current first-aid certificates acceptable to the department of labor and industries.

(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 shall provide a first-aid room properly heated and maintained within 100 yards of the principal entrance to the underground work. It shall be equipped with a first-aid kit,

medical supplies and equipment consisting of not less than the minimum requirements listed in chapter 296-155 WAC, Part B-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: 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.

(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.

[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 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 applications 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

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.

296-37-020 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.

296-37-030 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.

296-37-040 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.

296-37-050 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.

296-37-060 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.

296-37-070 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.

296-37-071 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.

296-37-072 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.

296-37-080 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.

296-37-081 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.

296-37-082 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.

296-37-090 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.

296-37-100 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.

296-37-110 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.

296-37-300 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.

296-37-310 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.

296-37-320 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.

296-37-330 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.

296-37-340 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 commercial 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; or

(b) Performed solely for search, rescue, or related public safety purposes by or under the control of a governmental agency; or

(c) Performed by noncommercial divers whose exposures may be of an entirely different type and whose operations are approved by the department of labor and industries;

(d) 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;

(e) Defined as scientific diving which is under the direction and control of a diving program containing 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/decompression 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 chief safety inspector 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: 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 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 duly authorized representative, the assistant director, division of industrial safety and health, department of labor and industries, Olympia, Washington. Variance application forms may be obtained from the department upon request.

[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).

(17) "Fsw": Feet of seawater (or equivalent static pressure head).

(18) "Heavy gear": Diver–worn deep–sea dress including helmet, breastplate, dry suit, shoes, and appropriate weights.

(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 surfaced–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: 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.

(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 hemoglobin.	x	x

Test	Initial Examination	Annual Reexamination
Sickle cell index	x	
White blood count	x	x
Urinalysis	x	x

[1]To 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 Predive 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 (this requirement does not preclude work swimming with, rather than against, the current); or

(d) In enclosed or physically confining spaces unless line-tended.

(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 operation.

(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: 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

(i) 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

(ii) 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.

[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) Liveboating. With an inwater decompression time of greater than 30 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: 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 systems.

(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 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 (CO_2) 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.

(a) Compressed gas cylinders shall:

(i) Be designed, constructed and maintained in accordance with the applicable provisions of WAC 296-24-920 through 296-24-94003.

(ii) Be stored in a ventilated area and protected from excessive heat;

(iii) Be secured from falling; and

(iv) 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 dead-weight 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: 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 record and report occupational injuries and illnesses in accordance with 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.

Note: Requests for information or copies of records and reports by OSHA or NIOSH shall be made to the director of the department of labor and industries.

(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, depth-time profiles, recording of dives, recompression/decompression procedure assessment evaluations, and records of hospitalizations 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 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 recompression/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) Recompression/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.

Note: Forward the records to the following address:
National Institute for Occupational
Safety and Health
Department of Health and Human Services
Surveillance Branch
Mail Stop R-18 Ridge
PHS CDC NIOSH
4676 Columbia Park Way
Cincinnati, Ohio 45226

(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: 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 Effective date. This standard shall be effective 30 days after being filed with the code reviser.

[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 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 cavitary 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: 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.]

Chapter 296-43 WAC
HEATING INSTALLATIONS--CABLE, RADIANT, SOIL, ETC.

WAC

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.

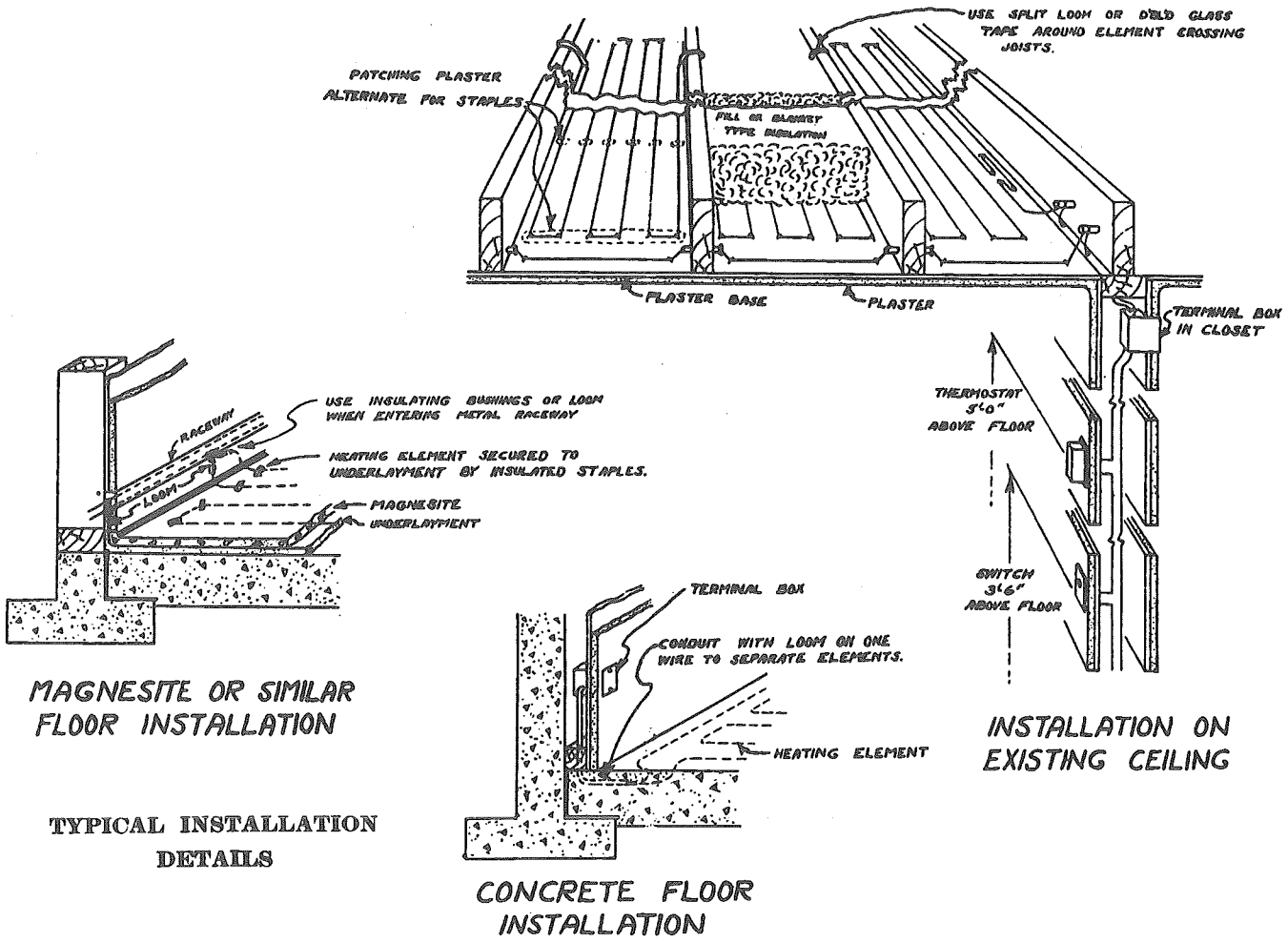
(d) Insulating sleeves shall be placed over the element from the point where it enters the slab through the conduit to the terminating box, unless nonheating leads, not less than 2 ft. long, are provided with the element by the factory.

(e) Suitable insulating bushings shall be used to separate the leads or elements where they enter the conduit in the slab.

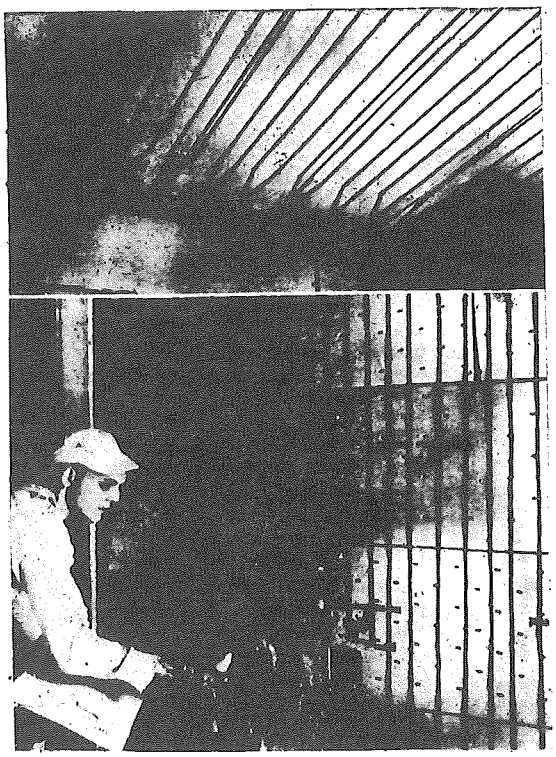
(4) **Magnesite, terrazzo, tile and similar floors and walls.**

(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.



TYPICAL INSTALLATION DETAILS



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.

(7) Gypsum board, plaster lath and similar heat conducting fire resistant materials may have the heating element applied directly thereto.

(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.]

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 296-44 WAC
SAFETY STANDARDS—ELECTRICAL CONSTRUCTION CODE

WAC

PART F—INSTALLATION AND MAINTENANCE OF ELECTRIC SUPPLY AND COMMUNICATION LINES

PART G—INSTALLATION, MAINTENANCE OF UNDERGROUND ELECTRIC SUPPLY AND COMMUNICATION LINES

PART H—INSTALLATION AND MAINTENANCE OF ELECTRIC UTILIZATION EQUIPMENT

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-44-019 Applicability of rules—To construction and reconstruction of lines. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-022 Applicability of rules—Restoration of clearances. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-028 Applicability of rules—Reconstruction or alteration. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-031 Applicability of other standards. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-034 Design, construction and maintenance. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-037 Limiting conditions specified. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-040 Waiving of rules. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-043 Exemptions or modifications. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-046 Emergency. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-049 Saving clause. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-052 Cooperation to avoid conflicts. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-055 Joint use of poles. [§ 2 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-058 Rules covering methods of protective grounding of circuits, equipment, and lightning arresters for stations, lines, and utilization equipment—Scope. [§ 9 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-061 Rules covering methods of protective grounding of circuits, equipment, and lightning arresters for stations, lines, and utilization equipment—Point of attachment of grounding conductor. [§ 9 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-064 Grounding conductor. [§ 9 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-067 Ground connections. [Rule 93C (codified as subsection (4)), filed 10/30/64, effective 12/1/64; Subsections A through D (codified as (1), (2), (3), (4) and (5)), filed 3/23/60, effective 12/1/58; Rule 93C, § 9 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-070 Method. [Subsection D (codified as (4)), filed 10/30/64, effective 12/1/64; Subsections A through C (codified as (1), (2), (3)), § 9 (part), filed 3/23/60, effective 12/1/58; Rule 94D, § 9 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-073 Ground resistance. [§ 9 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-076 Separate grounding conductors and grounds. [Subsection B (codified as (2)), filed 10/30/64, effective 12/1/64; Subsections A and B (codified as (1) and (3)), § 9 (part), filed 3/23/60, effective 12/1/58; Rule 96B, § 9 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-079 Protective arrangements of stations and substations—Scope of the rules. [§ 10 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-082 Protective arrangements of stations and substations—General requirements. [§ 10 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-085 Protective arrangements of stations and substations—Illumination. [§ 10 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-088 Protective arrangements of stations and substations—Floors, floor openings, passageways, stairs. [§ 10 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-091 Protective arrangements of stations and substations—Exits. [§ 10 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-094 Protective arrangements of stations and substations—Fire-fighting apparatus. [§ 10 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-097 Protective arrangements of stations and substations—Oil-filled apparatus. [§ 10 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-100 Protective arrangements of equipment—General requirement. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-103 Protective arrangements of equipment—Inspections. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-106 Protective arrangements of equipment—Guarding shaft ends, pulleys, and belts, and suddenly moving parts. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-109 Protective arrangements of equipment—Protective grounding. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-112 Protective arrangements of equipment—Guarding live parts. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-115 Protective arrangements of equipment—Working space about electric equipment. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-118 Protective arrangements of equipment—Hazardous locations. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-121 Protective arrangements of equipment—Shielding of equipment from deteriorating agencies. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-124 Protective arrangements of equipment—Identification. [§ 11 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-127 Rotating equipment (this includes generators, motors, motor-generators, and converters)—Speed-control and stopping devices. [§ 12 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-130 Rotating equipment (this includes generators, motors, motor-generators, and converters)—Guards for live parts. [§ 12 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-133 Rotating equipment (this includes generators, motors, motor-generators, and converters)—Grounding machine frames. [§ 12 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-136 Rotating equipment (this includes generators, motors, motor-generators, and converters)—Deteriorating agencies. [§ 12 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-139 Rotating equipment (this includes generators, motors, motor-generators, and converters)—Motors. [§ 12 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-142 Storage batteries—General. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-145 Storage batteries—Isolation. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-148 Storage batteries—Ventilation. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-151 Storage batteries—Insulation. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-154 Storage batteries—Racks and trays. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-157 Storage batteries—Floors. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-160 Storage batteries—Wiring in battery rooms. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-163 Storage batteries—Guarding live parts in battery rooms. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-166 Storage batteries—Illumination for battery rooms enclosing batteries of the nonsealed type. [§ 13 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-169 Transformers, induction regulators, rheostats, ground detectors, and similar equipment—Current-transformer secondary circuits. [§ 14 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-172 Transformers, induction regulators, rheostats, ground detectors, and similar equipment—Grounding secondary circuits of instrument transformers. [§ 14 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-175 Transformers, induction regulators, rheostats, ground detectors, and similar equipment—Grounding transformer cases. [§ 14 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-178 Transformers, induction regulators, rheostats, ground detectors, and similar equipment—Location and arrangement of power transformers. [§ 14 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-181 Transformers, induction regulators, rheostats, ground detectors, and similar equipment—Resistance devices. [§ 14 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-184 Transformers, induction regulators, rheostats, ground detectors, and similar equipment—Ground detectors. [§ 14 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-187 Conductors—Electrical protection. [§ 15 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-190 Conductors—Precaution against mechanical and thermal damage. [§ 15 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-193 Conductors—Isolation. [§ 15 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-196 Conductors—Guarding conductors. [§ 15 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-199 Conductors—Guarding in hazardous locations. [§ 15 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-202 Conductors—Taping ends and joints. [§ 15 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-205 Conductors—Wiring for illumination. [§ 15 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-208 Fuses, circuit-breakers, switches, and controllers—Accessible and indicating. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-211 Fuses, circuit-breakers, switches, and controllers—Oil switches. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-214 Fuses, circuit-breakers, switches, and controllers—Where switches are required. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-217 Fuses, circuit-breakers, switches, and controllers—Switches or other grounding devices. [§ 16 (part),

filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-220 Fuses, circuit-breakers, switches, and controllers—Capacity of switches and disconnectors. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-223 Fuses, circuit-breakers, switches, and controllers—Where fuses or automatic circuit-breakers are required. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-226 Fuses, circuit-breakers, switches, and controllers—Disconnection of fuses before handling. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-229 Fuses, circuit-breakers, switches, and controllers—Arcing or suddenly moving parts. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-232 Fuses, circuit-breakers, switches, and controllers—Grounding noncurrent-carrying metal parts. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-235 Fuses, circuit-breakers, switches, and controllers—Guarding live parts of switches, fuses, and automatic circuit-breakers. [§ 16 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-238 Switchboards—Location and accessibility. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-241 Switchboards—Material and illumination. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-244 Switchboards—Necessary equipment. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-247 Switchboards—Arrangement and identification. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-250 Switchboards—Spacings and barriers against short-circuit. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-253 Switchboards—Switchboard grounding. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-256 Switchboards—Guarding live parts on switchboards. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-259 Switchboards—Instrument cases. [§ 17 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-262 Lightning arresters—Location. [§ 18 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-265 Lightning arresters—Connecting wires. [§ 18 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-268 Lightning arresters—Grounding frames and cases of lightning arresters. [§ 18 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-271 Lightning arresters—Guarding live and arcing parts. [§ 18 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-274 Nature of rules—Minimum requirements. [§ 20 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-277 General requirements applying to overhead and underground lines—Design and construction. [§ 21 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-280 General requirements applying to overhead and underground lines—Installation and maintenance. [§ 21 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-283 General requirements applying to overhead and underground lines—Accessibility. [§ 21 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-286 General requirements applying to overhead and underground lines—Inspection and tests of lines and equipment. [§ 21 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-289 General requirements applying to overhead and underground lines—Isolation and guarding. [§ 21 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-292 General requirements applying to overhead and underground lines—Grounding of circuits and equipment. [§ 21 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-295 General requirements applying to overhead and underground lines—Arrangement of switches. [§ 21 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-298 Relations between various classes of lines—Relative levels. [§ 22 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-301 Relations between various classes of lines—Avoidance of conflict. [§ 22 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-304 Relations between various classes of lines—Joint use of poles by supply and communication circuits. [§ 22 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-307 Relations between various classes of lines—Separate pole lines. [§ 22 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-310 Clearances—General. [§ 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-313 Clearances—Horizontal clearances of supporting structures from other objects. [§ 23 (part), filed

3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-316 Clearances—Vertical clearance of wires above ground or rails. [§ 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-319 Clearances—Wire-crossing clearances. [§ 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-322 Clearances—Clearances of conductors of one line from other conductors and structures. [Tables 4 and 5, filed 10/30/64, effective 12/1/64; § 23 (part), Tables 4 and 5, filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-325 Clearances—Minimum line conductor clearances and separations at supports. [Subsections (1)(b)(ii) and (1)(c)(ii), filed 10/30/64, effective 12/1/64; § 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-328 Clearances—Climbing space. [§ 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-331 Clearances—Working space. [§ 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-334 Clearances—Vertical separation between line conductors, cables, and equipment located at different levels on the same pole or structure. [§ 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-337 Clearances—Clearances of vertical and lateral conductors from other wires and surfaces on the same support. [§ 23 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-340 Grades of construction—General. [§ 24 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-343 Grades of construction—Application of grades of construction to different situations. [§ 24 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-346 Grades of construction—Grades of construction for conductors. [§ 24 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-349 Grades of construction—Grades of supporting structures. [§ 24 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-352 Loading for Grades B, C, and D—General loading map. [§ 25 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-355 Loading for Grades B, C, and D—Conductor loading. [§ 25 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-358 Loading for Grades B, C, and D—Loads upon line supports. [§ 25 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-361 Strength requirements—Preliminary assumptions. [§ 26 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-364 Strength requirements—Grades B and C construction. [§ 26 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-367 Strength requirements—Grade D construction. [§ 26 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-373 Line insulators—Application of rule. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-376 Line insulators—Material and marking. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-379 Line insulators—Electrical strength of insulators in strain position. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-382 Line insulators—Ratio of flash-over to puncture voltage. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-385 Line insulators—Test voltages. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-388 Line insulators—Factory tests. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-391 Line insulators—Selection of insulators. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-394 Line insulators—Protection against arcing. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-397 Line insulators—Compliance with WAC 296-44-394 at crossings. [§ 27 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-400 Miscellaneous requirements—Supporting structures for overhead lines. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-403 Miscellaneous requirements—Tree trimming. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-406 Miscellaneous requirements—Guying. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-409 Miscellaneous requirements—Insulators in guys attached to poles and towers. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-412 Miscellaneous requirements—Span-wire insulators. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-415 Miscellaneous requirements—Overhead conductors. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-418 Miscellaneous requirements—Equipment on poles. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-421 Miscellaneous requirements—Protection for exposed overhead communication lines. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-424 Miscellaneous requirements—Circuits of one class used exclusively in the operation of circuits of another class. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-427 Miscellaneous requirements—Overhead electric railway construction. [§ 28 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-430 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Location. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-433 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Construction of duct and cable systems. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-436 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Construction of manholes. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-439 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Location of cables. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-442 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Protection and separation of conductors buried in earth. [§ 29 (part), Rule 294, filed 10/30/64, effective 12/1/64; § 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-445 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Protection of conductors in duct systems and manholes. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-448 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Guarding of live parts in manholes. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-451 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Construction at risers from underground. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-454 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Identification of conductors. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-457 Rules for underground lines (see also WAC 296-44-424 (2)(b))—Identification of apparatus connected in multiple. [§ 29 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-460 Installation and maintenance of electric utilization equipment—General requirements—Scope. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-463 Installation and maintenance of electric utilization equipment—General requirements. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-466 Installation and maintenance of electric utilization equipment—Reference to other codes. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-469 Installation and maintenance of electric utilization equipment—Grounding. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-472 Installation and maintenance of electric utilization equipment—Working spaces about electric equipment. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-478 Installation and maintenance of electric utilization equipment—Guarding or isolating live parts. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-481 Installation and maintenance of electric utilization equipment—Hazardous locations. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-484 Installation and maintenance of electric utilization equipment—Protection by disconnection. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-487 Installation and maintenance of electric utilization equipment—Identification of equipment. [§ 30 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-490 Conductors—Electrical protection. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-493 Conductors—Protective covering. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-496 Conductors—Identification of conductors and terminals. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-499 Conductors—Guarding and isolating conductors. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-502 Conductors—Guarding in damp or hazardous locations. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-505 Conductors—Precautions against excessive inductance and eddy currents. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-508 Conductors—Splicing and taping. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-511 Conductors—Uninsulated conductors. [§ 31 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-514 Fuses, circuit-breakers, switches and controllers—General requirements for switches. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-517 Fuses, circuit-breakers, switches and controllers—Hazardous locations. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-520 Fuses, circuit-breakers, switches and controllers—Where switches are required. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-523 Fuses, circuit-breakers, switches and controllers—Character of switches and disconnectors. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-526 Fuses, circuit-breakers, switches and controllers—Disconnection of fuses and thermal cut-outs before handling. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-529 Fuses, circuit-breakers, switches and controllers—Arcing or suddenly moving parts. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-532 Fuses, circuit-breakers, switches and controllers—Grounding noncurrent-carrying metal parts. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-535 Fuses, circuit-breakers, switches and controllers—Guarding live parts. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-538 Fuses, circuit-breakers, switches and controllers—Inclosed air-break switches (not including snap switches). [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-541 Fuses, circuit-breakers, switches and controllers—Control equipment. [§ 32 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-544 Switchboards and panelboards—Accessibility and convenient attendance. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-547 Switchboards and panelboards—Location and illumination. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-550 Switchboards and panelboards—Arrangement and identification. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-553 Switchboards and panelboards—Spacing, barriers and covers. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-556 Switchboards and panelboards—Grounding frames. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-559 Switchboards and panelboards—Guarding current-carrying parts. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-562 Switchboards and panelboards—Fuses on switchboards. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-565 Switchboards and panelboards—Panelboards. [§ 33 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-568 Motors and motor-driven machinery—Control devices. [§ 34 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-571 Motors and motor-driven machinery—Hazardous locations. [§ 34 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-574 Motors and motor-driven machinery—Deteriorating agencies. [§ 34 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-577 Motors and motor-driven machinery—Guards for live parts. [§ 34 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-580 Motors and motor-driven machinery—Grounding machine frames. [§ 34 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-583 Motors and motor-driven machinery—Protecting moving parts. [§ 34 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-586 Electric furnaces, storage batteries, transformers, and lightning arresters—Protection from burns. [§ 35 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-589 Electric furnaces, storage batteries, transformers, and lightning arresters—Grounding of furnace frames. [§ 35 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-592 Electric furnaces, storage batteries, transformers, and lightning arresters—Guarding live parts. [§ 35 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-595 Electric furnaces, storage batteries, transformers, and lightning arresters—Storage batteries. [§ 35 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-598 Electric furnaces, storage batteries, transformers, and lightning arresters—Transformers. [§ 35 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007

(Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-601 Electric furnaces, storage batteries, transformers, and lightning arresters—Lightning arresters. [§ 35 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-604 Lighting fixtures and signs—Fixtures. [§ 36 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-607 Lighting fixtures and signs—Receptacle for convenience outlet. [§ 36 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-610 Lighting fixtures and signs—Exposed live parts. [§ 36 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-613 Lighting fixtures and signs—Signs. [§ 36 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-616 Lighting fixtures and signs—Connectors for signs. [§ 36 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-619 Lighting fixtures and signs—Lamps in series circuits. [§ 36 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-622 Lighting fixtures and signs—Safe access to arc lamps. [§ 36 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-625 Portable appliances, cables and connectors, and insect eliminators (not including those for communication systems)—Insulation. [§ 37 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-628 Portable appliances, cables and connectors, and insect eliminators (not including those for communication systems)—Grounding of frames. [§ 37 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-631 Portable appliances, cables and connectors, and insect eliminators (not including those for communication systems)—Cable connectors. [§ 37 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-634 Portable appliances, cables and connectors, and insect eliminators (not including those for communication systems)—Identified conductors, cords, and connectors. [§ 37 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-637 Portable appliances, cables and connectors, and insect eliminators (not including those for communication systems)—Use of portables and pendants. [§ 37 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-640 Portable appliances, cables and connectors, and insect eliminators (not including those for communication systems)—Portable outdoor equipment of more than 750 volts between conductors. [§ 37 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-643 Portable appliances, cables and connectors, and insect eliminators (not including those for communication systems)—Insect eliminators. [§ 37 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-646 Electrically operated industrial locomotives, cars, cranes, hoists, and elevators—Guarding live and moving parts. [§ 38 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-649 Electrically operated industrial locomotives, cars, cranes, hoists, and elevators—Grounding noncurrent-carrying parts. [§ 38 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-652 Electrically operated industrial locomotives, cars, cranes, hoists, and elevators—Control of energy supply to cars, cranes, and industrial locomotives. [§ 38 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-655 Control of movement of industrial locomotives, cars, cranes, and elevators. [§ 38 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-658 Control of movement of industrial locomotives, cars, cranes, and elevators—Subway and car lighting. [§ 38 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-661 Telephone and other communication apparatus on circuits exposed to supply lines or lightning—Protective requirements. [§ 39 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-664 Telephone and other communication apparatus on circuits exposed to supply lines or lightning—Guarding current-carrying parts. [§ 39 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-667 Telephone and other communication apparatus on circuits exposed to supply lines or lightning—Grounding. [§ 39 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-670 Rules for radio and T.V. installations—Scope. [§ 50, filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-673 Classification of radio stations. [§ 51, filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007(Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-676 Antenna and counterpoise installation—Application of rules. [§ 52 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-679 Antenna and counterpoise installation—General requirements. [§ 52 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-682 Antenna and counterpoise installation—Locations to be avoided. [§ 52 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-685 Antenna and counterpoise installation—Ordinary construction of antenna systems. [§ 52 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007

(Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-688 Antenna and counterpoise installation—Special construction of antenna systems. [§ 52 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-691 Antenna and counterpoise installation—Guarding of antennas. [§ 52 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-694 Antenna and counterpoise installation—Supply circuits as antennas or grounds. [§ 52 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-697 Lead-in conductors—Application of rules. [§ 53 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-700 Lead-in conductors—Material. [§ 53 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-703 Lead-in conductors—Size. [§ 53 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-706 Lead-in conductors—Installation of lead-in conductor. [§ 53 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-709 Construction at building entrance—Application of rules. [§ 54 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-712 Construction at building entrance—Entrance. [§ 54 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-715 Construction at building entrance—Creepage and air-gap distance. [§ 54 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-718 Construction at building entrance—Mechanical protection of bushings. [§ 54 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-721 Protective devices—Application of rules. [§ 55 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-724 Protective devices—Receiving stations. [§ 55 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-727 Protective devices—Low-power transmitting stations. [§ 55 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-730 Protective and operating grounding conductors—Application of rules. [§ 56 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17-.040 and 49.17.050.

296-44-733 Protective and operating grounding conductors—General. [§ 56 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-736 Protective and operating grounding conductors—Material and size. [§ 56 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-739 Protective and operating grounding conductors—Installation of grounding conductors. [§ 56 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-742 Grounds and ground connections—Application of rules. [§ 57 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-745 Grounds and ground connections—Grounds. [§ 57 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-748 Grounds and ground connections—Attachment to pipes. [§ 57 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-751 Grounds and ground connections—Attachment to driven pipes, rods, or buried plates. [§ 57 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-754 Connection to power supply lines—Application of rules. [§ 58 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-757 Connection to power supply lines—Receiving stations and low-power transmitting stations. [§ 58 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-760 Batteries—Application of rules. [§ 59 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-763 Batteries—Care in handling. [§ 59 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-44-766 Batteries—Portable batteries. [§ 59 (part), filed 3/23/60, effective 12/1/58.] Repealed by 86-16-007 (Order 86-26), filed 7/25/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

PART A--INTRODUCTION

WAC 296-44-005 Preface. Pursuant to the provisions of RCW 43.22.050 and 49.17.010 these regulations are adopted to provide safe construction standards. They can contribute materially to the standard of service rendered by the utilities and also for the means of coordination between different types of lines such as power lines. These regulations formulate uniform requirements for electrical construction and installations, the application of which shall ensure adequate service and secure safety to persons engaged in the construction, installation, maintenance, operation, or use of electrical lines and equipment. These regulations are not to be construed as superceding existing statutes relating to electrical construction and installations as in RCW 19.29.010 through 19.29.060. Rules in this code which are mandatory are characterized by the use of the word

"shall." Where a rule is of an advisory nature it is indicated by the use of the word "should." Other practices which are considered desirable and not intended to be mandatory are referred to as recommendations. It is realized that conditions may exist which necessitate departures from such recommendations. Preparation of these revisions was completed through an advisory committee composed of representatives of the electrical utilities and communications companies, and labor, appointed by the assistant director for the department of labor and industries, division of industrial safety and health.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-005, filed 7/25/86; Preface (part), filed 3/23/60, effective 12/1/58.]

WAC 296-44-010 Definitions of special terms. (1) "Administrative authority" means the department of labor and industries through the supervisor of the division of safety.

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

(3) "Appliance" means current-consuming equipment, fixed or portable; for example, heating, cooking, and small motor-operated equipment.

(4) "Arm or crossarm" means a horizontal support attached to poles or structures generally at right angles to the conductor supported.

(5) "Arm, buck" means a crossarm used to change the direction of all or part of the conductors on the line arm immediately above or below. A buck arm is generally placed at right angles to the line arm.

(6) "Arm, clearance" means a crossarm supporting conductors installed on a pole of another line for the purpose of maintaining the prescribed clearances of these rules which, if the other line did not exist, could be maintained without such clearance arm.

(7) "Automatic" means self-acting, operating by its own mechanism when actuated by some impersonal influence – as, for example, a change in current strength; not manual, without personal intervention. Remote control that requires personal intervention is not automatic, but manual.

(8) "Bridge" means a structure which is used primarily for foot, vehicular or train traffic as distinguished from those which span certain areas and support signals or wires and which are classed as supporting poles, towers or structures.

(9) "Cable" means a stranded conductor (single conductor cable) or a combination of conductors insulated from one another (multiple-conductor cable).

(10) "Cable vault." (See definition of "manhole.")

(11) "Catenary construction" is that type of construction where an auxiliary wire or messenger is used to assist in supporting in desired alignment trolley contact wire, cables or large conductors that are incapable of supporting themselves in this desired alignment.

(12) "Circuit" means a conductor or system of conductors through which an electric current is intended to flow.

(13) "Circuit breaker" means a device designed to open under abnormal conditions a current-carrying circuit without injury to itself. The term as used in this code applies only to the automatic type designed to trip on a predetermined overload of current.

(14) "Circuits, railway signal" means those supply and communication circuits used primarily for supplying energy for controlling the operation of railway block signals, highway crossing signals, interlocking apparatus and their appurtenances.

(15) "Circuits, supply" means those circuits which are used for transmitting a supply of electrical energy.

(16) "Climbing space" means the space reserved along the surface of a pole or structure to permit ready access for linemen to equipment and conductors located on the pole or structure.

(17) "Common neutral system" is a system in which one conductor is used as the neutral for 2 or more different circuits; one conductor is used as the neutral for both primary and secondary circuits of a distribution system.

(18) "Common use" means simultaneous use by two or more utilities of the same kind.

(19) "Conductor" means a metallic conducting material, usually in the form of a wire or cable, suitable for carrying an electric current. Does not include bus bars.

(20) "Conductor, grounding" means a conductor which is used to connect the equipment or the wiring system with a grounding electrode or electrodes.

(21) "Conductor, lateral" means a conductor extending in a general horizontal direction and usually at an angle of approximately 90 degrees to the direction of the line conductors.

(22) "Conductor, line" means one of the wires or cables carrying electric current, supported by poles, towers, or other structures, but not including vertical or lateral connecting wires.

(23) "Conductors, open" means conductors separately and individually supported.

(24) "Conductors, unprotected" means supply conductors not covered by a "suitable protective covering," grounded metal conduit, grounded metal sheath or shield, or impregnated fiber.

(25) "Conductor, vertical" means, in pole wiring work, a wire or cable extending in an approximately vertical direction.

(26) "Conflict, antenna" means that an antenna or its guy wire is at a higher level than a supply or communication conductor and approximately parallel thereto, provided the breaking of the antenna or its support will be likely to result in contact between the antenna or guy wire and the supply or communication conductor.

(27) "Conflict, conductor" means that a conductor is so situated with respect to a conductor of another line at a lower level that the horizontal distance between them is less than the sum of the following values:

(a) Five feet.

(b) One-half the difference of level between the conductors concerned.

(c) The value required in Tables 6, 7, or 8 (WAC 296-44-325) for horizontal separation between conductors on the same support for the highest voltage carried by either conductor concerned. (See illustration at end of this section.)

(28) "Conflict, structure" (as applied to a pole line) means that the line is so situated with respect to a second line that the overturning (at the ground line) of the first line will result in contact between its poles or conductors and the conductors of the second line, assuming that no conductors are broken in either line. (See illustration at end of this section.)

EXCEPTIONS: Lines are not considered as conflicting under the following conditions:

(a) Where one line crosses another.

(b) Where two lines are on opposite sides of a highway, street, or alley and are separated by a distance not less than 60 percent of the height of the taller pole line and not less than 20 feet.

(29) "Current-carrying part" means 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.

(30) "Dead" means free from any electric connection to a source of potential difference and from electric charge; not having a potential different from that of the earth. The term is used only with reference to current-carrying parts which are sometimes alive.

(31) "Dead end" means the act, point or equipment used to transfer the mechanical tension in conductors from the conductors to noncurrent-carrying parts of a structure used to support the conductors and still maintain the insulating requirements of the conductors dead-ended.

(32) "Device" means a unit of an electric wiring system which is intended to carry but not consume electric energy.

(33) "Disconnector" means a switch which is intended to open a circuit only after the load has been thrown off by some other means.

(34) "Districts, loading" means those areas in which the specified loadings of these rules apply and are known as "heavy," "medium," and "light" loading districts.

(35) "Districts, rural" means all places not urban, usually in the country, but in some cases within city limits.

(36) "District, urban" means thickly settled areas (whether in cities or suburbs) or where congested traffic often occurs. A highway, even though in the country, on which the traffic is often very heavy, is considered as urban.

(37) "Division of safety" means the division of safety of the department of labor and industries.

(38) "Duct" means (in underground work) a single tubular runway for underground cables.

(39) "Electrical supply station" means any building, room, or separate space within which electric-supply equipment is located and the interior of which is accessible, as a rule, only to properly qualified persons.

Note: This includes generating stations and substations and generator, storage-battery, and transformer rooms, but excludes manholes and isolated-transformer vaults on private premises. (See definition of "transformer vault.")

(40) "Electrode, grounding" means a suitable metallic conducting material (generally copper or copper clad) imbedded in the earth and used for maintaining ground potential on conductors connected to it and for dissipating into the earth such electric current as may be impressed upon it.

(41) "Equipment" means a general term including fittings, devices, appliances, fixtures, apparatus, and the like, used as a part of, or in connection with, an electric installation.

(42) "Equipment, electric supply" means equipment which produces, modifies, regulates controls, or safeguards a supply of electric energy. Similar equipment, however, is not included where used in connection with signaling systems under the following conditions;

(a) Where the voltage does not exceed 150 volts.

(b) Where the voltage is between 150 and 550 volts, and the power transmitted does not exceed 3.2 kilowatts.

(43) "Equipment, utilization" means equipment, devices, and connected wiring which utilize electric energy for mechanical, chemical, heating, lighting, testing, or similar purposes and are not a part of supply equipment, supply lines, or communication lines.

(44) "Explosion-proof" means capable of withstanding without injury and without transmitting flame to the outside any explosion of gas which may occur within.

(45) "Exposed":

(a) "Applied to circuits" or lines means in such a position that in case of failure of supports or insulation contact with another circuit or line may result.

(b) "Applied to equipment" means that an object or device can be inadvertently touched or approached nearer than a safe distance by any person. It is applied to objects not suitably guarded or isolated.

(46) "Externally operable" means capable of being operated without exposing the operator to contact with live parts.

Note: This term is applied to equipment, such as a switch, that is inclosed in a case or cabinet.

(47) "Ground connection" means the equipment used in establishing a conducting path between an electric circuit or equipment and earth. A ground connection consists of a ground conductor, a ground electrode and the earth (soil, rock, etc.) which surrounds the electrode.

(48) "Grounded" means connected to earth by a ground connection or by an unintentional conducting path.

(49) "Grounded, effectively" means permanently connected to earth through a ground connection of sufficiently low impedance and having sufficient current-carrying capacity to prevent the building up of voltages which may result in undue hazard to connected equipment or to persons.

(50) "Grounded, system" means 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.

(51) "Guarded" means covered, shielded, fenced, inclosed, or otherwise protected, by means of suitable covers or casings, barrier rails or screens, mats or platforms, to remove the liability of dangerous contact or approach by persons or objects to a point of danger.

(52) "Guy" means a tension member (a solid wire or stranded wires) used to withstand an otherwise unbalanced force on a pole, crossarm, or other overhead line structure.

(53) "Guy, anchor" means a guy which has its lower anchorage in the earth and includes a sidewalk or ground guy.

(54) "Guy, overhead (span)" means a guy extending from a pole, crossarm, or structure to a pole, crossarm, or structure.

(55) "Handhole" means an opening in an underground system into which workmen reach, but do not enter.

(56) "Identification" means, for the purpose of these rules, to identify or identification, shall mean that method of coloring, lettering, numbering, marking or maintaining in any certain position in relation to other objects, the same wire, cable pipe, circuit, phases, or other material objects throughout the installation.

(57) "Inclosed" means surrounded by a case which will prevent accidental contact of a person with live parts. A solid inclosure means one which will neither admit accumulations of flyings or dust, nor transmit sparks or flying particles to the accumulations outside.

(58) "Insulated" means separated from other conducting surfaces by a dielectric substance or air space permanently offering a high resistance to the passage of current and to disruptive discharge through the substance or space.

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 rules, uninsulated. Insulating coverings of conductors is one means for making the conductors insulated.

(59) "Insulating" (where applied to the covering of a conductor, or to clothing, guards, rods, and other safety devices) means that a device, when interposed between a person and current-carrying parts, protects the person making use of it against electric shock from the current-carrying parts with which the device is intended to be used; the opposite of conducting.

(60) "Isolated" means that an object is not readily accessible to persons unless special means for access are used.

(61) "Isolation by elevation" means elevated sufficiently so that persons may safely walk underneath.

(62) "Joint use" means simultaneous use by two or more kinds of utilities.

(63) "Lightning arrester" means a device which has the property of reducing the voltage of a surge applied to its terminals, is capable of interrupting follow current if present, and restores itself to its original operating conditions.

(64) "Lines."

(a) Communication lines means the conductors and their supporting or containing structures which are located outside of buildings and are used for public or private signal or communication service, and which operate at 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 operating at less than 150 volts no limit is placed on the capacity of the system.

Note: Telephone, telegraph, railroad-signal, messenger-call, clock, fire or police-alarm and other systems conforming with the above are included.

Lines used for signaling purposes, but not included under the above definition, are considered as supply lines of the same voltage and are to be so run.

Exception is made under certain conditions for communication circuits used in the operation of supply lines. (See WAC 296-44-424(1).)

(b) "Communication lines, minor" means communication lines carrying not more than two circuits used mainly for local telephone or telegraph service, or for police or fire-alarm service.

(c) "Electric supply" means those conductors and their necessary supporting or containing structures which are located entirely outside of buildings and are used for transmitting a supply of electric energy.

Does not include open wiring on buildings, in yards or similar locations where spans are less than 20 feet, and all the precautions required for stations or utilization equipment, as the case may be, are observed.

Railway signal lines of more than 400 volts to ground are always supply lines within the meaning of these rules, and those of less than 400 volts may be considered as supply lines, if so run and operated throughout.

(65) "Low voltage protection" means the effect of a device operative on the reduction or failure of voltage to cause and maintain the interruption of power supply to the equipment protected.

(66) "Low voltage release" means the effect of a device operative on the reduction or failure of voltage to cause the interruption of power supply to the equipment, but not preventing the reestablishment of the power supply on return of voltage.

(67) "Maintenance" means the work done on any line or any element of any line for the purpose of extending its life (excepting the replacement of the supporting poles or structures) and includes the replacement, for any reason, of crossarms, pins, insulators, wires, cables, messengers, etc., but does not contemplate the addition of elements (excepting pole stubs and guy wires) which will change the identity of the structure.

(68) "Manhole" (more accurately termed splicing chamber or cable vault) means an opening in an underground system which workmen or others may enter for the purpose of installing cables, transformers, junction boxes, and other devices, and for making connections and tests.

(69) "Manual" means capable of being operated by personal intervention.

(70) "Messenger" means stranded wire which generally is not a part of the conducting system, its primary function being to support wires or cables of the conducting system; sometimes called "suspension strand."

(71) "Minor tracks" means railway tracks included in the following list:

(a) Spurs less than 2,000 feet long and not exceeding two tracks in the same span.

(b) Branches on which no regular service is maintained or which are not operated during the winter season.

(c) Narrow-gage tracks or other tracks on which standard rolling stock cannot, for physical reasons, be operated.

(d) Tracks used only temporarily for a period not exceeding 1 year.

(e) Tracks not operated as a public utility, such as industrial railways used in logging, mining, etc.

(72) "Multi-grounded system" means a system in which the neutral conductor is grounded at many places.

(73) "Objectionable flow of current," in grounding conductors, means any measurable amount of current flowing to earth which can be attributed to inadequately or improperly installed metallic return to sources of supply.

(74) "Open wire" means a conductor or pair of conductors separately supported above the surface of the ground.

(75) "Panelboard" means a single panel, or a group of panel units designed for assembly in the form of a single panel, including buses and with or without switches and/or automatic overcurrent-protective devices for the control of light, heat, or power circuits of small individual as well as aggregate capacity; designed to be placed in a cabinet or cut-out box placed in or against a wall or partition, and accessible only from the front. (See definition of "switchboard.")

(76) "Pole face" means that side of the pole on which crossarms are attached, or which is so designated by the utilities owning or operating the pole.

(77) "Qualified" means familiar with the construction and operation of the apparatus and the hazards involved.

(78) "Raceway" means any channel for loosely holding wires or cables in interior work, which is designed expressly and used solely for this purpose. Raceways may be of metal, wood, or insulating material, and the term includes wood and metal moldings consisting of a backing and capping, and also metal ducts into which wires are to be pulled.

(79) "Racks, vertical (secondary racks)" for the purpose of these rules shall include individual supports in rack configuration used for the support of conductors of 0 to 750 volts.

(80) "Reconstruction" means replacement of any portion of an existing installation by new equipment or construction. Does not include ordinary maintenance replacements.

(81) "Risers" means conductors which extend below the ground line and are generally installed on the surfaces of poles.

(82) "Sag":

(a) "Apparent sag at any point" means the departure of the wire at the particular point in the span from the straight line between the two points of support of the span, at 60°F, with no wind loading.

(b) "Apparent sag of a span" means the maximum departure of the wire in a given span from the straight line between the two points of support of the span, at 60°F, with no wind loading.

(c) "Final unloaded sag" means the sag of a conductor after it has been subjected for an appreciable period to the loading prescribed for the loading district in which it is situated, or equivalent loading, and the loading removed.

(d) "Initial unloaded sag" means the sag of a conductor prior to the application of any external load.

(e) "Maximum total sag" means the total sag at the midpoint of the straight line joining the two points of support of the conductor.

(f) "Total sag" means the distance measured vertically from any point of a conductor to the straight line joining its two points of support, under conditions of ice loading equivalent to the total resultant loading for the district in which it is located.

(g) "Unloaded sag of a conductor at any point in a span" means the distance measured vertically from the particular point in the conductor to a straight line between two points of support, without any external load.

(83) "Service" means the conductors and equipment for delivering electric energy from the secondary distribution or street main, or other distribution feeder, or from the transformer to the wiring system of the premises served.

(84) "Service drops" means the conductors strung between a pole line and a building or structure.

(85) "Span length" means the horizontal distance between two adjacent supporting points of a conductor.

(86) "Span wire" means a wire or cable used as an auxiliary support for wires, cables, or other equipment. As applied to trolley construction, it means a wire or cable used to support laterally, or which is attached to wires which support laterally, trolley contact conductors and appurtenances in electrical contact therewith, including wires commonly referred to as cross-span wires, bracket-span wires, pull-offs, trolley strain guys, dead ends, etc.

(87) "Splicing chamber." (See definition of "manhole.")

(88) "Substantial" means so constructed and arranged as to be of adequate strength and durability for the service to be performed under the prevailing conditions.

(89) "Supervisor" means the supervisor of the division of safety.

(90) "Switch" means a device for opening and closing or for changing the connection of a circuit. In these rules, a switch will always be understood to be manually operated, unless otherwise stated.

(91) "Switchboard" means a large single panel, frame, or assembly of panels, on which are mounted (on the face, or back, or both) switches, fuses, busses, and usually instruments.

(92) "Tags" means "men at work" tags of distinctive appearance, indicating that the equipment or lines so marked are being worked on.

(93) "Tension":

(a) "Final unloaded conductor tension" means the longitudinal tension in a conductor after the conductor has been stretched by the application for an appreciable period, and subsequent release, of the loadings of ice and wind, and temperature decrease, assumed for the loading district in which the conductor is strung (or equivalent loading).

(b) "Initial conductor tension" means the longitudinal tension in a conductor prior to the application of any external load.

(94) "Transformer vault" means an isolated inclosure either above or below ground with fire-resistant walls, ceiling, and floor, in which transformers and related equipment are installed, and which is not continuously attended during operation.

(95) "Voltage of a circuit" means the highest effective voltage between any two conductors of the circuit concerned.

EXCEPTION: Voltage of a grounded multiwire circuit, not exceeding 750 volts between any two conductors, means the highest effective voltage between any wire of the circuit and that point or conductor of the circuit which is grounded.

If one circuit is directly connected to 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.

(96) "Voltage to ground of":

(a) A "grounded circuit" means the highest effective voltage between any conductor of the circuit and that point or conductor of the circuit which is grounded.

(b) An "ungrounded circuit" means the highest effective voltage between any two conductors of the circuit concerned.

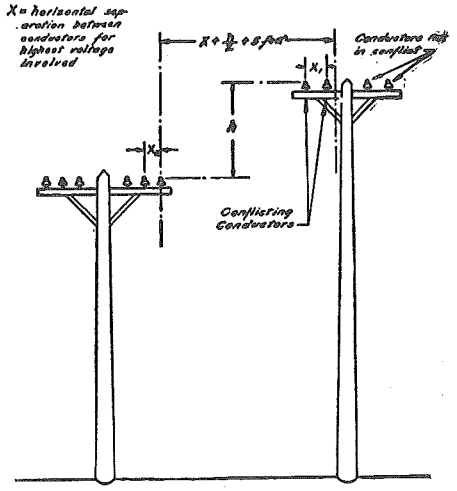
A "conductor of":

(a) A "grounded circuit" means the highest effective voltage between such conductor and that point or conductor of the circuit which is grounded.

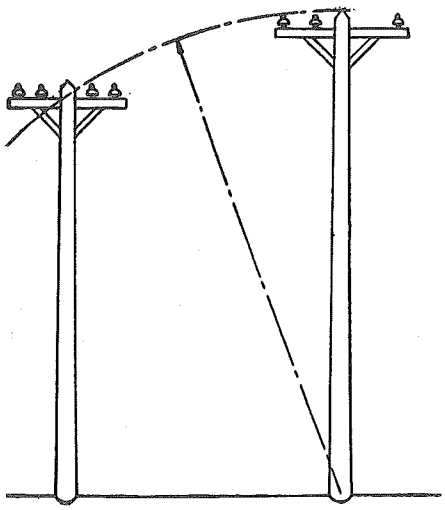
(b) An "ungrounded circuit" means the highest effective voltage between such conductor and any other conductor of the circuit concerned.

(97) "Wire gages": The American Wire Gage (AWG), otherwise known as Brown & Sharpe (B&S), is the standard gage for copper, aluminum, and other conductors, excepting steel, for which the Steel Wire Gage (Stl. WG) is used throughout these rules.

(98) "Working space, lateral" means the space reserved for working between conductor levels outside the climbing space, and to its right and left.



Conductor Conflict



Structure Conflict

[§ 1, filed 3/23/60, effective 12/1/58.]

WAC 296-44-011 Definitions of special terms applicable to this chapter. (1) "Administrative authority" means the department of labor and industries through the assistant director of the division of industrial safety and health.

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

(3) "Appliance" means current-consuming equipment, fixed or portable; for example, heating, cooking, and small motor-operated equipment.

(4) "Approved" means meets or exceeds the recognized standards of safety within the industry.

(5) "Arm or crossarm" means a horizontal support attached to poles or structures generally at right angles to the conductor supported.

(6) "Arm, buck" means a crossarm used to change the direction of all or part of the conductors on the line arm immediately above or below. A buck arm is generally placed at right angles to the line arm.

(7) "Arm, clearance" means a crossarm supporting conductors installed on a pole of another line for the purpose of maintaining the prescribed clearances of these rules which, if the other line did not exist, could be maintained without such clearance arm.

(8) "Automatic" means self–acting, operating by its own mechanism when actuated by some impersonal influence – as, for example, a change in current strength; not manual, without personal intervention. Remote control that requires personal intervention is not automatic, but manual.

(9) "Backfill (noun)" means materials such as sand, crushed stone, or soil, which are placed to fill an excavation.

(10) "Ballast section (railroads)" means the section of material, generally trap rock, which provides support under railroad tracks.

(11) "Bonding" means the electrical interconnecting of conductive parts, designed to maintain a common electrical potential.

(12) "Bridge" means a structure which is used primarily for foot, vehicular, or train traffic as distinguished from those which span certain areas and support signals or wires and which are classed as supporting poles, towers, or structures.

(13) "Cable" means 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).

(14) "Spacer cable" is a type of electric supply line construction consisting of an assembly of one or more covered conductors, separated from each other and supported from a messenger by insulating spacers.

(15) "Cable jacket" means a protective covering over the insulation, core, or sheath of a cable.

(16) "Cable sheath" means a conductive protective covering applied to cables.

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

(17) "Cable terminal" means a device which provides insulated egress for the conductors. Syn: Termination.

(18) "Cable vault." (See definition of "manhole.")

(19) "Catenary construction" is that type of construction where an auxiliary wire or messenger is used to assist in supporting in desired alignment trolley contact wire, cables or large conductors that are incapable of supporting themselves in this desired alignment.

(20) "Circuit" means a conductor or system of conductors through which an electric current is intended to flow.

(21) "Circuit breaker" means a switching device capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time, and breaking currents under specified abnormal condition such as those of short circuits.

(22) "Circuits, railway signal" means those supply and communication circuits used primarily for supplying energy for controlling the operation of railway block signals, highway crossing signals, interlocking apparatus and their appurtenances.

(23) "Circuits, supply" means those circuits which are used for transmitting a supply of electrical energy.

(24) "Climbing space" means the space reserved along the surface of a pole or structure to permit ready access for linemen to equipment and conductors located on the pole or structure.

(25) "Common neutral system" is a system in which one conductor is used as the neutral for two or more different circuits; one conductor is used as the neutral for both primary and secondary circuits of a distribution system.

(26) "Common use" means simultaneous use by two or more utilities of the same kind.

(27) "Conductor":

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

(b) "Bundled conductor": An assembly of two or more conductors used as a single conductor and employing spacers to maintain a predetermined configuration. The individual conductors of this assembly are called subconductors.

(c) "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.

(d) "Grounded conductor": A conductor which is intentionally grounded, either solidly or through a noninterrupting current–limiting device.

(e) "Grounding conductor": A conductor which is used to connect the equipment or the wiring system with a grounding electrode or electrodes.

(f) "Insulated conductor": A conductor covered with a dielectric (other than air) having a rated insulating strength equal to or greater than the voltage of the circuit in which it is used.

(g) "Lateral conductor": A wire or cable extending in a general horizontal direction at an angle to the general direction of the line conductors.

(h) "Line conductor" (overhead supply or communication lines): A wire or cable intended to carry electric currents, extending along the route of the line, supported by poles, towers, or other structures, but not including vertical or lateral conductors.

(i) "Open conductor": A type of electric supply or communication line construction in which the conductors are bare, covered or insulated and without grounding shielding and individually supported at the structure either directly or with insulators. Syn: Open wire.

(j) "Conductor shielding": An envelope which encloses the conductor of a cable and provides an equipotential surface in contact with the cable insulation.

(28) "Conduit" means a structure containing one or more ducts.

Note: Conduit may be designated as iron pipe conduit, tile conduit, etc. If it contains one duct only it is called single–duct conduit; if it contains more than one duct, it is called multiple–duct conduit; usually with the number of ducts as a prefix, for example, two–duct multiple conduit.

(29) "Conduit system" means any combination of duct, conduit, conduits, manholes, handholes, and vaults joined to form an integrated whole.

(30) "Conflict, antenna" means that an antenna or its guy wire is at a higher level than a supply or communication conductor and approximately parallel thereto, provided the breaking of the antenna or its support will be likely to result in contact between the antenna or guy wire and the supply or communication conductor.

(31) "Conflict, conductor" means that a conductor is so situated with respect to a conductor of another line at a lower level that the horizontal distance between them is less than the sum of the following values:

(a) Five feet.

(b) One–half the difference of level between the conductors concerned.

(c) The value required in Tables 6, 7, or 8 for horizontal separation between conductors on the same support for the highest voltage carried by either conductor concerned. (See illustration.)

(32) "Conflict, structure" (as applied to a pole line) means that the line is so situated with respect to a second line that the overturning at the ground line of the first line will result in contact between its poles or conductors and the conductors of the second line, assuming that no conductors are broken in either line. (See illustration.)

Notes:

Lines are not considered as conflicting under the following conditions:

(a) Where one line crosses another.

(b) Where two lines are on opposite sides of a highway, street, or alley and are separated by a distance of not less than sixty percent of the height of the taller pole line and not less than twenty feet.

(33) "Current–carrying part" means 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.

(34) "Dead" means free from any electric connection to a source of potential difference and from electric charge; not having a potential different from that of the earth. The term is used only with reference to current–carrying parts which are sometimes alive.

(35) "Dead end" means the act, point or equipment used to transfer the mechanical tension in conductors from the conductors to noncurrent–carrying parts of a structure used to support the conductors and still maintain the insulating requirements of the conductors dead–ended.

(36) "Deenergized" means free from any electrical connection to a source of potential difference and from electric charge; not having a potential different from that of earth.

(37) "Device" means a unit of an electric wiring system which is intended to carry but not consume electric energy.

(38) "Disconnecting or isolating switch" means a mechanical switching device used for changing the connections in a circuit, or for isolating a circuit or equipment from a source of power.

Note: It is required to carry normal load current continuously, and also abnormal or short–circuit current for short intervals as specified. It is also required to open or close circuits either when negligible current is broken or made, or when no significant change in the voltage across the terminals of each of the switch poles occurs. Syn: Disconnector, isolator.

(39) "Districts, loading" means those areas in which the specified loadings of these rules apply and are known as "heavy," "medium," and "light" loading districts.

(40) "Districts, rural" means all places not urban, usually in the country, but in some cases, within the city limits.

(41) "Districts, urban" means thickly settled areas (whether in cities or suburbs) or where congested traffic often occurs. A highway, even though in the country, on which the traffic is often heavy, is considered as urban.

(42) "Division of industrial safety and health" means the division of industrial safety and health of the department of labor and industries.

(43) "Duct" means a single enclosed raceway for conductors or cable.

(44) "Effectively grounded" means intentionally connected to earth through a grounded 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.

(45) "Electric supply equipment" means equipment which produces, modifies, regulates, controls, or safeguards a supply of electric energy. Syn: Supply equipment.

(46) "Electric supply station" means any building, room, or separate space within which electric–supply equipment is located and the interior of which is accessible, as a rule, only to properly qualified persons.

Note: This includes generating stations and substations and generator, storage–battery, transformer rooms, but excludes manholes and isolated–transformer vaults on private premises. (See definition of transformer vaults.)

(47) "Electrode, grounding" means a suitable metallic conducting material (generally copper or copper clad) imbedded in the earth and used for maintaining ground potential on conductors connected to it and for dissipating into the earth such electric current as may be impressed upon it.

(48) "Energized" means 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.

(49) "Equipment" means a general term including fittings, devices, appliances, fixtures, apparatus, and similar terms used as part of or in connection with an electric supply or communication system.

(50) "Equipment utilization" means equipment, devices, and connected wiring which utilize electric energy for mechanical, chemical, heating, lighting, testing, or similar purposes and are not a part of supply equipment, supply lines, or communication lines.

(51) "Explosion proof" means capable of withstanding without injury and without transmitting flame to the outside any explosion of gas which may occur within.

(52) "Explosion proof apparatus" means apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor which may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and which operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

(53) "Exposed" means not isolated or guarded.

(54) "Externally operable" means capable of being operated without exposing the operator to contact with live parts.

(55) "Fireproofing (of cables)" means the application of a fire–resistant covering.

(56) "Ground connection" means the equipment used in establishing a conducting path between an electric circuit or equipment and earth. A grounded connection consists of a ground conductor, a ground electrode, and the earth (soil, rock, etc.) which surrounds the electrode.

(57) "Grounded" means connected to or in contact with earth or connected to some extended conductive body which serves instead of the earth.

(58) "Grounded effectively" means permanently connected to earth through a ground connection 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. (See effectively grounded.)

(59) "Grounded system" means 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.

(60) "Guarded" means covered, fenced, enclosed, or otherwise protected, by means of suitable covers or casings, barrier rails or screens, mats or platforms, designed to minimize 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.

(61) "Guy" means a tension member (a solid wire or stranded wires) used to withstand an otherwise unbalanced force on a pole, crossarm, or other overhead line structure.

(62) "Guy, anchor" means a guy which has its lower anchorage in the earth and includes a sidewalk or ground guy.

(63) "Guy, overhead (span)" means a guy extending from a pole, crossarm, or structure to a pole, crossarm, or structure.

(64) "Handhole" means an access opening, provided in equipment or in a below–the–surface enclosure in connection with underground lines, into which workers reach but do not enter, for the purpose of installing, operating, or maintaining equipment or cable or both.

(65) "Identification" means for the purpose of these rules, to identify, or identification shall mean that method of coloring, lettering, numbering, marking, or maintaining in any certain position in relation to other objects, the same wire, cable pipe, circuit, phases, or other objects throughout the installation.

(66) "Inclosed" means surrounded by a case which will prevent accidental contact of a person with live parts. A solid inclosure means one which will neither admit accumulations of flyings or dust, nor transmit sparks or flying particles to the accumulations outside.

(67) "Insulated" means separated from other conducting surfaces by a dielectric substance or air space permanently offering a high resistance to the passage or current and to disruptive discharge through the substance or space.

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 rules, uninsulated. Insulating coverings of conductors is one means for making the conductors insulated.

(68) "Insulating (where applied to the covering of a conductor, or to clothing, guards, rods, and other safety devices)" means that a device when interposed between a person and current–carrying parts, protects the person making use of it against electric shock from the current–carrying parts with which the device is intended to be used; the opposite of conducting.

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

(70) "Insulation shielding" means an envelope which encloses the insulation of a cable and provides an equipotential surface in contact with the cable insulation.

(71) "Insulator" means insulating material in a form designed to support a conductor physically and electrically separate it from another conductor or object.

(72) "Isolated" means that an object is not readily accessible to persons unless special means for access are used.

(73) "Isolated by elevation" means elevated sufficiently so that persons may safely walk underneath.

(74) "Isolator" (See disconnecting or isolating switch.)

(75) "Jacket" means a protective covering over the insulation, core, or sheath of a cable.

(76) "Joint use" means simultaneous use by two or more kinds of utilities.

(77) "Lightning arrester" means a device which has the property of reducing the voltage of a surge applied to its terminals, is capable of interrupting follow current if present and restores itself to its original operating conditions.

(78) "Lines:"

(a) "Communication lines" means the conductors and their supporting or containing structures which are located outside of buildings and are used for public or private signal or communication service, and which operate at 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 operating at less than 150 volts no limit is placed on the capacity of the system.

Note: Telephone, telegraph, railroad–signal, messenger–call, clock, fire or police–alarm and other systems conforming with the above are included. Lines used for signaling purposes, but not included under the above definition, are considered as supply lines of the same voltage and are to be so run. Exception is made under certain conditions for communication circuits used in the operation of supply lines.

(b) "Electrical supply lines" means those conductors and their necessary supporting or containing structures which are located entirely outside of buildings and are used for transmitting a supply of electric energy.

Note: Does not include open wiring on buildings, in yards or similar locations where spans are less than twenty feet, and all the precautions required for stations or utilization equipment, as the case may be, are observed. Railway signal lines of more than 400 volts to ground are always supply lines within the meaning of these rules; those of less than 400 volts may be considered as supply lines, if so run and operated throughout.

(79) "Low voltage protection" means the effect of a device operative on the reduction or failure of voltage to cause and maintain the interruption of power supply to the equipment protected.

(80) "Low voltage release" means the effect of a device operative on the reduction or failure of voltage to cause the interruption of power supply to the equipment, but not preventing the reestablishment of the power supply on return of voltage.

(81) "Maintenance" means the work done on any line or any element of any line for the purpose of extending its life (excepting the replacement of the supporting poles or structures); includes the replacement, for any reason, of crossarms, pins, insulators, wires, cables, messengers, etc., but does not contemplate the addition of elements (excepting pole stubs and guy wires) which will change the identity of the structure.

(82) "Manhole" means an opening in an underground system which workers or others may enter for the purpose of installing cables, transformers, junction boxes, and other devices, and for making connections and tests.

(83) "Manhole cover" means a removable lid which closes the opening to a manhole or similar subsurface enclosure.

(84) "Manhole grating" means a grid which provides ventilation and a protective cover for a manhole opening.

(85) "Manual" means capable of being operated by personal intervention.

(86) "Messenger" means stranded wire which generally is not a part of the conducting system, its primary function being to support wires or cables of the conducting system; sometimes called "suspension strand."

(87) "Minor tracks" means railway tracks included in the following list:

(a) Spurs less than two thousand feet long and not exceeding two tracks in the same span.

(b) Branches on which no regular service is maintained or which are not operated during the winter season.

(c) Narrow–gage tracks or other tracks on which standard rolling stock cannot, for physical reasons, be operated.

(d) Tracks used only temporarily for a period not exceeding one year.

(e) Tracks not operated as a public utility, such as industrial railways used in logging, mining, etc.

(88) "Multigrounded system" means a system in which the neutral conductor is grounded at many places.

(89) "Objectionable flow of current" in grounding conductors, means any measurable amount of current flowing to earth which can be attributed to inadequately or improperly installed metallic return to sources of supply.

(90) "Open wire" means a conductor or pair of conductors separately supported above the surface of the ground.

(91) "Pad–mounted equipment" is a general term describing enclosed equipment, the exterior of which enclosure is at ground potential, positioned on a surface–mounted pad.

(92) "Panelboard" means a single panel, or a group of panel units designed for assembly in the form of a single panel, including buses and with or without switches and/or automatic overcurrent–protective devices for the control of light, heat, or power circuits of small individual as well as aggregate capacity; designed to be placed in a cabinet or cut–out box placed in or against a wall or partition, and accessible only from the front. (See definition of switchboard.)

(93) "Pole face" means that side of the pole on which crossarms are attached, or which is so designated by the utilities owning or operating the pole.

(94) "Prestressed concrete structures" means concrete structures which include metal tendons that are tensioned and anchored either before or after curing of the concrete.

(95) "Pulling iron" means an anchor secured in the wall, ceiling, or floor of a manhole or vault to attach rigging used to pull cable.

(96) "Pulling tension" is the longitudinal force exerted on a cable during installation.

(97) "Qualified" means a person who is familiar with the construction of, or operation of such lines and/or equipment that concerns his 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 electrical trades with which he may be connected.

(98) "Raceway" means any channel for loosely holding wires or cables in interior work, which is designed expressly and used solely for this purpose. Raceways may be of metal, wood, or insulating material, and the term includes wood and metal moldings consisting of a backing and capping, and also metal ducts into which wires are to be pulled.

(99) "Random separation" means installed with no deliberate separation.

(100) "Racks, vertical (secondary racks)" for the purpose of these rules shall include individual supports in rack configuration used for the support of conductors of 0 to 750 volts.

(101) "Reconstruction" means replacement of any portion of an existing installation by new equipment or construction. Does not include ordinary maintenance replacements.

(102) "Readily climbable" means having sufficient handholds and footholds to permit an average person to climb easily without using a ladder or other special equipment.

(103) "Remotely operable (as applied to equipment)" means capable of being operated from a position external to the structure in which it is installed or from a protected position within the structure.

(104) "Risers" means conductors which extend below the ground line and are generally installed on the surfaces of poles.

(105) "Roadway" means the portion of highway, including shoulders, for vehicular use.

Note: A divided highway has two or more roadways.

(106) "Rural districts": All places not urban. This may include thinly settled areas within the city limits.

(107) "Sag":

(a) The distance measured vertically from a conductor to the straight line joining its two points of support. Unless otherwise stated in the rule, the sag referenced to is the sag at the midpoint of the span.

(b) "Initial unloaded sag": The sag of a conductor prior to the application of any external load.

(c) "Final sag": The sag of a conductor under specified conditions of loading and temperature applied, after it has been subjected for an appreciable period to the loading prescribed for the loading district in which it is situated, or equivalent loading, and the loading removed. Final sag shall include the effect of inelastic deformation (creep).

(d) "Final unloaded sag": The sag of a conductor after it has been subjected for an appreciable period to the loading prescribed for the loading district in which it is situated, or equivalent loading, and the loading removed. Final unloaded sag shall include the effect of inelastic deformation (creep).

(e) "Total sag": The distance measured vertically from the conductor to the straight line joining its two points of support, under conditions of ice loading equivalent to the total resultant loading for the district in which it is located.

(f) "Maximum total sag": The total sag of the midpoint of the straight line joining the two points of support of the conductor.

(g) "Apparent sag of a span": The maximum distance between the wire in a given span and the straight line between the two points of support of the wire, measured perpendicularly from the straight line.

(h) "Sag of a conductor at any point in a span": The distance measured vertically from the particular point in the conductor to a straight line between its two points of support.

(i) "Apparent sag at any point in the span": The distance, at the particular point in the span, between the wire and the straight line between the two points of support of the wire, measured perpendicularly from the straight line.

(108) "Service" means the conductors and equipment for delivering electric energy from the secondary distribution or street main, or other distribution feeder, or from the transformer to the wiring system of the premises served.

(109) "Service drops" means the conductors strung between a pole line and a building or structure.

(110) "Service drop" means the overhead conductors between the electric supply or communication line and the building or structure being served.

(111) "Shoulder" means the portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles for emergency use and for lateral support of base and surface course.

(112) "Side–wall pressure" means the crushing force exerted on a cable during installation.

(113) "Span length" means the horizontal distance between two adjacent supporting points of a conductor.

(114) "Span wire" means a wire or cable used as an auxiliary support for wires, cables, or other equipment. As applied to trolley construction, it means a wire or cable used to support laterally, or which is attached to wires which support laterally, trolley contact conductors and appurtenances in electrical contact therewith, including wires commonly referred to as cross–span wires, bracket–span wires, pull–offs, trolley strain guys, dead ends, etc.

(115) "Splicing chamber." (See definition of "manhole.")

(116) "Structure conflict" means a line is so situated with respect to a second line that the overturning of the first line will result in contact between its supporting structures or conductors and the conductors of the second line, assuming that no conductors are broken in either line.

(117) "Supply equipment." (See electric supply equipment.)

(118) "Supply station." (See electric supply station.)

(119) "Supporting structure" means the main supporting unit (usually a pole or tower).

(120) "Susceptiveness" means the characteristics of a communications circuit including its connected apparatus which determine the extent to which it is adversely affected by inductive fields.

(121) "Switch" means a device for opening and closing or for changing the connection of a circuit. In these rules, a switch will always be understood to be manually operated, unless otherwise stated.

(122) "Switchboard" means a large single panel, frame, or assembly of panels, on which are mounted (on the face, or back, or both) switches, fuses, busses, and usually instruments.

(123) "Tag" means accident prevention tag (DANGER PEOPLE AT WORK, etc.) of a distinctive appearance used

for the purpose of personnel protection to indicate that the operation of the device to which it is attached is restricted.

(124) "Tension":

(a) "Final unloaded conductor tension" means the longitudinal tension in a conductor after the conductor has been stretched by the application for an appreciable period, and subsequent release, of the loadings of ice and wind and temperature decrease, assumed for the loading district in which the conductor is strung (or equivalent loading).

(b) "Initial conductor tension" means the longitudinal tension of a conductor prior to the application of any external load.

(125) "Termination." (See "cable terminal.")

(126) "Transformer vault" means an isolated inclosure either above or below ground with fire-resistant walls, ceiling, and floor, in which transformers and related equipment are installed, and which is not continuously attended during operation.

(127) "Traveled way" means the portion of the roadway for the movement of vehicles, exclusive of shoulders and full-time parking lanes.

(128) "Underground network distribution system" means an underground electrical installation fed from multiple primary sources directly associated with area-wide secondary network connected into a common grid.

(129) "Underground residential distribution system (URD)" means 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.

(130) "Urban districts" means thickly settled areas (whether in cities or suburbs) or where congested traffic often occurs. A highway, even though in thinly settled areas, on which the traffic is often very heavy, is considered as urban.

(131) "Utility" means an organization responsible for the installation, operation or maintenance of electric supply or communications systems.

(132) "Utility interactive system" means an electric power production system which is operating in parallel with and capable of delivering energy to a utility electric supply system.

(133) "Utilization equipment" means equipment, devices, and connected wiring which utilize electric energy for mechanical, chemical, heating, lighting, testing, or similar purposes and are not a part of supply equipment, supply lines, or communication lines.

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

(135) "Voltage" means the effect (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.

(136) "Voltage of an effectively grounded circuit" means the highest nominal voltage available between any conductor of the circuit and ground unless otherwise indicated.

(137) "Wire gages" means the American Wire Gage (AWG), otherwise known as Brown and Sharpe (B&S), is the standard gage for copper, aluminum, and other conductors, excepting steel, for which the Steel Wire Gage (Stl. WG) is used throughout these rules.

(138) "Working space, lateral" means the space reserved for working between conductor levels outside the climbing space, and to its right and left.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-011, filed 7/25/86.]

WAC 296-44-013 Purpose and scope. (1) The construction standards and requirements included in this vertical chapter shall apply throughout the state wherever construction, maintenance, operation, or use of electrical lines and high voltage equipment takes place within the jurisdiction of the department of labor and industries. Examples include, but are not limited to those specified in WAC 296-44-016.

(2) 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, chapter 296-62 WAC, General occupational health standards, chapter 296-32 WAC, Safety standards for telecommunications, chapter 296-45 WAC, Electrical workers safety rules, and chapter 296-155 WAC, Safety standards for construction work.

(3) If a provision of this chapter conflicts with a provision of the General safety and health standards chapter 296-24 WAC or the General occupational health standards chapter 296-62 WAC, the provision of this chapter shall prevail.

(4) When a provision of this chapter conflicts with a provision from any chapter of another vertical safety standard applying to the employers' specific type of work place, the provision of the vertical safety standard of specific application shall prevail.

(5) These construction standards, however, are not intended to circumvent the exposure levels or work standards provided for workers in the applicable sections of the standards referenced above.

(6) The safety and health requirements of this chapter do not imply that other safe work practices, procedures, or methods should not be used where such methods, procedures, or practices would tend to prevent accidents. The provisions of this chapter do not relieve the employer and employee of their respective duties to do whatever is reasonable and practicable to avoid causing accidents.

(7) The department's standards and rules shall not be applicable to those operations under the exclusive jurisdiction of the federal government.

(8) When the words "shall" or "must" are used in this chapter, the requirement is compulsory. The words "may" or "should," as used in this chapter, identify recommendations or suggestions only.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-013, filed 7/25/86; § 2 (part), filed 3/23/60, effective 12/1/58.]

WAC 296-44-015 Lines constructed prior to these rules. 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.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-015, filed 7/25/86.]

WAC 296-44-016 Applicability. These rules apply to:

(1) All overhead electrical supply and communications lines and equipment located outside of buildings.

(2) Underground lines and equipment.

(3) Stations and substations.

(4) Radio installations.

(5) All other electrical installations which come under the jurisdiction of the department of labor and industries, division of industrial safety and health.

(6) The installation and maintenance of electric utilization equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-016, filed 7/25/86; § 2 (part), filed 3/23/60, effective 12/1/58.]

WAC 296-44-017 References. (1) ANSI A12.1-1973, Safety Code for Floor and Wall Openings, Railings, and Toeboards.[3]

(2) ANSI A14.1-1982, Safety Requirements for Portable Wood Ladders.

(3) ANSI A14.2-1982, Safety Requirements for Portable Metal Ladders.

(4) ANSI A14.3-1982, Safety Requirements for Fixed Ladders.

(5) ANSI A14.5-1982, Safety Requirements for Portable Reinforced Plastic Ladders.

(6) ANSI A58.1-1972, Building Code Requirements for Minimum Design Loads in Buildings and Other Structures.

(7) ANSI A92.2-1979, Vehicle Mounted Elevating and Rotating Aerial Devices.

(8) ANSI B15.1-1972, Safety Standard for Mechanical Power Transmission Apparatus.

(9) ANSI C29.1-1982, Test Methods for Electrical Power Insulators.

(10) ANSI C29.2-1982, Wet-Process Porcelain and Toughened Glass Insulators (Suspension Type).

(11) ANSI C29.3-1980, Wet-Process Porcelain Insulators (Spool Type).

(12) ANSI C29.4-1977, Wet-Process Porcelain Insulators (Strain Type).

(13) ANSI C29.5-1977, Wet-Process Porcelain Insulators Low- and Medium-Voltage Pin Type.

(14) ANSI C29.6-1977, Wet-Process Porcelain Insulators, High Voltage Pin Type.

(15) ANSI C29.7-1982, Wet-Process Porcelain Insulators, High Voltage Line-Post Type.

(16) ANSI C84.1-1977, Voltage Ratings for Electric Power Systems and Equipment (60Hz); (includes supplement ANSI C84.1a 1980).

(17) ANSI C92.1-1982, Voltage Values for Preferred Transient Insulation Levels.

(18) ANSI O5.1-1979, Specifications and Dimensions for Wood Poles.

(19) ANSI Z53.1-1979, Safety Color Code for Marking Physical Hazards.

(20) ANSI Z87.1-1979, Practice for Occupational and Educational Eye and Face Protection.

(21) ANSI Z88.2-1980, Practices for Respiratory Protection.

(22) ANSI Z89.1-1981, Safety Requirements for Industrial Headwear.

(23) ANSI Z244.1-1982, Minimum Safety Requirements for Personnel Protection——Lockout/Tagout of Energy Sources.

(24) ANSI/ASTM D12079a, Specification for Rubber Insulating Gloves.

(25) ANSI/ASTM D1050-80, Specifications for Rubber Insulating Line Hose.

(26) ANSI/ASTM F496-80, Specifications for In-Service Care of Insulating Gloves and Sleeves.

(27) ANSI/IEEE Std 100-1977, IEEE Standard Dictionary of Electrical and Electronics Terms.

(28) ANSI/IEEE Std 268-1982, IEEE Standard Metric Practice.

(29) ANSI/NFPA 10-1981, Portable Fire Extinguisher.

(30) ANSI/NFPA 30-1981, Flammable and Combustible Liquids Code.

(31) ANSI/NFPA 70-1981, National Electrical Code.[4]

(32) ANSI/NFPA 77-1977, Recommended Practice on Static Electricity.

(33) ANSI/NFPA 85F-1982, Installation and Operation of Pulverized Fuel Systems.

(34) API RP500, Recommended Practice for Classification of Areas for Electrical Installations in Petroleum Refineries.[5]

(35) ASTM D178-81, Specification for Rubber Insulating Matting.[6]

(36) ASTM D1048-81, Specification for Rubber Insulating Blankets.

(37) ASTM D1049-81, Specification for Rubber Insulating Covers.

(38) ASTM D1051-81, Specification for Rubber Insulating Sleeves.

(39) ASTM F478-81, Specifications for In-Service Care of Insulating Line Hose and Covers.

(40) ASTM F479-81, Specifications for In-Service Care of Insulating Blankets.

(41) IEEE Std 80-1976, Guide for Safety in Substation Grounding.[7]

(42) NFPA 496–1982, Purged Enclosures for Electrical Equipment in Hazardous Locations.[8]

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–017, filed 7/25/86.]

PART B--GROUNDING FOR ELECTRICAL AND COMMUNICATION FACILITIES

WAC 296–44–023 Grounding methods for electric supply and communication facilities.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–023, filed 7/25/86.]

WAC 296–44–02301 Purpose. The purpose of WAC 296–44–02301 through 296–44–02349 is to provide practical methods of grounding, as one of the means of safeguarding employees and the public from injury that may be caused by electrical potential.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–02301, filed 7/25/86.]

WAC 296–44–02305 Scope. WAC 296–44–02301 through 296–44–02349 covers methods of protective grounding of supply and communication conductors and equipment. The rules requiring grounding are in other parts of this code.

These rules do not cover the grounded return of electric railways nor those lightning protection wires which are normally independent of supply or communication wires or equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–02305, filed 7/25/86.]

WAC 296–44–02309 Point of connection of grounding conductor. (1) Direct current systems which are to be grounded:

(a) 750 volts and below. Connection shall be made only at supply stations. In three–wire direct–current systems the connection shall be made to the neutral.

(b) Over 750 volts. Connection shall be made at both the supply and load stations. The connection shall be made to the neutral of the system. The ground or grounding electrode may be external to or remotely located from each of the stations.

One of the two stations may have its ground connection made through surge arresters provided the other station neutral is effectively grounded as described above.

(2) Alternating current systems which are to be grounded:

(a) 750 volts and below. The point of the grounding connection on a wye–connected three–phase four–wire system, or on a single–phase three–wire system, shall be the neutral conductor. On other one–, two–, or three–phase systems with an associated lighting circuit or circuits, the point of grounding connection shall be on the common circuit conductor associated with the lighting circuits.

The point of grounding connection on three–phase three–wire system, whether derived from a delta connected or an ungrounded wye–connected transformer installation not used for lighting, may be any of the circuit conductors, or it may be a separately derived neutral.

The grounding connections shall be made at the source, and at the line side of all service equipment.

(b) Over 750 volts.

(i) Nonshielded (bare or covered conductors or insulated nonshielded cables).

Grounding connection shall be made at the neutral of the source. Additional connections may be made, if desired, along the length of the neutral, where this is one of the system conductors.

(ii) Shielded.

(A) Surge–arrester cable–shielding interconnection. Cable shielding grounds shall be bonded to surge arrester grounds, where provided, at points where underground cables are connected to overhead lines.

(B) Cable without insulating jacket. Connection shall be made to the neutral of the source transformer and at cable termination points.

(C) Cable with insulating jacket. Additional bonding and connections between the cable insulation shielding or sheaths and the system ground are recommended. In multigrounded shielded cable systems, the shielding (including sheath) shall be grounded at each cable joint exposed to personnel contact. Where multigrounded shielding cannot be used for electrolysis or sheath current reasons, the shielding sheaths and splice enclosure devices shall be insulated for the voltage which may appear on them during normal operation.

Bonding transformers or reactors may be substituted for direct ground connection at one end of the cable.

(I) Separate grounding conductor. If a separate grounding conductor is used as an adjunct to a cable run underground, it shall be connected at the source transformer and at cable accessories where these are to be grounded.

(II) Separate grounding conductor location. This grounding conductor shall be located in the same direct burial or duct bank run (or the same duct if this is of magnetic material) as the circuit conductors.

Note: The grounding conductor for a circuit which is installed in a magnetic duct need not be in the same duct if the duct containing the circuit is bonded to the separate grounding conductor at both ends.

(3) Messenger wires and guys.

(a) Messenger wires. Messenger wires required to be grounded shall be connected to grounding conductors at poles or structures at maximum intervals as listed below:

(i) Where messenger wires are adequate for system grounding conductors (WAC 296–44–02315 (3)(a), (b), and (e)) four connections in each mile.

(ii) Where messenger wires are not adequate for system grounding conductors, eight connections per mile, exclusive of service grounds.

(b) Guys. Guys which are required to be grounded shall be connected to:

(i) Grounded steel structures or to an effective ground connection on wood poles.

(ii) A line conductor which has at least four ground connections in each mile of line in addition to the ground connections at individual services.

(4) Current in grounding conductor. Ground connection points shall be so arranged that under normal circumstances there will be no objectionable flow of current over the grounding conductor. If an objectionable flow of current occurs over a grounding conductor due to the use of multiple grounds, one or more of the following should be used:

(a) Abandon one or more grounds.

(b) Change location of grounds.

(c) Interrupt the continuity of the conductor between ground connections.

(d) Subject to the approval of the administrative authority take other effective means to limit the current.

The system ground of the source transformer shall not be removed.

The temporary currents set up under abnormal conditions while the grounding conductors are performing their intended protective functions are not considered objectionable. The conductor shall have the capability of conducting anticipated fault current without thermal overloading or excessive voltage buildup. Refer to WAC 296-44-02315(3).

(5) Fences. Fences, where required to be grounded by other parts of this code, shall be grounded at or near the location of a supply line or lines crossing them, and additionally, at distances not exceeding one hundred fifty feet on either side. Fences shall also be grounded at each side of a gate or other opening in the fence. Any gate or other opening shall also be bonded across by a buried bonding jumper. A gate shall be metallically connected or bonded to the grounding conductor, jumper, or fence. Separate barbed wire strands above fencing, on nonconducting posts, shall be bonded to metallic fencing or grounding conductors at the grounding points.

Where required to be grounded, fences shall be bonded to the grounding system of the enclosed equipment or to a separate underground conductor below or near the fence line.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-02309, filed 7/25/86.]

WAC 296-44-02315 Grounding conductor and means of connection. (1) Composition of grounding conductors. In all cases the grounding conductor shall be made of copper or other metals or combinations of metals which will not corrode excessively during the expected service life under the existing conditions and, if practical, shall be without joint or splice. If joints are unavoidable, they shall be so made and maintained as to not materially increase the resistance of the grounding conductor and shall have appropriate mechanical and corrosion resistant characteristics. For surge arresters and ground detectors, the grounding conductor or conductors shall be as short, straight, and free from sharp bends as practical. The structural metal frame of a building or structure may serve as a grounding conductor to an acceptable grounding electrode.

In no case shall a circuit-opening device be inserted in the grounding conductor or connection except where its operation will result in the automatic disconnection from all sources of energy of the circuit leads connected to the equipment so grounded.

Note: Temporary disconnection of grounding conductors for testing purposes, under competent supervision, shall be permitted.

(2) Connection of grounding conductors. Connection of the grounding conductor shall be made by a means matching the characteristics of both the grounded and grounding conductors, and suitable for the environmental exposure. These means include brazing, welding, mechanical and compression connections, ground clamps, and ground straps. Soldering is acceptable only in conjunction with lead sheaths.

(3) Ampacity and strength. The "short time ampacity" of a bare grounding conductor is that current which the conductor can carry for the time during which the current flows without melting or separating under the applied tensions. If a grounding conductor is insulated, its short time ampacity is the current which it can carry for the applicable time without damaging the insulation. Where grounding conductors at one location are paralleled, the increased total current capacity may be considered.

(a) System grounding conductors for single-grounded systems. The system grounding conductor or conductors for a system with single system grounding electrode or set of electrodes, exclusive of grounds at individual services, shall have a short time ampacity adequate for the fault current which can flow in the grounding conductor or conductors for the operating time of the system protective device. If this value cannot be readily determined, continuous ampacity of the grounding conductor or conductors shall be not less than the full load continuous current of the system supply transformer or other source of supply.

(b) System grounding conductors for multigrounded alternating current systems. The system grounding conductors for an alternating current system with grounds at more than one location exclusive of grounds at individual services shall have continuous total ampacities at each location of not less than one-fifth that of the conductors to which they are attached. (See also subsection (3)(h) of this section.)

(c) Grounding conductors for instrument transformers. The grounding conductor for instrument cases and secondary circuits of instrument transformers shall not be smaller than AWG No. 12 copper or have equivalent ampacity.

(d) Grounding conductors for primary surge arresters. The grounding conductor or conductors shall have adequate short time ampacity under conditions of excess current caused by or following a surge. Individual arrester grounding conductors shall be no smaller than AWG No. 6 copper or AWG No. 4 aluminum.

Note: Arrester grounding conductors may be copper-clad or aluminum-clad steel wire having not less than thirty percent of the conductivity of solid copper or aluminum wire of the same diameter.

Where flexibility of the grounding conductor, such as adjacent to the base of the arrester, is vital to its proper operation, a suitably flexible conductor shall be employed.

(e) Grounding conductors for equipment, messenger wires, and guys.

(i) Conductors. The grounding conductors for equipment, raceways, cable, messenger wires, guys, sheaths, and other metal enclosures for wires shall have short time ampacities adequate for the available fault current and operating time of the system fault protective device. If no overcurrent or fault protection is provided, the ampacity of the grounding conductor shall be determined by the design and operating conditions of the circuit, but shall not be less than that of AWG No. 8 copper. Where the adequacy and continuity of the conductor enclosures and their attachment to the equipment enclosures is assured, this path can constitute the equipment grounding conductor.

(ii) Connections. Connection of the grounding conductor shall be to a suitable lug, terminal, or device not disturbed in normal inspection, maintenance, or operation.

(f) Fences. The grounding conductor for fences required to be grounded by other parts of this code shall be any of those meeting the requirements of subsection (3)(h) of this section or shall be steel wire not smaller than No. 5 steel wire gauge. It shall be connected to the fence posts with connecting means suitable for the material when the posts are of conducting material. If the posts are of nonconducting material, suitable bonding connections shall be made to the fence mesh strands and the barbed wire strands at each grounding conductor point.

(g) Bonding of equipment frames and enclosures. Where required, a low impedance metallic path shall be provided for the passage of possible conductor or equipment, or both, fault current back to the grounded terminal of the supply, where the supply is local. Where the supply is remote, the metallic path shall interconnect the equipment frames and enclosures with all other nonenergized conducting components within reach and shall additionally be connected to ground as outlined in subsection (3)(h) of this section. Short-time ampacities of bonding conductors shall be adequate for the duty involved.

(h) Ampacity limit. No grounding conductor need have greater ampacity than either:

(i) The phase conductors which would supply the ground fault current, or

(ii) The maximum current which can flow through it to the ground electrode or electrodes to which it is attached. For a single grounding conductor and connected electrode or electrodes, this would be the supply voltage divided by the electrode resistance (approximately).

(i) Strength. All grounding conductors shall have mechanical strength suitable for the conditions to which they may reasonably be subjected.

Further, unguarded grounding conductors shall have a tensile strength not less than that of AWG No. 8 softdrawn copper, except as noted in subsection (3)(c) of this section.

(4) Guarding and protection.

(a) The grounding conductors for single grounded systems and those exposed to mechanical damage shall be guarded. However, grounding conductors need not be guarded where not readily accessible to the public nor where grounding multigrounded circuits or equipment.

(b) Where guarding is required, grounding conductors shall be protected by guards suitable for the exposure to which they may reasonably be subjected. The guards should extend for not less than 8 feet above the ground or platform from which the grounding conductors are accessible to the public.

(c) Where guarding is not required, grounds shall be protected by being substantially attached closely to the surface of the pole or other structure in areas of exposure to mechanical damage and, where practical, on the portion of the structure having least exposure.

(d) Guards used for grounding conductors of lightning protection equipment shall be of nonmagnetic materials if the guard completely encloses the grounding conductor or is not bonded at both ends to the grounding conductor.

(5) Underground.

(a) Grounding conductors laid directly underground shall be laid slack or shall be of sufficient strength to prevent being readily broken by earth movement or settling normal at the particular location.

(b) Direct-buried uninsulated joints or splices in grounding conductors should be welded, brazed, or of the compression type to minimize the possibility of loosening or corrosion. The number of joints or splices should be the minimum practical.

(c) Grounding cable insulation shielding systems shall be interconnected with all other accessible grounded power supply equipment in manholes, handholes, and vaults.

Note: Where cathodic protection or shield cross-bonding is involved, interconnection may be omitted.

(d) Looped magnetic elements such as structural steel, piping, reinforcing bars, etc., should not separate grounding conductors from the phase conductors of circuits they serve.

(e) Metals used for grounding, in direct contact with earth, concrete, or masonry, shall have been proven suitable for such exposure.

Note 1: Under present technology, aluminum has not generally been proven suitable for such use.

Note 2: Metals of different galvanic potentials which are electrically interconnected may require protection against galvanic corrosion.

(f) Sheath transposition connections (cross-bonding).

(i) Where cable insulating shields or sheaths, which are normally connected to ground, are insulated from ground to minimize shield circulating currents, they shall be insulated from personnel contact at accessible locations. Transposition connections and bonding jumpers shall be insulated for nominal 600 volt service, unless the normal shielding voltage exceeds this level, in which

case the insulation shall be ample for the working voltage to ground.

(ii) Bonding jumpers and connecting means shall be sized and selected to carry the available fault current without damaging jumper insulation or sheath connections.

(6) Common grounding conductor for circuits, metal raceways, and equipment. Where the ampacity of a supply system grounding conductor is also adequate for equipment grounding requirements, this conductor may be used for the combined purpose. Equipment referred to includes the frames and enclosures of supply system control and auxiliary components, conductor raceways, cable shields, and other enclosures.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-02315, filed 7/25/86.]

WAC 296-44-02319 Grounding electrodes. The grounding electrode shall be permanent and adequate for the electrical system involved. A common electrode or electrode system shall be employed for grounding the electrical system and the conductor enclosures and equipment served by that system. This may be accomplished by interconnecting these elements at the "point of connection of grounding conductor," WAC 296-44-02309.

Grounding electrodes shall be one of the following:

(1) Existing electrodes. Existing electrodes consist of conducting items installed for purposes other than grounding:

(a) Metallic water piping system. Extensive metallic underground cold water piping systems may be used as grounding electrodes.

Note: Such systems normally have very low resistance to earth and have been extensively used in the past. They are the preferred electrode type where they are readily accessible.

Note: Water systems with nonmetallic noncurrent-carrying pipe or insulating joints are not suitable for use as grounding electrodes.

(b) Local systems. Isolated buried metallic cold water piping connecting to wells having sufficiently low measured resistance to earth may be used as grounding electrodes.

Note: Care should be exercised to insure that all parts that might become disconnected are effectively bonded together.

(c) Steel reinforcing bars in concrete foundations and footings. The reinforcing bar system of a concrete foundation or footing which is not insulated from direct contact with earth, and which extends at least three feet below grade, constitutes an effective and acceptable type of grounding electrode. Where steel supported on this foundation is to be used as a grounding conductor (tower, structure, etc.), it shall be interconnected by bonding between anchor bolts and reinforcing bars or by cable from the reinforcing bars to the structure above the concrete.

The normally applied steel ties are considered to provide adequate bonding between bars of the reinforcing cage.

Note: Where reinforcing bars in concrete are not suitably connected to a metal structure above the concrete, and the latter structure is subjected to grounding discharge currents (even connected to another electrode), there is likelihood of damage to the intervening concrete from ground-seeking current passing through the semi-conducting concrete.

(2) Made electrodes.

(a) General. Where made electrodes are used, they shall as far as practical penetrate into permanent moisture level and below the frostline. Made electrodes shall be of metal or combinations of metals which do not corrode excessively under the existing conditions for the expected service life.

All outer surfaces of made electrodes shall be conductive, that is, not having paint, enamel, or other insulating type covering.

(b) Driven rods. Driven rods may be sectional; the total length shall not be less than eight feet. Driven depth shall be eight feet minimum. The upper end shall be flush with or below the ground level unless suitably protected. Longer rods or multiple rods may be used to reduce the ground resistance. Spacing between multiple rods should not be less than six feet.

Note: Where rock bottom is encountered, driven depth may be less than eight feet or other types of electrode employed.

Iron or steel rods shall have minimum cross-sectional dimension of five-eighths inch. Copper-clad, stainless steel, or stainless steel-clad rods shall have a minimum cross-sectional dimension of one-half inch.

(c) Buried wire, strips, or plates. In areas of high soil resistivity or shallow bedrock, or where lower resistance is required than attainable with driven rods, one or more of the following electrodes may be more useful:

(i) Wire. Bare wires 0.162 inch in diameter or larger, conforming to WAC 296-44-02315 (5)(e), buried in earth at a depth not less than eighteen inches and not less than one hundred feet total in length, laid approximately straight, constitutes an acceptable made electrode. (This is frequently designated a "counterpoise.") The wire may be in a single length, or may be several lengths connected at ends or at some point away from the ends. The wire may take the form of a network with many parallel wires spaced in two-dimensional array, referred to as a grid.

Note 1: Where rock bottom is encountered, burial depth may be less than eighteen inches.

Note 2: Other lengths or configurations may be used if their suitability is supported by a qualified engineering study.

(ii) Strips. Strips of metal not less than ten feet in total length and with total (two sides) surface not less than five square feet buried in soil at a depth not less than eighteen inches constitute an acceptable made electrode. Ferrous metal electrodes shall be not less than one-fourth inch in thickness and nonferrous metal electrodes not less than 0.06 inches.

Note: Strip electrodes are frequently useful in rocky areas where only irregularly shaped pits are practical to excavate.

(iii) Plates or sheets. Metal plates or sheets having not less than two square feet of surface exposed to the soil, and at a depth of not less than five feet, constitute an

acceptable made electrode. Ferrous metal electrodes shall be not less than one-fourth inch in thickness and nonferrous metal electrodes not less than 0.06 inches.

(d) Pole butt plates and wire wraps.

(i) General. In areas of very low soil resistivity there are two constructions, described in specifications (ii) and (iii) below, which may provide effective grounding electrode functions although they are inadequate in most other locations. Where these have been proven to have adequately low earth resistance by the application of WAC 296-44-02329, two such electrodes may be counted as one made electrode and ground for application of WAC 296-44-02309 (3)(a), (3)(b)(ii), 296-44-02335(3) and 296-44-02329(3); however, these types shall not be the sole grounding electrode at transformer locations.

(ii) Pole butt plates. Subject to the limitations of WAC 296-44-02319 (2)(d), a pole butt plate on the base of a wooden pole, possibly folded up around the base of the pole butt, may be considered an acceptable electrode in locations where the limitations of WAC 296-44-02329 are met. The plates shall be not less than one-fourth inch thick if of ferrous metal and not less than 0.06 inch thick if of nonferrous metal. Further, the minimum plate area exposed to the soil shall be 0.5 square feet.

(iii) Wire wrap. Subject to the limitations of WAC 296-44-02319 (2)(a), made electrodes may be wire attached to the pole previous to the setting of the pole. The wire shall be of copper or other metals which will not corrode excessively under the existing conditions and shall have a continuous bare or exposed length below ground level of not less than twelve feet, shall extend to the bottom of the pole, and shall not be smaller than AWG No. 6.

(e) Concentric neutral cable. Systems employing extensive (one hundred feet minimum length) buried bare concentric neutral cable in contact with the earth may employ the concentric neutral as a grounding electrode. The concentric neutral may be covered with a semi-conducting jacket which has a radial resistivity not exceeding one hundred meter ohms and which will remain essentially stable in service. The radial resistivity of the jacket material is that value calculated from measurements on a unit length of cable, of the resistance between the concentric neutral and a surrounding conducting medium. Radial resistivity equals resistance of unit length times the surface area of jacket divided by the average thickness of the jacket over the neutral conductors. All dimensions are to be expressed in meters.

(f) Concrete-encased electrodes. A metallic wire, rod, or structural shape, meeting WAC 296-44-02315 (5)(e) and encased in concrete which is not insulated from direct contact with earth shall constitute an acceptable ground electrode. The concrete depth below grade shall be not less than one foot, and a depth of two and one-half feet is recommended. Wire shall be no smaller than AWG No. 4 if copper, or three-eighths inch diameter if steel. It shall be not less than twenty feet long, and shall remain entirely within the concrete except for the external connection. The conductor should be run as straight as practical.

The metal elements may be composed of a number of shorter lengths arrayed within the concrete and connected together (for example, the reinforcing system in a structural footing).

Note: Other wire length or configurations may be used if their suitability is supported by a qualified engineering study.

Note 1: The lowest resistance per unit wire length will result from a straight wire installation.

Note 2: The outline of the concrete need not be regular, but may conform to an irregular or rocky excavation.

Note 3: Concrete encased electrodes are frequently more practical or effective than driven rods or strips or plates buried directly in earth.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-02319, filed 7/25/86.]

WAC 296-44-02323 Method of connection to electrode. (1) Ground connections. The ground connections shall be as accessible as practical and shall be made to the electrode by methods providing the required permanence and ampacity, such as:

(a) A permanently effective clamp, fitting, braze, or weld.

(b) A bronze plug which has been tightly screwed into the electrode.

(c) For steel-framed structures employing a concrete-encased reinforcing bar electrode, a steel rod similar to the reinforcing bar shall be used to join, by welding, a main vertical reinforcing bar to an anchor bolt. The bolt shall be substantially and permanently connected to the baseplate of the steel column supported on that footing. The electrical system may then be connected (for grounding) to the building frame by welding or by a bronze bolt tapped into a structural member of that frame.

(d) For nonsteel frame structures employing a concrete-encased rod or wire electrode, an insulated copper conductor of size meeting the requirements of WAC 296-44-02315(3) (except not smaller than AWG No. 4) shall be connected to the steel rod or wire using a cable clamp suitable for steel cable. This clamp and all the bared portion of the copper conductor including ends of exposed strands within the concrete shall be completely covered with mastic or sealing compound before concrete is poured to minimize the possibility of galvanic corrosion. The copper conductor end shall be brought to or out of the concrete surface at the required location for connection to the electrical system. If the copper wire is carried beyond the surface of the concrete, it shall be no smaller than AWG No. 2.

Alternatively, the copper wire may be brought out of the concrete at the bottom of the hole and carried external to the concrete for surface connection.

(2) Point of connection to piping systems.

(a) The point of connection of a grounding conductor to a metallic water piping system shall be as near as is practical to the water-service entrance to the building or

near the equipment to be grounded and shall be accessible. If a water meter is between the point of connection and the underground water pipe, the metallic water piping system shall be made electrically continuous by bonding together all parts between the connection and the pipe entrance which may become disconnected, such as meters and service unions.

(b) Made grounds or grounded structures should be separated by ten feet or more from pipelines used for the transmission of flammable liquids or gases operating at high pressure (one hundred fifty pounds per square inch or greater) unless they are electrically interconnected and cathodically protected as a single unit. Grounds within ten feet of such pipelines should be avoided or shall be coordinated so that hazardous alternating current conditions will not exist and cathodic protection of the pipeline will not be nullified.

(3) Contact surfaces. If any coating of nonconducting material, such as enamel, rust, or scale, is present on electrode contact surfaces, at the point of connection, such a coating shall be thoroughly removed where required to obtain the requisite good connection. Special fittings so designed as to make such removal of nonconducting coatings unneccessary may also be used.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-02323, filed 7/25/86.]

WAC 296-44-02329 Ground resistance. Requirements. The grounding electrode system may consist of one or more interconnected electrodes. It shall have a resistance to ground low enough to minimize hazards to personnel and to permit prompt operation of circuit protective devices.

(1) Supply stations. Where very high voltages and currents are involved, such as in large substations, extensive grounding grid systems of multiple buried wires and rods and other protective means may be required.

Note: It is recommended that the combination of maximum local ground fault current and impedance of the grounding system not exceed values which will limit exposure potentials to the following:

$$E_{step} = (1000 + 6\rho s)\frac{0.116}{\sqrt{t}}$$

$$E_{touch} = (1000 + 1.5\rho s)\frac{0.116}{\sqrt{t}}$$

where

E_{step} maximum tolerable voltage difference between any two points on the ground surface which can be touched simultaneously by two (separated) feet

E_{touch} maximum tolerable voltage difference between any point on the ground where a man may stand and any point which can be touched simultaneously by either hand

ps resistivity of the soil near the surface in ohm-meters (divide the ohm-centimeter value by one hundred to obtain this)

t time of exposure in seconds (clearing time of system overcurrent equipment)

(2) Single grounded (unigrounded or delta) systems. Individual made electrodes shall, where practical, have a resistance to ground not exceeding twenty-five ohms. If a single electrode resistance exceeds twenty-five ohms, two electrodes connected in parallel shall be used.

(3) Multiple grounded systems. The neutral, which shall be of sufficient size and ampacity for the duty involved, shall be connected to made electrodes at each transformer location and at a sufficient number of additional points to total not less than four grounds in each mile of line, not including grounds at individual services.

Note: Multiple grounding systems extending over a substantial distance are more dependent on the multiplicity of grounding electrodes than on the resistance to ground of any individual electrode. Therefore, no specific values are imposed for the resistance of individual electrodes.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-02329, filed 7/25/86.]

WAC 296-44-02335 Separation of grounding conductors. (1) Except as permitted in subsection (2) of this section grounding conductors from equipment and circuits of each of the following classes shall be run separately to the grounding electrode for each of the following classes:

(a) Surge arresters of circuits over 750 volts, and frames of any equipment operating at over 750 volts.

(b) Lighting and power circuits under 750 volts.

(c) Lightning rods, unless attached to a grounded metal supporting structure.

Alternatively, the grounding conductors shall be run separately to a sufficiently heavy ground bus or system ground cable which is well connected to ground at more than one place.

(2) The grounding conductors of either of the equipment classes detailed in subsection (1)(a) and (b) of this section may be interconnected utilizing a single grounding conductor, provided:

(a) There is a direct earth grounding connection at each arrester location.

(b) The secondary neutral is common with, or connected to, a primary neutral meeting the grounding requirements of subsection (3) of this section.

(3) Primary and secondary circuits utilizing a single conductor as a common neutral shall have at least four ground connections on such conductor in each mile of line, exclusive of ground connections at customers' service equipment.

(4) Ungrounded or single grounded systems and multiple grounded systems.

(a) Ungrounded or single grounded systems. Where the secondary neutral is not interconnected with the primary surge arrester grounding conductor as in subsection (2) of this section, interconnection may be made through a spark gap or device which performs an equivalent function. The gap or device shall have a 60 Hz

breakdown voltage of at least twice the primary circuit voltage but not necessarily more than 10kV. At least one other grounding connection on the secondary neutral shall be provided with its grounding electrode located at a distance of not less than twenty feet from the surge arrester grounding electrode in addition to customers' grounds at each service entrance.

(b) Multiple grounded systems. On multiple grounded systems the primary and secondary neutrals should be interconnected according to subsection (2) of this section. However, where it is necessary to separate the neutrals, interconnection of the neutrals shall be made through a spark gap or a device which performs an equivalent function. The gap or device shall have a 60 Hz breakdown voltage not exceeding 3 kV. At least one other grounding connection on the secondary neutral shall be provided with its grounding electrode located at a distance not less than six feet from the primary neutral and surge arrester grounding electrode in addition to the customers' grounds at each service entrance. Since a different potential can exist where primary and secondary neutrals are not directly interconnected, the secondary grounding conductor shall be insulated for 600 V.

(5) Where separate electrodes are used for system isolation, separate grounding conductors shall be used. Where multiple electrodes are used to reduce grounding resistance, they may be bonded together and connected to a single grounding conductor.

(6) Made electrodes used for grounding surge arresters of ungrounded supply systems operated at potentials exceeding 15 kilovolts phase to phase should be located at least twenty feet from buried communications cables. Where lines with lesser separations are to be constructed, reasonable advance notice should be given to the owners or operators of the affected systems.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-02335, filed 7/25/86.]

WAC 296-44-02349 Grounding methods for telephone and other communication apparatus on circuits exposed to supply lines or lightning. Protectors and, where required, exposed noncurrent-carrying metal parts located in central offices or outside installations shall be grounded in the following manner:

(1) Electrode. The grounding conductor shall be connected to an acceptable grounding electrode as described in WAC 296-44-02319, with the following additions and exception:

(a) Connection may be made to the metallic supply, service conduit, service-equipment enclosure, or grounding electrode conductor where the grounded conductor of the supply service is connected to an acceptable water pipe electrode at the building.

(b) Where the grounding means in WAC 296-44-02319 (1)(a) and this section are not available, the grounding conductor shall be connected to the metallic supply service conduit, service-equipment enclosure, grounding electrode conductor, or grounding electrode of the supply service of a multigrounded neutral power supply.

Note: A variance to WAC 296-44-02319 (2)(b) is allowed for this application. Iron or steel rods may have a minimum cross-sectional dimension of one-half inch and a length of five feet. The driven depth shall be five feet subject to the exception of WAC 296-44-02319 (2)(b).

(2) Electrode connection. The grounding conductor shall preferably be made of copper (or other material which will not corrode excessively under the prevailing conditions of use) and shall be not less than AWG No. 14 (0.064 inch) in size. The grounding conductor shall be attached to the electrode by means of a bolted clamp or other suitable methods.

(3) Bonding of electrodes. A bond not smaller than AWG No. 6 (0.162 inch) copper or equivalent shall be placed between the communication grounding electrode and the supply system neutral grounding electrode where separate electrodes are used in or on the same building or structure.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-02349, filed 7/25/86.]

WAC 296-44-025 Applicability of rules--Lines constructed prior to these rules. 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.

[§ 2 (part), filed 3/23/60, effective 12/1/58.]

PART C--RULES FOR THE INSTALLATION AND MAINTENANCE OF ELECTRIC SUPPLY STATIONS AND EQUIPMENT

WAC 296-44-035 Rules for the installation and maintenance of electric supply stations and equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-035, filed 7/25/86.]

WAC 296-44-03505 Purpose. The purpose of WAC 296-44-03505 through 296-44-13431 is the practical safeguarding of persons during the installation, operation, or maintenance of electric supply stations and their associated equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-03505, filed 7/25/86.]

WAC 296-44-03509 Scope. WAC 296-44-03505 through 296-44-13431 covers the electric supply conductors and equipment, along with the associated structural arrangements in electric supply stations, which are accessible only to qualified personnel. It also covers the conductors and equipment employed primarily for the utilization of electric power when such conductors and equipment are used by the utility in the exercise of its function as a utility.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-03509, filed 7/25/86.]

WAC 296-44-041 Protective arrangements in electric supply stations.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-041, filed 7/25/86.]

WAC 296-44-04105 General requirements. (1) Enclosure of equipment. Rooms and spaces in which electric supply conductors or equipment are installed shall be so arranged with fences, screens, partitions or walls as to minimize the possibility of entrance of unauthorized persons or interference by them with equipment inside. Entrances not under observation of an authorized attendant shall be kept locked.

Warning signs shall be displayed at entrances.

Metal fences when used to enclose electric supply stations having energized electrical conductors or equipment shall have a minimum height of eight feet overall and shall be grounded in accordance with WAC 296-44-023.

The requirements for fence height may be satisfied with any one of the following:

(a) Fence fabric, eight feet or more in height.

(b) A combination of seven feet or more of fence fabric and a one foot extension utilizing three or more strands of barbed wire.

(c) Other types of construction, such as nonmetallic material, which present equivalent barriers to climbing or other unauthorized entry.

(2) Rooms and spaces. All rooms and spaces in which electric supply equipment is installed shall comply with the following requirements.

(a) Construction. They shall be as much as practical noncombustible.

(b) Use. They should be as much as practical free from combustible materials, dust, and fumes and shall not be used for manufacturing or for storage, except for minor parts essential to the maintenance of the installed equipment. (For battery areas, see WAC 296-44-074, for auxiliary equipment in classified locations, see WAC 296-44-05137.)

(c) Ventilation. There should be sufficient ventilation to maintain operating temperatures within ratings, arranged to minimize accumulation of airborne contaminants under any operating conditions.

(d) Moisture and weather. They should be dry. In outdoor stations or stations in wet tunnels, subways or other moist or high humidity locations, the equipment shall be suitably designed to withstand the prevailing atmospheric conditions.

(3) Electric equipment. To minimize movement, all stationary equipment shall be supported and secured in place in a manner consistent with its conditions of service.

Note: In areas of limited seismic activity, some equipment such as transformers may be considered as secured in place by their own weight; equipment which tends to move during operation, such as circuit breakers and rotating equipment, are considered to require appropriate additional measures.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-04105, filed 7/25/86.]

WAC 296-44-04109 Illumination. (1) Under normal conditions. Rooms and spaces shall have means for artificial illumination. The illumination levels listed in Table 041-1 are the minimum footcandles for safety to be maintained on the task.

(2) Emergency lighting.

(a) A separate emergency source of illumination with automatic initiation, from an independent generator, storage battery or other suitable source, shall be provided in every attended station.

(b) Emergency lighting of three footcandles shall be provided in exit paths from all areas of attended stations. Consideration must be given to the type of service to be rendered whether of short time or long duration. The minimum duration shall be one and one-half hours. It is recommended that emergency circuit wiring shall be kept independent of all other wiring and equipment.

(3) Fixtures. Arrangements for permanent fixtures and plug receptacles shall be such that portable cords need not be brought into dangerous proximity to live or moving parts. All lighting shall be controlled and serviced from safely accessible locations.

(4) Attachment plugs and receptacles for general use. Portable conductors shall be attached to fixed wiring only through separable attachment plugs which will disconnect all poles by one operation. Receptacles installed on two or three wire single phase, ac branch circuits shall be of the grounding type. Receptacles connected to circuits having different voltages, frequencies or types of current (ac or dc) on the same premises shall be of such design that attachment plugs used on such circuits are not interchangeable.

(5) Receptacles in damp or wet locations. All 120 V ac permanent receptacles shall either be provided with ground fault interrupter (GFI) protection, or be on a grounded circuit which is tested at such intervals as experience has shown to be necessary.

Table 041-1 Illumination Levels

Location	Minimum Footcandles
Central station	
Air conditioning equipment, air preheater and fan floor, ash sluicing	5
Auxiliaries, battery areas, boiler feed pumps, tanks, compressors, gage area	10
Boiler platforms	5
Burner platforms	10
Cable room, circulator, or pump bay	5
Chemical laboratory	25
Coal conveyor, crusher, feeder, scale areas, pulverizer, fan area, transfer tower	5
Condensers, deaerator floor, evaporator floor, heater floors	5
Control rooms	
Vertical face of switchboards	
Simples or section of duplex operator:	
Type A—Large centralized control room 66 inches above floor	25

Table 041-1 Illumination Levels

Location	Minimum Footcandles
Type B—Ordinary control room 66 inches above floor	15
Section of duplex facing away from operator	15
Bench boards (horizontal level)	25
Area inside duplex switchboards	5
Rear of all switchboard panels (vertical)	5
Dispatch boards	
Horizontal plane (desk level)	25
Vertical face of board (48 inches) above floor, facing operator:	
System load dispatch room	25
Secondary dispatch room	15
Hydrogen and carbon dioxide manifold area	10
Precipitators	5
Screen house	10
Soot or slag blower platform	5
Steam headers and throttles	5
Switchgear, power	10
Telephone equipment room	10
Tunnels or galleries, piping	5
Turbine bay subbasement	10
Turbine room	15
Visitor's gallery	10
Water treating area	10
Central station (exterior)	
Catwalks	5
Cinder dumps	5
Coal storage area	5
Coal unloading	
Dock (loading or unloading zone)	5
Barge storage area	5
Car dumper	5
Tipple	5
Conveyors	5
Entrances	
Generating or service building	
Main	10
Secondary	5
Gate house	
Pedestrian entrance	10
Conveyor entrance	5
Fence	5
Fuel-oil delivery headers	5
Oil storage tanks	5
Open yard	5
Platforms—Boiler, turbine deck	5
Roadway	
Between or along buildings	5
Not bordered by buildings	5
Substation	
General horizontal	5
Specific vertical (on disconnects)	5

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-04109, filed 7/25/86.]

WAC 296-44-04125 Floor, floor openings, passageways, stairs. (1) Floors. Floors shall have even surfaces and afford secure footing. Slippery floors or stairs should be provided with antislip covering.

(2) Passageways. Passageways, including stairways, shall be unobstructed and shall, where practical, provide at least seven feet headroom. Where the preceding requirements are not practical, the obstructions should be painted, marked or indicated by warning signs and the area properly lighted.

(3) Railings. All floor openings without gratings or other adequate cover and raised platforms and walkways in excess of one foot in height shall be provided with railings. Openings in railings for units such as fixed ladders, cranes, and the like shall be provided with adequate guards such as grates, chains, or sliding pipe sections.

(4) Stair guards. All stairways consisting of four or more risers shall be provided with handrails.

Note: For additional information see ANSI A12.1-1973[1].[9]

(5) Top rails. All top rails shall be kept unobstructed for a distance of three inches in all directions except from below at supports.

[9]The numbers in brackets correspond to those in the references of WAC 296-44-017.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-04125, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-04129 Exits. (1) Clear exits. Each room or space and each working space about equipment shall have a means of exit which shall be kept clear of all obstructions. Exit doors shall swing out and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.

Note: This rule does not apply to gates in fences for outdoor equipment installations.

(2) Double exits. If the plan of the room or space and the character and arrangement of equipment are such that an accident would be likely to close or make inaccessible a single exit, a second exit shall be provided.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-04129, filed 7/25/86.]

WAC 296-44-04135 Fire extinguishing equipment. Fire extinguishing equipment shall be portable and installed in accordance with WAC 296-24-590.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-04135, filed 7/25/86.]

WAC 296-44-051 Installation and maintenance of equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-051, filed 7/25/86.]

WAC 296-44-05105 General requirements. All electric equipment shall be constructed, installed, and

maintained so as to safeguard personnel as far as practical.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05105, filed 7/25/86.]

WAC 296-44-05109 Inspections. (1) In-service equipment. Electric equipment shall be inspected and maintained at such intervals as experience has shown to be necessary. Equipment or wiring found to be defective shall be put in good order or permanently disconnected.

(2) Idle equipment. Infrequently used equipment or wiring shall be inspected and tested before use to determine its fitness for service. Idle equipment energized but not connected to a load shall be inspected and maintained at such intervals as experience has shown to be necessary.

(3) Emergency equipment. Equipment and wiring maintained for emergency service shall be inspected and tested at such intervals as experience has shown to be necessary to determine its fitness for service.

(4) New equipment. New equipment shall be inspected and tested before being placed in service.

Note: The equipment to be tested does not include fittings, devices, appliances, fixtures or other hardware.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05109, filed 7/25/86.]

WAC 296-44-05115 Guarding shaft ends, pulleys, belts and suddenly moving parts. (1) Mechanical transmission machinery. The methods for safeguarding pulleys, belts and other equipment used in the mechanical transmission of power shall be in accordance with ANSI B15.1-1972 [8].

(2) Suddenly moving parts. Parts of equipment which move suddenly in such a way that persons in the vicinity are likely to be injured by such movement, shall be guarded or isolated.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05115, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-05119 Protective grounding. (1) Protective grounding or physical isolation of noncurrent-carrying metal parts. All electric equipment shall have the exposed noncurrent-carrying metal parts, such as frames of generators and switchboards, cases of transformers, switches and operating levers effectively grounded or physically isolated. All metallic guards including rails, screen fences, etc. about electric equipment shall be effectively grounded.

(2) Grounding method. All grounding which is intended to be a permanent and effective protective measure, such as surge arrester grounding, grounding of circuits, equipment, or wire raceways, shall be made in accordance with the methods specified in WAC 296-44-023.

Note: For additional information see IEEE Std. 80-1976[41].

(3) Provision for grounding equipment during maintenance. Electric equipment or conductors normally operating at more than 600 V between conductors, on or about which work is occasionally done while isolated from a source of electric energy by disconnecting or isolating switches only, shall be provided with some means for grounding, such as switches, connectors or a readily accessible means for connecting a portable grounding conductor. When necessary, grounding may be omitted on conductors normally operating at 25 kV or less and not influenced by higher voltage conductors, where visible openings in the source of supply are available and are properly tagged in the open position.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05119 filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-05125 Guarding live parts. (1) Where required.

(a) Guards shall be provided around all live parts operating above 150 V to ground without an adequate insulating covering, unless their location gives sufficient horizontal or vertical or a combination of these clearances to minimize the possibility of accidental human contact. Clearances from live parts to any permanent supporting surface for workers shall equal or exceed either of those shown in Table 051-1 and illustrated in Figure 051.1.

(b) Parts over or near passageways through which material may be carried, or in or near spaces such as corridors, storerooms and boiler rooms used for nonelectrical work shall be guarded or given clearances in excess of those specified such as may be necessary to secure reasonable safety. The guards shall be substantial and completely shield or enclose the live parts without openings. In spaces used for nonelectrical work, guards should be removable only by means of tools or keys.

(c) Parts of indeterminate potential, such as telephone wires exposed to induction from high voltage lines, ungrounded neutral connections, ungrounded frames, ungrounded parts of surge arresters, or ungrounded instrument cases connected directly to a high voltage circuit, shall be guarded on the basis of the maximum voltage which may be present.

(2) Strength of guards. Guards shall be sufficiently strong and shall be supported rigidly and securely enough to prevent them from being displaced or dangerously deflected by a person slipping or falling against them.

(3) Types of guards.

(a) Location or physical isolation. Parts having clearances equal to or greater than specified in Table 051-1, 124-1 are guarded by location. Parts are guarded by isolation when all entrances to enclosed spaces, runways, fixed ladders, and the like are kept locked, barricaded, or roped off and warning signs are posted at all entrances.

(b) Shields or enclosures. Guards less than four inches outside of the guard zone shall completely enclose the

parts from contact up to the heights listed in Column 2 of Table 051–1. They shall not be closer to the live parts than listed in Column 4 of Table 051–1, except when suitable insulating material is used with circuits of less than 2500 V to ground. (See note under Table 051–1.) If more than four inches outside the guard zone, the guards shall extend a minimum of eight feet six inches above the floor. Covers or guards, which must at any time be removed while the parts they guard are live, shall be arranged so that they cannot readily be brought into contact with live parts.

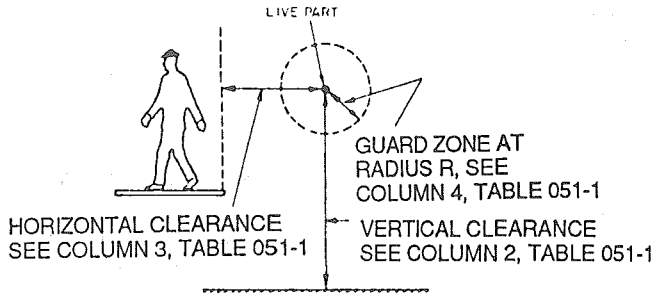


Fig. 051.1

Table 051–1. Minimum Clearance from Live Parts

PART A – Low, Medium and High Voltages

Nominal voltage between phases (1)	Minimum vertical clearance of unguarded parts (2)[1]		Minimum horizontal clearance of unguarded parts (3)[1]		Minimum clearance guard to live parts (4)[1]	
	Feet	Inches	Feet	Inches	Feet	Inches
151 to 600	8	8	3	4		2
2,400	8	9	3	4		3
7,200	8	10	3	4		4
13,800	9	0	3	6		6
23,000	9	3	3	9		9
34,500	9	6	4	0	1	0
46,000	9	10	4	4	1	4
69,000	10	5	4	11	1	11
115,000	11	7	6	1	3	1
138,000	12	2	6	8	3	8
161,000	12	10	7	4	4	4
230,000	14	10	9	4	6	4

PART B – Extra high voltages (based on switching surge factors)[2]

Maximum design voltage between phases (1)	Switching surge factor[3] per unit (A)[4]	Switching surge line to ground (B)[4]	Minimum vertical clearance of unguarded parts (2)[1]		Minimum horizontal clearance of unguarded parts (3)[1]		Minimum clearance guard to live parts (4)[1]	
		kV	Ft	In	Ft	In	Ft	In
362,000	2.2 or below	650	15	6	10	0	7	0
	2.3	680	16	0	10	6	7	6
	2.4	709	16	6	11	0	8	0

PART B – Extra high voltages (based on switching surge factors)[2]

Maximum design voltage between phases (1)	Switching surge factor[3] per unit (A)[4]	Switching surge line to ground (B)[4]	Minimum vertical clearance of unguarded parts (2)[1]		Minimum horizontal clearance of unguarded parts (3)[1]		Minimum clearance guard to live parts (4)[1]	
		kV	Ft	In	Ft	In	Ft	In
	2.5	739	17	2	11	8	8	8
	2.6	768	17	9	12	3	9	3
	2.7	798	18	4	12	10	9	10
	2.8	828	18	11	13	5	10	5
	2.9	857	19	7	14	1	11	1
	3.0	887	20	2	14	8	11	8
550,000	1.8 or below	808	18	10	13	4	10	4
	1.9	853	19	6	14	0	11	0
	2.0	898	20	6	15	0	12	0
	2.1	943	21	6	16	0	13	0
	2.2	988	22	6	17	0	14	0
	2.3	1033	23	7	18	1	15	1
	2.4	1078	24	8	19	2	16	2
	2.5	1123	25	10	20	4	17	4
	2.6	1167	27	0	21	6	18	6
	2.7	1212	28	4	22	10	19	10
800,000	1.5	980	22	4	16	10	13	10
	1.6	1045	23	11	18	5	15	5
	1.7	1110	25	6	20	0	17	1
	1.8	1176	27	3	21	9	18	9
	1.9	1241	29	0	23	6	20	6
	2.0	1306	30	10	25	4	22	4
	2.1	1372	32	9	27	3	24	3
	2.2	1437	34	8	29	3	26	2
	2.3	1502	36	9	31	3	28	3
	2.4	1567	38	9	33	3	30	3

PART C – Extra high voltages (based on BIL factors)[2]

Maximum design voltage between phases (1)	Basic impulse insulation[5] level (BIL) (C)[4]	Minimum vertical clearance of unguarded parts (2)[1]		Minimum horizontal clearance of unguarded parts (3)[1]		Minimum clearance guard to live parts (4)[1]	
	kV	Ft	In	Ft	In	Ft	In
362,000	1050	15	6	10	0	7	0
362,000	1300	17	2	11	8	8	8
550,000	1550	18	10	13	4	10	4
550,000	1800	20	6	15	0	12	0
800,000	2050	22	5	16	11	13	11

Notes and explanations to terms used in Table 051.1:

[1] Interpolate for intermediate values. The clearances in Column 4 of this table are solely for guidance in installing guards without definite engineering design and are not to be considered as a requirement for such engineering design. For example, the minimum clearances in the tables above are not intended to refer to the clearances between live parts and the walls of the cells, compartments or similar enclosing structures. They do not apply to the clearances between bus bars and supporting structures nor to clearances between the blade of a disconnecting switch and its base. However, where surge protective devices are applied to protect the live parts, the vertical clearances, Column 2 of Table 124–1 Part A may be reduced provided the clearance is not less than eight feet and six inches plus the electrical clearance between energized parts and ground as limited by the surge protective devices.

[2] Minimum clearances shall satisfy either switching surge or BIL duty requirements, whichever are greater.

[3] Switching surge factor – an expression of the maximum switching surge crest voltage in terms of the maximum operating line to neutral crest voltage of the power system.

[4] The values of Columns A, B, and C are power system design factors that shall correlate with selected minimum clearances. Adequate data to support these design factors should be available.

[5] The selection of station BIL shall be coordinated with surge protective devices when using BIL to determine minimum clearance. BIL–basic impulse insulation level–for definition and application see ANSI C92.1–1982 [17].

(c) Railings. Railings are not substitutes for complete guards. If the vertical distance in Table 051–1 cannot be obtained, railings may be used. Railings, if used, shall be located at a horizontal distance of at least three feet and preferably not more than four feet from the nearest point of the guard zone which is less than eight feet, six inches above the floor (see Fig. 051–2).

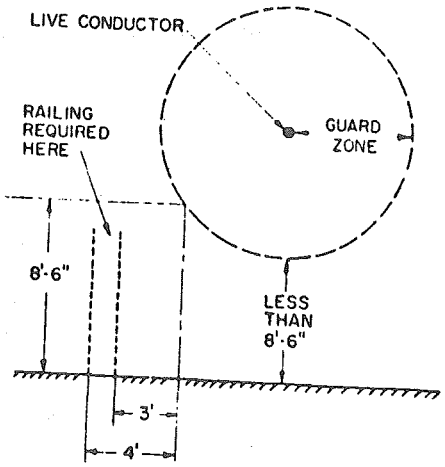


Fig. 051-2

Railing used as Guards

(d) Mats. Mats of rubber or other suitable insulating material complying with ASTM D178–81 [35] may be used at switchboards, switches, or rotating machinery as supplementary protection.

(e) Live parts below supporting surfaces for persons. The supporting surfaces for persons above live parts shall be without openings. Toe boards at least six inches high and handrails shall be provided at all edges.

(f) Insulating covering on conductors or parts. Conductors and parts may be considered as guarded by insulation if they have either of the following:

(i) Insulation covering of a type and thickness suitable for the voltage and conditions under which they are expected to be operated and if operating above 2500 V to ground having metallic insulation shielding or semiconducting shield in combination with suitable metallic drainage which is grounded to an effective ground.

Note: Nonshielded insulated conductors listed by a qualified testing laboratory shall be permitted for use up to 8000 V (phase–to–phase) when the conductors meet the requirements of ANSI/NFPA 70–1981 [31], Article 310–6.

(ii) Barriers or enclosures which are electrically and mechanically suitable for the conditions under which they are expected to be operated.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–05125, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296–44–05129 Working space about electric equipment. (1) Working space (600 volts or less). Access and working space shall be provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment.

(a) Clear spaces. Working space required by this section shall not be used for storage. When normally enclosed energized parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be guarded.

(b) Access and entrance to working space. At least one entrance shall be provided to give access to the working space about electrical equipment.

(c) Working space. The working space in the direction of access to energized parts operating at 600 volts or less which require examination, adjustment, servicing, or maintenance while energized shall not be less than indicated in Table 051–2. In addition to the dimensions shown in Table 051–2 the working space shall not be less than thirty inches wide in front of the electric equipment. Distances shall be measured from the energized parts if such are exposed or from the enclosure front or opening if such are enclosed. Concrete, brick, or tile walls shall be considered grounded.

Table 051–2 Working Space

Voltage to ground	Minimum Clear Distance		
	ft	ft	ft
Condition:	1	2	3
0–150	3	3	3
151–600	3	3 1/2	4

Where the *conditions* are as follows:

1. Exposed energized parts on one side and no energized or grounded parts on the other side of the working space, or exposed energized parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated bus bars operating at not over 300 V shall not be considered energized parts.

2. Exposed energized parts on one side and grounded parts on the other side.

3. Exposed energized parts on both sides of the work space (not guarded as provided in Condition 1) with the operator between.

Note: Working space shall not be required in back of assemblies, such as dead–front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.

(d) Headroom working space. The minimum headroom of working spaces about switchboards or control centers shall be seven feet.

(e) Front working space. In all cases where there are energized parts normally exposed on the front of switchboards or motor control centers, the working space in front of such equipment shall not be less than three feet.

(2) Working space over 600 volts. Working space shall be in accordance with Table 051-1 clearances for guarding.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05129, filed 7/25/86.]

WAC 296-44-05131 Equipment for work on energized parts. When it is necessary for personnel to move themselves, material, or tools within the guard zone of unguarded energized parts, protective equipment shall be provided.

This protective equipment shall be periodically inspected, tested, and kept in a safe condition. Protective equipment shall be rated for not less than the voltage involved.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05131, filed 7/25/86.]

WAC 296-44-05135 Classified locations. Electrical installations in classified areas shall meet the requirements of ANSI/NFPA 70-1981 [31], Articles 500 through 503 and Articles 511 through 517.

Specific classified areas in a power plant or substation and their classifications are identified in the following subsections.

(1) Coal-handling locations.

(a) Unventilated tunnels below stockpiles or surge piles and spaces inside, above or below coal storage silos or bunkers or other enclosed coal storage spaces where methane or coal dust may accumulate, are Class I, Division 1, Group D, and Class II, Division 1, Group F locations.

(b) Enclosed areas of preparation plants or coal handling facilities where coal dust might accumulate, are Class II, Division 1, Group F locations.

(c) Electrical equipment in other locations in which hazardous concentrations of flammable gases or vapors may exist continually, intermittently or periodically under normal operating conditions shall be in accordance with ANSI/NFPA 70-1981 [31], Article 501 or be adequately ventilated.

(d) The minimum acceptable requirements for adequate ventilation (pressurization) to reduce the classification of an enclosed area or enclosure within a Class I, Division 1 area to nonclassified are:

(i) The ventilation system shall maintain at least 0.1 inch of positive water pressure in the area with all openings closed.

(ii) The ventilation system shall provide a minimum velocity of 60 feet per minute outward through each opening with all openings open at the same time.

(iii) The ventilation system shall be interlocked so that on failure of the ventilation system, all power to the area shall be de-energized except to those devices which meet the Class I, Division 1 requirements without the ventilation system.

(iv) The maximum operating temperature of any internal surface shall not exceed eighty percent of the ignition temperature of the hazardous material involved.

(e) Locations in which combustible dust is or may be in suspension in the air continuously, intermittently, or periodically under normal operating conditions, or in quantities sufficient to produce explosions or ignitable mixtures, are classified as Class II, Division 1, Group F locations and all electrical equipment shall be installed and maintained in accordance with the requirements of ANSI/NFPA 70-1981 [31], Article 502.

(f) Locations where dangerous concentrations of suspended dust are prevented during normal operation but where dust accumulations on electrical equipment may be sufficient to interfere with the safe dissipation of heat from electrical equipment or might be ignited by arcs, sparks, or burning material from such equipment are Class II, Division 2, Group F locations and all electrical equipment shall be installed and maintained in accordance with the requirements of ANSI/NFPA 70-1981 [31], Article 502.

(g) Enclosed sections where only wet coal is handled or enclosed sections so cut off as to be free from dangerous amounts of coal dust are not classified. Coal shall be considered to be wet if enough water sprays are installed and maintained to prevent more than 0.3 ounce of coal dust per cubic foot of enclosed air volume from being thrown into suspension or from accumulating on or in electrical equipment.

(h) Locations having completely dust-tight pulverized fuel systems designed and installed in compliance with ANSI/NFPA 85F-1982 [33], shall not be considered classified.

(i) Portable lamps for use in fuel bunkers or bins shall be suitable for Class II, Division 1 locations.

(j) Sparking electrical tools shall not be used where flammable dust or dust clouds are present.

(k) An equipment grounding conductor shall be carried with the power conductors and serve to ground the frames of all equipment supplied from that circuit. The origin of the grounding conductor shall be:

(i) Ungrounded delta or wye—Transformer frame ground.

(ii) Grounded delta or wye—Transformer grounded secondary connection.

(iii) Resistance grounded wye—The grounded side of the grounding resistor.

(l) Ungrounded systems should be equipped with a ground fault indicating device to give both a visual and audible alarm upon the occurrence of a ground fault in the system.

(2) Flammable and combustible liquids.

(a) Flammable liquid shall mean a liquid having a flash point below 100°F and having a vapor pressure not exceeding forty pounds per square inch (absolute) at 100°F and shall be known as a Class I liquid.

(b) Combustible liquid shall mean a liquid having a flash point greater than or equal to 100°F and having a

vapor pressure not exceeding forty pounds per square inch (absolute) at 100°F.

(c) Class I liquids are subdivided as follows:

(i) Class IA includes those having flash points below 73°F and having a boiling point below 100°F.

(ii) Class IB includes those having flash points below 73°F.

(iii) Class IC includes those having flash points at or above 73°F and below 100°F.

(d) Combustible liquids are subdivided as follows:

(i) Class II includes those having flash points equal to or greater than 100°F but less than 140°F.

(ii) Class IIIA includes those having flash points equal to or greater than 140°F but less than 200°F.

(iii) Class IIIB includes those having flash points greater than or equal to 200°F.

(3) Flammable liquid storage area. Electrical wiring and equipment located in inside storage rooms used for Class I liquids shall be approved for Class I, Division 2 locations, (see Table 051–3).

Table 051–3 Electrical Equipment Classified Areas–Flammable Liquid Storage Areas

Location	NEC Class I Division	Extent of Classified Area
Indoor equipment installed where flammable vapor–air mixtures may exist under normal operations.	1	Area within 5 ft of any edge of such equipment, extending in all directions.
	2	Area between 5 ft and 8 ft of any edge of such equipment, extending in all directions. Also, area up to 3 ft above floor or grade level within 5 ft to 25 ft horizontally from any edge of such equipment.*
Outdoor equipment installed where flammable vapor–air mixtures may exist under normal operations.	1	Area within 3 ft of any edge of such equipment extending in all directions.
	2	Area between 3 ft and 8 ft of any edge of such equipment extending in all directions. Also, area up to 3 ft above floor or grade level within 3 ft to 10 ft horizontally from any edge of such equipment.
Tank – Above ground		
Shell, ends, or roof and dike area	2	Within 10 ft from shell, ends or roof of tank. Area inside dikes to level of top of dike.
Vent	1	Within 5 ft of open end of vent, extending in all directions.
	2	Area between 5 ft and 10 ft from open end of vent, extending in all directions.
Floating roof	1	Area above the roof and within the shell.
*Note: The release of Class I liquids may generate vapors to the extent that the entire building, and possibly a zone surrounding it, should be considered a Class I, Division 2 location.		
Tank – Underground fill opening	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
	2	Up to 18 in above grade level within a horizontal radius of 10 ft from a loose fill connection and within a horizontal radius of 5 ft from a tight fill connection.
Vent – Discharging upward	1	Within 3 ft of open end of vent, extending in all directions.
	2	Area between 3 ft and 5 ft of open end of vent, extending in all directions.
Drum and container filling; outdoors, or indoors with adequate ventilation	1	Within 3 ft of vent and fill opening, extending in all directions.
	2	Area between 3 ft and 5 ft from vent or fill opening, extending in all directions. Also up to 18 in above floor or grade level within a horizontal radius of 10 ft from vent or fill opening.
Pumps, bleeders, withdrawal fitting, meters and similar devices		
Indoors	2	Within 5 ft of any edge of such devices, extending in all directions. Also, up to 3 ft above floor or grade level within 25 ft horizontally from any edge of such devices.
Outdoors	2	Within 3 ft of any edge of such devices, extending in all directions. Also up to 18 in above grade level within 10 ft horizontally from any edge of such devices.
Pits		
Without mechanical ventilation	2	Entire area within pit if any part is within a Division 1 or 2 classified area.
With mechanical ventilation	2	Entire area within pit if any part is within a Division 1 or 2 classified area.
Containing valves, fittings or piping, and not within a Division 1 or 2 classified area	2	Entire pit
Drainage ditches, separators, impounding basins	2	Area up to 18 in above ditch, separator or basin. Also up to 18 in above grade within 15 ft horizontally from any edge.

*Note: The release of Class I liquids may generate vapors to the extent that the entire building, and possibly a zone surrounding it, should be considered a Class I, Division 2 location.

Table 051-4 Electrical Equipment Classified Areas-Bulk Plants

Location	NEC Class I, Group D Division	Extent of Classified Area
Bottom loading with vapor recovery or any bottom unloading	2	Within 3 ft of point of connections, extending in all directions. Also up to 18 in above grade within a horizontal radius of 10 ft from point of connection.

(4) Loading and unloading facilities. Electrical equipment located in the area shall comply with the requirements of Table 051-4.

(a) Static protection. Bonding facilities for protection against static sparks during the loading of tank vehicles through open domes shall be provided (i) where Class I liquids are loaded, or (ii) where Class II or Class III liquids are loaded into vehicles which may contain vapors from previous cargoes of Class I liquids.

(A) Protection as required in (a) of this subsection shall consist of a metallic bond wire permanently electrically connected to the fill stem or to some part of the rack structure in electrical contact with the fill stem. The free end of such wire shall be provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle.

(B) Such bonding connection shall be made fast to the vehicle or tank before dome covers are raised and shall remain in place until filling is completed and all dome covers have been closed and secured.

Note: Bonding as specified in (a)(A) and (B) of this subsection is not required:

(aa) Where vehicles are loaded exclusively with products not having a static accumulating tendency, such as asphalts including cutback asphalts, most crude oils, residual oils and water soluble liquids;

(bb) Where no Class I liquids are handled at the loading facility and the tank vehicles loaded are used exclusively for Class II and Class III liquids; and

(cc) Where vehicles are loaded or unloaded through closed bottom or top connections whether the hose or pipe is conductive or nonconductive.

(b) Stray currents. Tank car loading facilities where flammable and combustible liquids are loaded or unloaded through open domes shall be protected against stray currents by permanently bonding the pipe to at least one rail and to the rack structure, if of metal. Multiple pipes entering the rack area shall be permanently electrically bonded together. In addition, in areas where excessive stray currents are known to exist, all pipe entering the rack area shall be provided with insulating sections to electrically isolate the rack piping from the pipe lines. These precautions are not necessary where Class II or Class III liquids are handled exclusively and there is no probability that tank cars will contain vapors from previous cargoes of Class I liquids. Temporary bonding is not required between the tank car and the rack or piping during either loading or unloading irrespective of the class of liquid handled.

(c) Container filling facilities. Class I liquids shall not be dispensed into metal containers unless the nozzle or fill pipe is in electrical contact with the container. This can be accomplished by maintaining metallic contact during filling, by a bond wire between them, or by other conductive path having an electrical resistance not greater than 10^6 ohms. Bonding is not required where a container is filled through a closed system, or is made of glass or other nonconducting material.

Note: For additional information see ANSI/NFPA 77-1977 [32].

(5) Gasoline dispensing stations.

(a) WAC 296-44-05135(5) shall apply to areas where Class I liquids are stored, handled or dispensed. For areas where Class II or Class III liquids are stored, handled or dispensed, the electrical equipment may be installed in accordance with the provisions of applicable sections of this code (ANSI C2).

(b) All electrical equipment and wiring shall be furnished and installed in accordance with ANSI/NFPA 70-1981 [31]. All electrical equipment integral with the dispensing hose or nozzle shall be suitable for use in Division 1 locations.

(c) Table 051-5 shall be used to delineate and classify areas for the purpose of installation of electrical equipment under normal circumstances. A classified area shall not extend beyond an unpierced wall, roof, or other solid partition. For a definition of the class and division designations see ANSI/NFPA 70-1981 [31], Article 500.

(d) The area classifications listed in Table 051-5 are based on the premise that the installation meets the applicable requirements of this code in all respects. Should this not be the case, the local governing authority having jurisdiction (i.e., local, state or federal authorities) shall have the authority to determine the extent of the classified area.

Table 051-5 Electrical Equipment Classified Areas-Gasoline Dispensing Stations

Location	NEC Class I Division	Extent of Classified Area
Gasoline dispensing units (except overhead type dispensers)	1	The area up to 4 ft vertically above the base within the enclosure or up to a solid partition less than 4 ft above the base, located above the nozzle insertion level and above the level of any gasketed joint, hose, or stuffing box.
	2	Within 18 in horizontally in all directions from the Division 1 area within the enclosure.
Outdoor	2	Up to 18 in above grade level within 20 ft horizontally of any edge of enclosure.

Location	NEC Class I Division	Extent of Classified Area
Indoor		
With mechanical ventilation	2	Up to 18 in above grade or floor level within 20 ft horizontally of any edge of enclosure.
With gravity ventilation	2	Up to 18 in above grade or floor level within 25 ft horizontally of any edge of enclosure.
Gasoline dispensing units		Within the dispenser enclosure and 18 in in all directions from the enclosure where not suitably cut off by ceiling or wall. All electrical equipment integral with the dispensing hose or nozzle.
Overhead type		
Gasoline dispensing units	2	An area extending 2 ft horizontally in all directions beyond the Division 1 area and extending to grade below the classified area.
Overhead type *(Continued)*		
	2	Up to 18 in above grade level with 20 ft horizontally measured from a point vertically below the edge of any dispenser.
Gasoline dispensing station lubrication or service room	1	Any pit within any unventilated area.
with dispensing	2	Any pit with ventilation
	2	Area up to 18 in above floor or grade level and 3 ft horizontally from a lubrication pit.
Dispenser for Class I liquids	2	Within 3 ft of any fill or dispensing point, extending in all directions.
Without dispensing	2	Entire area within any pit used for lubrication or similar services where Class I liquids may be released.
	2	Area up to 18 in above any such pit, and extending a distance of 3 ft horizontally from any edge of the pit.
Storage and rest rooms	Non-classified	If there is any opening to these rooms within the extent of a Division 1 area, the entire room shall be classified as Division 1.

Location	NEC Class I, Group D Division	Extent of Classified Area
Vapor processing pits	1	Any pit, box, or space below grade level, any part of which is within a Division 1 or 2 location or which houses any equipment used to transport or process vapors.
Equipment	2	Within protective enclosures. The space within 18 in in all directions of equipment containing flammable vapor or liquid extending to grade level. Up to 18 in above grade level within 10 ft horizontally of the vapor processing equipment.

(6) Boilers.

(a) When storing, handling, or burning fuel oils which may have flash points below 100°F (Class I liquids, as defined in ANSI/NFPA 30–1981 [30]) or which may be heated above their flash point, attention must be given to electrical installations in areas where flammable vapors or gases may be present in the atmosphere. Typical locations are: Burner areas, fuel–handling equipment areas, fuel storage areas, pits, sumps, and low spots where fuel leakage or vapors may accumulate. ANSI/NFPA 70–1981 [31], Article 500 provides for classifying such areas and defines requirements for electrical installations in the areas so classified. The burner front piping and equipment shall be designed and constructed to eliminate hazardous concentrations of flammable gases that exist continuously, intermittently, or periodically under normal operating conditions. Providing the burners are thoroughly purged before removal for cleaning, burner front maintenance operations will not cause hazardous concentrations of flammable vapors to exist frequently. With such provisions, the burner front is not normally classified more restrictively, than Class I, Division 2.

(b) The operating company shall be responsible for classifying areas where fuel is stored, handled, or burned, and for revising the classification if conditions are changed. Installations shall conform to ANSI/NFPA 30–1981 [30] and ANSI/NFPA 70–1981 [31].

Note: For additional guidance see API RP 500 [34].

(7) Gaseous hydrogen systems for supply equipment.

(a) Outdoor storage areas shall not be located beneath electric power lines.

(b) Safety considerations at specific storage areas. Electrical equipment shall be suitable for Class I, Division 2 locations:

(i) Within fifteen feet of outdoor storage spaces;

(ii) Within adequately ventilated separate buildings or special rooms for storing hydrogen;

(iii) Within twenty–five feet of a hydrogen storage space in an adequately ventilated building used for other purposes.

(c) Space around elements of the generator hydrogen seal oil system shall not be considered classified for electrical installation except where external venting is not provided in the bearing drain system.

(d) Spaces around the hydrogen piping system beyond the point where the hydrogen storage system connects to distribution piping shall not be considered classified for electrical installations, outside the boundaries established in WAC 296–44–05115 (7)(b)(a) and (c).

(8) Liquid hydrogen systems.

(a) Electrical wiring and equipment located within three feet of a point where connections are regularly made and disconnected, shall be in accordance with ANSI/NFPA 70–1981 [31], Article 501, Class I, Group B, Division 1 locations.

(b) Except as provided in (a) of this subsection electrical wiring and equipment located within twenty–five feet of a point where connections are regularly made and

disconnected or within twenty-five feet of a liquid hydrogen storage container, shall be in accordance with ANSI/NFPA 70-1981 [31], Article 501, Class I, Group B, Division 2 locations. When equipment approved for Class I, Group B atmospheres is not commercially available, the equipment may be (i) purged or ventilated in accordance with NFPA 496-1982 [42] or (ii) intrinsically safe, or (iii) approved for Class I, Group C atmospheres. This requirement does not apply to electrical equipment which is installed on mobile supply trucks or tank cars from which the storage container is filled.

(9) Sulfur. Electrical wiring and equipment located in areas where sulfur dust is in suspension in explosive or ignitable mixtures during normal operations, shall be suitable for Class II, Division 1, Group G.

(10) Oxygen. Bulk oxygen installations are not defined as classified locations.

(11) Liquefied petroleum gas (LPG).

(a) LPG is heavier than air.

(b) Since LPG is contained in a closed system of piping and equipment, the system need not be electrically conductive or electrically bonded for protection against static electricity.

(c) Fixed electrical equipment and wiring installed within classified areas specified in Table 051-6 shall meet the requirements of ANSI/NFPA 70-1981 [31], Article 500.

Table 051-6 Electrical Equipment Classified Areas-LPG Storage

Location	NEC Class I Group D	Extent of Classified Area
Storage containers other than DOT cylinders	2	Within 15 ft in all directions from connections, except connections otherwise covered in Table K-1.
Tank vehicle and tank car loading and unloading	1	Within 5 ft in all directions from connections regularly made or disconnected for product transfer.
	2	Beyond 5 ft but within 15 ft in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade.
Gage vent openings other than those on DOT cylinders	1	Within 5 ft in all directions from point of discharge.
	2	Beyond 5 ft but within 15 ft in all directions from point of discharge.
Relief valve	1	Within direct path of discharge.
Discharge other than those on DOT cylinders		Note: Fixed electrical equipment should preferably not be installed.
	1	Within 5 ft in all directions from point of discharge.
	2	Beyond 5 ft but within 15 ft in all directions from point of discharge except within the path of discharge.
Pits or trenches containing or located beneath LP-Gas valves, regulators, and similar equipment:		
Without mechanical ventilation	1	Entire pit or trench.
	2	Entire room and any adjacent room not separated by a gastight partition.
	2	Within 15 ft in all directions from pit or trench when located outdoors.
With adequate mechanical ventilation	2	Entire pit or trench.
	2	Entire room and any adjacent room not separated by a gastight partition.
	2	Within 15 ft in all directions from pit or trench when located outdoors.
Special buildings or rooms for storage of portable containers	2	Entire room.
Pipelines and connections containing operational bleeds, drips, vents or drains	1	Within 5 ft in all directions from point of discharge.
Container filling:		
Indoors without ventilation	1	Entire room.
Indoors with adequate ventilation	1	Within 5 ft in all directions and connections regularly made or disconnected for product transfer.
	2	Beyond 5 ft and entire room.
Outdoors in open air	1	Within 5 ft in all directions and connections regularly made or disconnected for product transfer.
	2	Beyond 5 ft but within 15 ft in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator or the sphere and grade.

Table 051-7 Electrical Equipment Classified Areas-Natural Gas (Methane) Areas

Location	NEC Class I Group D	Extent of Classified Area
Nonfired areas containing gas pipeline connections, valves or gages:		
Indoors with adequate ventilation	2	Entire room and any adjacent room not separated by a gastight partition and 15 ft beyond any wall or roof ventilation discharge vent or louver.
Outdoors in open air at or above grade	2	Within 15 ft in all directions of connections, valves, or gages.

Location	NEC Class I Group D	Extent of Classified Area
Pits, trenches or sumps located in or adjacent to Division 1 or 2 areas	1	Entire pit, trench or sump.

(12) Natural gas (methane).

(a) Natural gas is lighter than air.

(b) Since natural gas is contained in a closed system of piping and equipment, the system need not be electrically conductive or electrically bonded for protection against static electricity.

(c) Fixed electrical equipment and wiring installed within classified areas specified in Table 127-5 shall meet the requirements of ANSI/NFPA 70-1981 [31], Article 500.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05135, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-05141 Identification. Electrical equipment and devices shall be identified for safe use and operation. The identification shall be as nearly uniform as practical throughout any one station. Identification marks shall not be placed on removable covers or doors where the interchanging of those covers or doors is possible.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-05141, filed 7/25/86.]

WAC 296-44-065 Rotating equipment. Rotating equipment includes generators, motors, motor generators and rotary converters.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-065, filed 7/25/86.]

WAC 296-44-06505 Speed control and stopping devices. (1) Automatic overspeed trip device for prime movers. When harmful overspeed can occur, prime movers driving generating equipment shall be provided with automatic overspeed trip devices in addition to their governors.

(2) Manual stopping devices. Stopping devices, such as switches or valves which can be operated from locations convenient to machine operators, shall be provided for all prime movers and for motors driving generating equipment.

Manual controls to be used in emergency for machinery and electrical equipment shall be located so as to provide protection to the operator during such emergency.

(3) Speed limit for motors. Machines of the following types shall be provided with speed-limiting devices unless their inherent characteristics or the load and the mechanical connection thereto are such as to safely limit the speed.

(a) Separately excited direct-current motors.

(b) Series motors.

(4) Low-voltage protection of motors. All motors so employed or arranged that an unexpected starting of the motor is a personnel hazard shall be equipped with low-voltage protection. This shall automatically cause and maintain the interruption of the motor circuit when the voltage falls below an operating value. This rule does not apply to those motors with an emergency use and where the opening of the circuit may cause less safe conditions.

(5) Adjustable-speed motors. Adjustable-speed motors, controlled by means of field regulation, shall, in addition to the provisions of WAC 296-44-06505(3), be so equipped and connected that the field cannot be weakened sufficiently to permit dangerous speed.

(6) Protection of control circuits. Where speed-limiting or stopping devices and systems are electrically operated, the control circuits by which such devices are actuated shall be protected from mechanical damage. Such devices and systems should be of the automatic tripping type.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-06505, filed 7/25/86.]

WAC 296-44-06511 Motor control. If the starting is automatic, as for example, by a float switch, or if the starting device or control switch is not in sight, or more than fifty feet distant from the motor and all parts of the machinery operated, the power or control circuit shall be such that it can positively be kept open as by use of lockout/tagout procedures.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-06511, filed 7/25/86.]

WAC 296-44-06517 Mobile hydrogen equipment. Mobile hydrogen supply units being used to replenish a hydrogen system shall be bonded both to the grounding system and to the grounded parts of the hydrogen system.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-06517, filed 7/25/86.]

WAC 296-44-074 Storage batteries.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-074, filed 7/25/86.]

WAC 296-44-07405 General. The provisions of this section are intended to apply to all stationary installations of storage batteries.

Space shall be provided around batteries for safe inspection, maintenance, testing, and cell replacement and space left above the cells to allow for operation of lifting equipment when required, addition of water, and taking measurements.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-07405, filed 7/25/86.]

WAC 296-44-07411 Location. Storage batteries shall be located within a protective enclosure or area accessible only to qualified persons. A protective enclosure can be a battery room, control building, or a case, cage, or fence which will protect the contained equipment and

minimize the possibility of inadvertent contact with energized parts.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-07411, filed 7/25/86.]

WAC 296-44-07417 Ventilation. The battery area shall be ventilated, either by a natural or powered ventilation system to prevent accumulation of hydrogen. The ventilation system shall limit hydrogen accumulation to less than an explosive mixture. Failure of continuously operated or automatically controlled powered ventilation system shall be annunciated.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-07417, filed 7/25/86.]

WAC 296-44-07423 Racks. Racks refer to frames designed to support cells or trays. Racks shall be firmly anchored preferably to the floor. Racks should not be anchored to both the walls and the floor, thus allowing movement in the event of an earthquake. Racks made of metal shall be grounded.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-07423, filed 7/25/86.]

WAC 296-44-07427 Floors in battery areas. Floors of battery areas should be an acid-resistive material, or be painted with acid-resistive paint, or otherwise protected. Provision should be made to contain spilled electrolyte.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-07427, filed 7/25/86.]

WAC 296-44-07433 Illumination for battery areas. Lighting fixtures shall be protected from physical damage by guards or isolation. Receptacles and lighting switches should be located outside of battery areas.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-07433, filed 7/25/86.]

WAC 296-44-07439 Service facilities. (1) Proper eye protection and clothing shall be provided in the battery area during battery maintenance and installation and shall consist of:

(a) Goggles or goggles and face shield;

(b) Acid resistant gloves;

(c) Protective aprons and overshoes;

(d) Portable or stationary eye washing facilities for rinsing eyes and skin in accordance with chapter 296-62 WAC.

(2) Warning signs inside and outside of a battery room or in the vicinity of a battery area, prohibiting smoking, sparks or flame shall be provided.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-07439, filed 7/25/86.]

PART D--INSTALLATION AND MAINTENANCE OF ELECTRIC SUPPLY STATIONS AND EQUIPMENT

WAC 296-44-086 Transformers and regulators.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-086, filed 7/25/86.]

WAC 296-44-08605 Current-transformer secondary circuits protection when exceeding 600 volts. Secondary circuits, when in a primary voltage area exceeding 600 V should, except for short lead lengths at the terminals of the transformer, have the secondary wiring adequately protected by means of grounded conduit or by a grounded metallic covering. Current transformers shall have provision for shorting the secondary winding.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-08605, filed 7/25/86.]

WAC 296-44-08611 Grounding secondary circuits of instrument transformers. The secondary circuits of instrument transformers shall be effectively grounded where functional requirements permit.

Note: This will sometimes require marking to distinguish such a circuit from others with which it is associated, but which are protected by ground connections.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-08611, filed 7/25/86.]

WAC 296-44-08619 Location and arrangement of power transformers and regulators. (1) Outdoor installations.

(a) A transformer or regulator shall be installed so that all energized parts are enclosed or guarded so as to minimize the possibility of inadvertent contact, or the energized parts shall be isolated in accordance with WAC 296-44-05125. The case shall be grounded in accordance with WAC 296-44-05119.

(b) Oil-filled transformers shall be protected by one or more of the following methods to minimize fire hazards. The method to be applied shall be according to the degree of fire hazard and the amount of oil contained in the transformer. Recognized methods are space separation, fire-resistant barriers, automatic extinguishing systems, absorption beds and enclosures.

The amount of oil contained should be considered in the selection of space separation, fire-resistant barriers, automatic extinguishing systems, absorption beds, and enclosures which confine the oil of a ruptured transformer tank all of which are recognized safeguards.

(2) Indoor installations.

(a) Transformers and regulators 75 kVA and above containing flammable liquid and located indoors shall be installed in ventilated rooms or vaults separated from the balance of the building by fire walls. Doorways to the interior of the building shall be equipped with fire doors and shall have means of containing the oil.

(b) Transformers or regulators of the dry type or containing a nonflammable liquid or gas may be installed in a building without a fireproof enclosure. When installed in a building which is used for other than station purposes the case or the enclosure shall be designed so that all energized parts are enclosed in the case grounded in accordance with WAC 296-44-05119. As an alternate, the entire unit may be enclosed so as to minimize the possibility of inadvertent contact by persons with any

part of the case or wiring. When installed, the pressure relief vent of a unit containing a nonbiodegradable liquid shall be furnished with a means for absorbing toxic gases.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-08619, filed 7/25/86.]

WAC 296-44-098 Conductors.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-098, filed 7/25/86.]

WAC 296-44-09805 Electrical protection. Conductors shall be suitable for the location, use and voltage.

(1) Overcurrent protection required. Conductors and insulation shall be protected against excessive heating by the design of the system and by overcurrent, alarm, indication, or trip devices.

(2) Grounded conductors. Conductors normally grounded for the protection of persons shall be arranged without overcurrent protection or other means which could interrupt their continuity to ground.

(3) Circuits exposed to higher voltages. If exposed through transformer windings or outdoor circuits to higher voltages, circuits of less than 750 volts shall be isolated or grounded unless in suitable cable with grounded metal sheath, placed in grounded conduit or other suitable duct, or identified and guarded as required for conductors of the highest voltage to which they are exposed.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-09805, filed 7/25/86.]

WAC 296-44-09811 Mechanical protection. All conductors shall be adequately supported to withstand forces caused by the maximum short circuit current to which they may be subjected.

Where exposed to mechanical damage, casing, armor, or other means shall be employed to prevent damage or disturbance to conductors, their insulation, or supports.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-09811, filed 7/25/86.]

WAC 296-44-09819 Isolation. All nonshielded insulated conductors of more than 2500 volts to ground and bare conductors of more than 150 V to ground, shall be isolated by elevation or guarded in accordance with WAC 296-44-05125.

Nonshielded, insulated, and jacketed conductors may be installed in accordance with WAC 296-44-05125 (3)(f).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-09819, filed 7/25/86.]

WAC 296-44-09826 Conductor terminations. (1) Insulation. Ends and joints of insulated conductors, unless otherwise adequately guarded, shall have insulating covering equivalent to that of other portions of the conductor.

(2) Metal-sheathed or shielded cable. Insulation of the conductors where leaving the metal sheath or shield, shall be protected from mechanical damage, moisture and excessive electrical stress.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-09826, filed 7/25/86.]

WAC 296-44-110 Circuit breakers, reclosers, switches and fuses.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-110, filed 7/25/86.]

WAC 296-44-11005 Arrangement. Circuit breakers, reclosers, switches and fuses shall be so installed as to be accessible only to persons qualified for operation and maintenance. Walls, barriers, latched doors, location, isolation or other means shall be provided to protect persons from energized parts or arcing. Conspicuous marking shall be provided at the device and at any remote operating points to identify the equipment controlled. When the contact parts of a switching device are not normally visible, the device shall be equipped with an indicator to show all normal operating positions.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-11005, filed 7/25/86.]

WAC 296-44-11021 Application. Circuit breakers, reclosers, switches, and fuses should be utilized with due regard to their assigned ratings of voltage and continuous and momentary currents. Circuit breakers, reclosers and fuses which perform a fault current interrupting function shall be capable of safely interrupting the maximum short circuit current available from the system at the point of application. The interrupting capacity should be reviewed prior to each significant system change.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-11021, filed 7/25/86.]

WAC 296-44-11029 Circuit breakers, reclosers and switches containing oil. Circuit interrupting devices containing flammable liquids shall be adequately segregated from other equipment and buildings to limit damage in the event of an explosion or fire. Segregation may be provided by spacing, by fire-resistant barrier walls, or by metal cubicles. Gas relief vents should be equipped with oil separating devices or piped to a safe location. Means shall be provided to control oil which could be discharged from vents or by tank rupture. This may be accomplished by absorption beds, pits, drains, or by any combination of these. Buildings or rooms housing this equipment shall be of fire resistant construction.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-11029, filed 7/25/86.]

WAC 296-44-11035 Switches and disconnecting devices. (1) Capacity. Switches shall be of suitable voltage and ampere rating for the circuit in which they are installed. Switches used to break load current shall be marked with the current which they are rated to interrupt. It is recommended that switches that are not rated to interrupt the full load of the circuit be interlocked

with circuit breakers to minimize the possibility of the switches being opened under load.

(2) Provisions for disconnecting. Switches and disconnectors shall be so arranged that they can be locked in the open and closed positions, or plainly tagged where it is not possible to install locks. For devices that are operated remotely and automatically, the control circuit shall be provided with a positive disconnecting means near the apparatus to prevent accidental operation of the mechanism.

(3) Visible break switch. A visible break switch or disconnector shall be inserted in each ungrounded conductor between electric supply equipment or lines and sources of energy of more than 600 V, if the equipment or lines may have to be worked on without protective grounding while the sources may be energized.

Where metal clad switchgear equipment is used, the withdrawn position of the circuit breaker, where clearly indicated, constitutes a visible break for this purpose.

(4) Accidental closing. Switches shall be so installed as to minimize the danger of accidental operation, and where practicable so that gravity cannot close them; such switches as may tend to close by gravity shall be provided with a proper latch or stop block to prevent accidental closing.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-11035, filed 7/25/86.]

WAC 296-44-11041 Disconnection of fuses. Fuses in circuits of more than 150 V to ground or more than 60 A shall be classified as disconnecting fuses or be arranged so that before handling:

(1) The fuses can be disconnected from all sources of electric energy; or

(2) The fuses can be conveniently removed by means of insulating handles.

Fuses can be used to disconnect from the source when they are so rated.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-11041, filed 7/25/86.]

WAC 296-44-125 Switchgear and metal enclosed bus.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-125, filed 7/25/86.]

WAC 296-44-12505 Switchgear assemblies. (1) General requirements for all switchgear.

(a) To minimize movement, all switchgear shall be secured in a manner consistent with its conditions of service and applicable manufacturer's instructions.

(b) Cable routed to switchgear shall be supported to minimize forces applied to conductor terminals.

(c) Piping containing liquids, or corrosive or hazardous gases, shall not be routed in the vicinity of switchgear unless suitable barriers are installed to protect the switchgear from damage in the event of a pipe failure.

(d) Switchgear shall not be located where foreign flammable or corrosive gases or liquids are intentionally discharged. Companion equipment such as transformers and switchgear are not considered foreign.

(e) Switchgear should not be installed in a location which is still specifically under active construction, especially where welding and burning are required directly overhead. Special precautions should be observed to minimize impingement of slag, metal filings, moisture, dust, or hot particles.

Note: Switchgear may be installed in a general construction area provided suitable temporary protection is provided to minimize the risks associated with general construction activities.

(f) Precautions shall be taken to protect energized switchgear from damage when maintenance is performed in the area.

(g) Switchgear enclosure surfaces shall not be used as physical support for any item unless specifically designed for that purpose.

(h) Enclosure interiors shall not be used as storage areas unless specifically designed for the purpose.

(i) Metal instrument cases shall be grounded, enclosed in covers which are metal and grounded, or of insulating material.

(2) Metal enclosed power switchgear.

(a) Switchgear shall not be located within twenty-five feet horizontally indoors or ten feet outdoors of storage containers, vessels, utilization equipment or devices containing flammable liquids or gases.

Note: If an intervening barrier, designed to mitigate the potential effects of flammable liquids or gases, is installed, the distances listed above do not apply.

The restrictions are not intended to apply to the power transformer(s) supplying the switchgear.

(b) Enclosed switchgear rooms shall have at least two means of egress, one at each extreme of the area, not necessarily in opposite walls. Doors shall swing out and be equipped with panic bars, pressure plates or other devices that are normally latched but open under simple pressure.

Note: One door may be used when required by physical limitations if means are provided for unhampered exit during emergencies.

(c) Space shall be maintained in front of switchgear to allow breakers to be removed and turned without obstruction.

(d) Space shall be maintained in the rear of the switchgear to allow for door opening to at least 90° open, or a minimum of three feet and no inches without obstruction when removable panels are used.

(e) Permanently mounted devices, panelboards, etc., located on the walls shall not encroach on the space requirements in WAC 296-44-12515 (2)(d).

(f) Where columns extend into the room beyond the wall surface, the face of the column shall not encroach on the space requirements in WAC 296-44-12515 (2)(d).

(g) Low-voltage cables or conductors, except those to be connected to equipment within the compartment, shall not be routed through the medium-voltage or high-voltage divisions of switchgear unless installed in rigid metal conduit or isolated by rigid metal barriers.

(h) Low-voltage conductors routed from medium-voltage or high-voltage sections of switchgear shall terminate in a low-voltage section before being routed external to the switchgear.

(i) Conductors entering switchgear shall be insulated for the higher operating voltage in that compartment or be separated from insulated conductors of other voltage ratings.

(j) Switchgear enclosures shall be suitable for the environment in which they are installed.

(k) A warning sign shall be placed in each cubicle containing more than one high-voltage source.

(l) The location of control devices shall be readily accessible to personnel. Instruments, relays and other devices requiring reading or adjustments should be so placed that work can readily be performed from the working space.

(3) Dead front power switchboards. Dead front power switchboards with uninsulated rear connections shall be installed in rooms or spaces that are capable of being locked, with access limited to qualified personnel.

(4) Motor control centers.

(a) Motor control centers shall not be connected to systems having higher short circuit capability than the bus bracing can withstand. Where current limiting fuses are employed on the source side of the bus, the bus bracing and breaker interrupting rating are determined by the peak let-through characteristic of the current limiting fuse.

(b) A warning sign shall be placed in each cubicle containing more than one voltage source.

(5) Control switchboards.

(a) Cabinets containing solid-state logic devices, electron tubes, or relay logic devices such as boiler analog, burner safety, annunciators, computers, invertors, precipitator logic, soot blower control, load control, telemetering, totalizing microwave radio, etc., are covered under these rules.

(b) Where carpeting is installed in rooms containing control switchboards, it shall be antistatic type and shall minimize the release of noxious, corrosive, caustic, or toxic gas under any condition.

(c) Layout of the installation shall provide adequate clearance in front of, or rear of panels if applicable, to allow meters to be read without use of stools or auxiliary devices.

(d) Where personnel access to control panels such as bench boards is required, cables shall be routed through openings separate from the personnel opening. Removable, sliding, or hinged panels are to be installed to close the personnel opening when not in use.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-12505, filed 7/25/86.]

WAC 296-44-12515 Metal enclosed bus. (1) General requirements for all types of bus.

(a) Busways shall be installed only in accessible areas.

(b) Busways unless specifically approved for the purpose, shall not be installed: Where subject to severe physical damage or corrosive vapors; in hoistways; in any classified hazardous location; outdoors or in damp locations.

(c) Dead ends of busway shall be closed.

(d) Busways should be marked with the voltage and current rating for which they are designed, in such manner as to be visible after installation.

(2) Isolated-phase bus.

(a) The minimum clearance between an isolated-phase bus and any magnetic material shall be the distance recommended by the manufacturer to avoid overheating of the magnetic material.

(b) Nonmagnetic conduit should be used to protect the conductors for bus alarm devices, thermocouples, space heaters, etc., if routed within the manufacturer's recommended minimum distance to magnetic material and parallel to isolated-phase bus enclosures.

(c) When enclosure drains are provided for isolated-phase bus, necessary piping shall be provided to divert water away from electrical equipment.

(d) Wall plates for isolated-phase bus shall be nonmagnetic, such as aluminum or stainless steel.

(e) Grounding conductors for isolated-phase bus accessories should not be routed through ferrous conduit.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-12515, filed 7/25/86.]

WAC 296-44-134 Surge arresters.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-134, filed 7/25/86.]

WAC 296-44-13405 General requirements. If arresters are required, they shall be located as close as practical to the equipment they protect.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-13405, filed 7/25/86.]

WAC 296-44-13415 Indoor locations. Arresters, if installed inside of buildings shall be enclosed or shall be located well away from passageways and combustible parts.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-13415, filed 7/25/86.]

WAC 296-44-13421 Grounding conductors. Grounding conductors shall be run as directly as possible between the arresters and ground and be of low impedance and ample current-carrying capacity (see WAC 296-44-023 for methods of protective grounding).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-13421, filed 7/25/86.]

WAC 296-44-13431 Installation. Arresters shall be installed in such a manner and location that neither the expulsion of gases nor the arrester disconnector is directed upon live parts in the vicinity.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-13431, filed 7/25/86.]

PART E--INSTALLATION, MAINTENANCE OF OVERHEAD SUPPLY AND COMMUNICATION LINES

WAC 296-44-170 Safety rules for the installation and maintenance of overhead electric supply and communication lines.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-170, filed 7/25/86.]

WAC 296-44-17005 Purpose. The purpose of WAC 296-44-170 through 296-44-31792 is the practical safeguarding of persons during the installation, operation, or maintenance of overhead supply and communication lines and their associated equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-17005, filed 7/25/86.]

WAC 296-44-17017 Scope. These sections cover supply and communication conductors and equipment in overhead lines. They cover the associated structural arrangements of such systems and the extension of such systems into buildings. The rules include requirements for spacing, clearances, and strength of construction. They do not cover installations in electric supply stations.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-17017, filed 7/25/86.]

WAC 296-44-17029 Application of rules. The general requirements for application of these rules are contained in WAC 296-44-016. However, when a structure is replaced, the arrangement of equipment shall conform to the current edition of WAC 296-44-21287(3).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-17029, filed 7/25/86.]

WAC 296-44-182 General requirements.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-182, filed 7/25/86.]

WAC 296-44-18205 Referenced sections. The introduction WAC 296-44-005, 296-44-013, and 296-44-016, definitions WAC 296-44-011, references WAC 296-44-017, and grounding methods WAC 296-44-023 shall apply to the requirements of WAC 296-44-170 through 296-44-31792.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-18205, filed 7/25/86.]

WAC 296-44-18225 Induced voltages. Rules covering supply line influence and communication line susceptiveness have not been detailed in this code. Cooperative procedures are recommended in the control of voltages induced from proximate facilities. Therefore, reasonable advance notice should be given to owners or operators of other proximate facilities which may be adversely affected by new construction or changes in existing facilities.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-18225, filed 7/25/86.]

WAC 296-44-18239 Accessibility. All parts which must be examined or adjusted during operation shall be arranged so as to be accessible to authorized persons by the provision of adequate climbing spaces, working spaces, working facilities, and clearances between conductors.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-18239, filed 7/25/86.]

WAC 296-44-18250 Inspection and tests of lines and equipment. (1) When in service.

(a) Initial compliance with rules. Lines and equipment shall comply with these safety rules when placed in service.

(b) Inspection. Lines and equipment shall be inspected at such intervals as experience has shown to be necessary.

(c) Tests. When considered necessary, lines and equipment shall be subjected to practical tests to determine required maintenance.

(d) Record of defects. Any defects affecting compliance with this code revealed by inspection or tests, if not promptly corrected, shall be recorded; such records shall be maintained until the defects are corrected.

(e) Remedying defects. Lines and equipment with recorded defects which could reasonably be expected to endanger life or property shall be promptly repaired, disconnected, or isolated.

(2) When out of service.

(a) Lines infrequently used. Lines and equipment infrequently used shall be inspected or tested as necessary before being placed into service.

(b) Lines temporarily out of service. Lines and equipment temporarily out of service shall be maintained in a safe condition.

(c) Lines permanently abandoned. Lines and equipment permanently abandoned shall be removed or maintained in a safe condition.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-18250, filed 7/25/86.]

WAC 296-44-18261 Grounding of circuits, supporting structures, and equipment. (1) Methods. Grounding required by these rules shall be in accordance with the applicable methods given in WAC 296-44-023.

(2) Circuits.

(a) Common neutral. A conductor used as a common neutral for primary and secondary circuits shall be effectively grounded as specified in WAC 296-44-023.

(b) Other neutrals. Primary or secondary neutral conductors, other than common neutrals, which are to be effectively grounded, shall be grounded as specified in WAC 296-44-023.

(c) Surge arresters. Where the operation of surge arresters is dependent upon grounding, they shall be grounded in accordance with the methods outlined in WAC 296-44-023.

(d) Use of earth as part of circuit. Supply circuits shall not be designed to use the earth normally as the sole conductor for any part of the circuit.

(3) Noncurrent-carrying parts.

(a) General. Metal or metal reinforced supporting structures, including lamp posts; metal conduits and raceways; cable sheaths; messengers; metal frames, cases and hangers of equipment; and metal switch handles and operating rods shall be effectively grounded.

Note 1: This rule does not apply to frames, cases, and hangers of equipment and switch handles and operating rods which are eight feet or more above readily accessible surfaces or are otherwise isolated or guarded and where the practice of not grounding such items has been a uniform practice over a well defined area.

Note 2: This rule does not apply to isolated or guarded equipment cases in certain specialized applications, such as series capacitors where it is necessary that equipment cases be either ungrounded or connected to the circuit. Such equipment cases shall be considered as energized and shall be suitably identified.

Note 3: This rule does not apply to equipment cases, frames, equipment hangers, conduits, raceways, and cable sheaths enclosing only communications conductors, provided they are not exposed to probable contact with open supply conductors of over 300 volts.

(b) Guys. Guys shall be effectively grounded if attached to a supporting structure carrying any supply conductor of more than 300 volts or if exposed to such conductors.

Note 1: This rule does not apply to guys containing an insulator or insulators installed in accordance with and meeting the requirements of WAC 296-44-31738.

Note 2: This rule does not apply to guys attached to supporting structures if all supply conductors are in cable conforming to the requirements of WAC 296-44-21209 (3)(a), (b), and (c).

Note 3: This rule does not apply if the guy is attached to a supporting structure on private right-of-way if all the supply circuits exceeding 300 volts meet the requirements of WAC 296-44-19209 (2)(b).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-18261, filed 7/25/86.]

WAC 296-44-18273 Arrangement of switches. (1) Accessibility. Switches or their control mechanisms shall be installed so as to be accessible to authorized persons.

(2) Indicating open or closed position. Switch position shall be visible or clearly indicated.

(3) Locking. Switch operating mechanisms which are accessible to unauthorized persons shall have provisions for locking in each operational position.

(4) Uniform position. The handles or control mechanisms for all switches throughout any system should have consistent positions when opened and uniformly different positions when closed in order to minimize operating errors. Where this practice is not followed, the switches should be marked to minimize mistakes in operation.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-18273, filed 7/25/86.]

WAC 296-44-194 Relations between various classes of lines.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-194, filed 7/25/86.]

WAC 296-44-19405 Relative levels. (1) Standardization of levels. The levels at which different classes of conductors are to be located should be standardized by agreement of the utilities concerned.

(2) Relative levels: Supply and communication conductors.

(a) Preferred levels. Where supply and communication conductors cross each other or are located on the same structures, the supply conductors should be carried at the higher level.

Note: This rule does not apply to trolley feeders which may be located for convenience approximately at the level of the trolley-contact conductor.

(b) Special construction for supply circuits, the voltage of which is 600 volts or less and carrying power not in excess of 5 kilowatts. Where all circuits are owned or operated by one party or where cooperative consideration determines that the circumstances warrant and the necessary coordinating methods are employed, single-phase alternating-current or two-wire direct-current circuits carrying a voltage of 600 volts or less between conductors, with transmitted power not in excess of 5 kilowatts, when involved in the joint use of structures with communication circuits may be installed in accordance with Footnote 14 of Table 212-1 and Footnote 1 of Table 212-15, under the following conditions.

(i) That such supply circuits are of covered conductor not smaller than No. 8 AWG medium hard-drawn copper or its equivalent in strength, and the construction otherwise conforms with the requirements for supply circuits of the same class.

(ii) That the supply circuits be placed on the end and adjacent pins of the lowest through signal support arm and that a thirty inch climbing space be maintained from the ground up to a point at least twenty-four inches above the supply circuits. The supply circuits shall be rendered conspicuous by the use of insulators of different form or color from others on the poleline or by stenciling the voltage on each side of the support arm between the pins carrying each supply circuit, or by indicating the voltage by means of metal characters.

(iii) That there shall be a vertical clearance of at least two feet between the support arm carrying these supply circuits and the next support arm above. The other pins on the support arm carrying the supply circuits may be occupied by communication circuits used in the operation or control of signal system or other supply system if owned, operated, and maintained by the same company operating the supply circuits.

(iv) That such supply circuits shall be equipped with arresters and fuses installed in the supply end of the circuit and where the signal circuit is alternating current, the protection shall be installed on the secondary side of the supply transformer. The arresters shall be designed so as to break down at approximately twice the voltage between the wires of the circuit, but the breakdown voltage of the arrester need not be less than 1 kilovolt. The fuses shall have a rating not in excess of approximately twice the maximum operating current of the circuit, but their rating need not be less than 10 amperes. The fuses likewise shall in all cases have rating of at

least 600 volts, and where the supply transformer is a stepdown transformer, shall be capable of opening the circuit successfully in the event the transformer primary voltage is impressed upon them.

(v) Such supply circuits in cable meeting the requirements of WAC 296-44-21209 (3)(a), (b), and (c) may be installed below communication attachments, with not less than two feet vertical separation between the supply cable and the lowest communication attachment. Communication circuits other than those used in connection with the operation of the supply circuits shall not be carried in the same cable with such supply circuits.

(vi) Where such supply conductors are carried below communication conductors, transformers and other apparatus associated therewith shall be attached only to the sides of the support arm in the space between, and at no higher level than, such supply wires.

(vii) Lateral runs of such supply circuits carried in a position below the communication space shall be protected through the climbing space by wood molding or equivalent covering, or shall be carried in insulated multiple-conductor cable, and such lateral runs shall be placed on the underside of the support arm.

(3) Relative levels: Supply lines of different voltage classifications (as classified in Table 212-15).

(a) At crossings or conflicts. Where supply conductors of different voltage classifications cross each other or structure conflict exists, the higher voltage lines should be carried at the higher level.

(b) On structures used only by supply conductors. Where supply conductors of different voltage classifications are on the same structures, relative levels should be as follows:

(i) Where all circuits are owned by one utility, the conductors of higher voltage should be placed above those of lower voltage.

(ii) Where different circuits are owned by separate utilities, the circuits of each utility may be grouped together and one group of circuits may be placed above the other group provided that the circuits in each group are located so that those of higher voltage are at the higher levels and that any of the following conditions are met:

(A) A vertical spacing of not less than that required by Table 212-15 is maintained between the nearest line conductors of the respective utilities.

(B) Conductors of a lower voltage classification placed at a higher level than those of a higher classification shall be placed on the opposite side of the structure.

(C) Ownership and voltage are prominently displayed.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-19405, filed 7/25/86.]

WAC 296-44-19421 Avoidance of conflict. Two separate lines, either of which carries supply conductors, should be so separated from each other that neither conflicts with the other. If this is not practical, the conflicting line or lines should be separated as far as possible and shall be built to the grade of construction required by WAC 296-44-242 for a conflicting line, or the two lines shall be combined on the same structures.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-19421, filed 7/25/86.]

WAC 296-44-19433 Joint use of structures. Joint use of structures should be considered for circuits along the same general route. The choice between joint use of structures and separate lines shall be determined through cooperative consideration of all the factors involved, including the character of circuits, the total number and weight of conductors, tree conditions, number and location of branches and service drops, possible structure conflicts, availability of right-of-way, etc. Where such joint use is mutually agreed upon, it shall be subject to the appropriate grade of construction specified in WAC 296-44-242.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-19433, filed 7/25/86.]

WAC 296-44-212 Clearances.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-212, filed 7/25/86.]

WAC 296-44-21209 General. (1) Application. This section covers all clearances, including climbing spaces, involving overhead supply and communications lines. Clearances of equipment from structure surfaces, from spaces accessible to the general public, and height above ground are covered in WAC 296-44-31765.

(2) Measurement of clearance and spacing. Unless otherwise stated, all clearances shall be measured from surface to surface and all spacings shall be measured center to center. For clearance measurement, live metallic hardware electrically connected to line conductors shall be considered a part of the line conductors. Metallic bases of potheads, surge arresters, and similar devices shall be considered a part of the supporting structure.

(3) Supply cables. For clearance purposes, supply cables, including splices and taps, conforming to any of the following requirements are permitted lesser clearances than open conductors of the same voltage. Cables should be capable of withstanding tests applied in accordance with an applicable standard.

(a) Cables of any voltage having an effectively grounded continuous metal sheath or shield, or cables designed to operate on a multigrounded system at 8.7 kV or less, having a semiconducting insulation shield in combination with suitable metallic drainage, all supported on and cabled together with an effectively grounded bare messenger-neutral.

(b) Cables of any voltage, not included in (a) of this subsection covered with a continuous auxiliary semiconducting shield in combination with suitable metallic drainage and supported on and cabled together with an effectively grounded bare messenger.

(c) Insulated, nonshielded cable operated at not over 5 kV phase-to-phase, or 2.9 kV phase-to-ground, supported on and cabled together with an effectively grounded bare messenger.

(4) Covered conductors. Covered conductors shall be considered bare conductors for all clearance requirements except that spacing between conductors of the same or different circuits, including grounded conductors, may be reduced below the minimum requirements for open conductors when the conductors are owned, operated, or maintained by the same party and when the conductor covering provides sufficient dielectric strength to prevent a short circuit in case of momentary contact between conductors or between conductors and the grounded conductor. Intermediate spacers may be used to maintain conductor spacing and provide support.

(5) Neutral conductors.

(a) Neutral conductors which are effectively grounded throughout their length and associated with circuits of 0 to 22 kilovolts to ground may have the same clearances as guys and messengers, except as provided for conductors over railroads in WAC 296-44-21230(1), Table 212-1, Footnote 15.

(b) All other neutral conductors of supply circuits shall have the same clearances as the phase conductors of the circuit with which they are associated.

(6) Alternating and direct current circuits. The rules of this section are applicable to both alternating and direct current circuits. For direct current circuits, the clearance requirements shall be the same as those for alternating current circuits having the same crest voltage to ground.

(7) Constant-current circuits. The clearances for constant-current circuits shall be determined on the basis of their nominal full-load voltage.

(8) Maintenance of clearances and spacings. The clearances and spacing required shall be maintained at the values and under the conditions specified in WAC 296-44-212.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21209, filed 7/25/86.]

WAC 296-44-21221 Clearances of supporting structures from other objects. Supporting structures, support arms and equipment attached thereto, and braces shall have the following clearances from other objects. The clearance shall be measured between the nearest parts of the objects concerned.

(1) From fire hydrants. Not less than three feet.

RECOMMENDATION: Where conditions permit, a clearance of not less than four feet is recommended.

(2) From streets, roads, and highways.

(a) Where there are curbs: Supporting structures, support arms, or equipment attached thereto, up to fifteen feet above the road surface shall be located a sufficient distance from the street side of the curbs to avoid contact by ordinary vehicles using and located on the traveled way. In no case shall such distance be less than six inches.

(b) Where there are no curbs, supporting structures should be located a sufficient distance from the roadway to avoid contact by ordinary vehicles using and located on the traveled way.

(c) Location of overhead utility installations on highways with narrow rights-of-way or on urban streets with closely abutting improvements are special cases which must be resolved in a manner consistent with the prevailing limitations and conditions.

(3) From railroad tracks. Where railroad tracks are paralleled or crossed by overhead lines, all portions of the supporting structures, support arms, anchor guys, and equipment attached thereto less than twenty-two feet above the nearest track rail shall be located not less than twelve feet from the nearest track rail. See WAC 296-44-21253(8).

Note 1: A clearance of not less than seven feet may be allowed where the supporting structure is not the controlling obstruction, provided sufficient space for a driveway is left where cars are loaded or unloaded.

Note 2: Supports for overhead trolley contact conductors may be located as near their own track rail as conditions require. If very close, however, permanent screens on cars will be necessary to protect passengers.

Note 3: Where necessary to provide safe operating conditions which require an uninterrupted view of signals, signs, etc. along tracks, the parties concerned shall cooperate in locating structures to provide the necessary clearance.

Note 4: At industrial sidings, a clearance of not less than seven feet shall be permitted, provided sufficient space is left where cars can be loaded or unloaded.

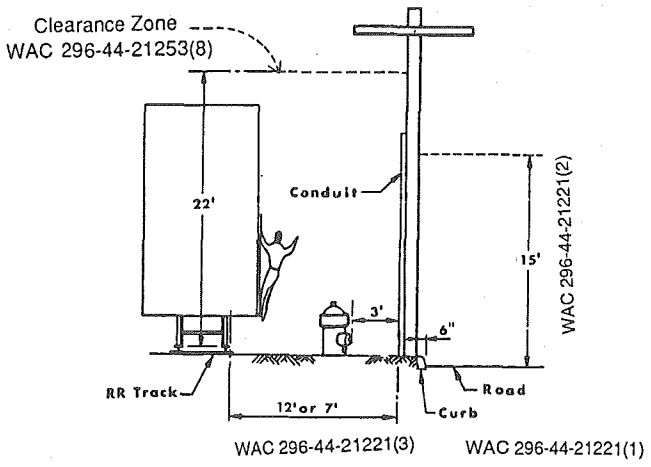


Fig. 212-1

Clearances to Other Objects

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21221, filed 7/25/86.]

WAC 296-44-21230 Vertical clearance of wires, conductors, cables, and live parts of equipment above ground, rails, or water. The vertical clearance of all wires, conductors, cables, and live parts of equipment above ground in generally accessible places, or above the

top of the rails or water, shall not be less than the following:

(1) Basic clearances for wires, conductors, and cables. The clearances in Table 212-1 apply under the following conditions:

(a) Conductor temperature of 60°F, no wind, with final unloaded sag in the wire, conductors, or cables, or with initial unloaded sag in cases where these facilities are maintained approximately at initial unloaded sags.

(b) Span lengths not greater than the following:

Loading District	Span Lengths (feet)
Heavy	[1]175
Medium	[1]250
Light	350

[1] One hundred fifty feet in heavy-loading district and two hundred twenty-five feet in medium-loading district for three-stand conductors, each wire of which is 0.09 inches or less in diameter.

Table 212-1 Minimum Vertical Clearance of Wires, Conductors, and Cables Above Ground, Rails, or Water (Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly deenergizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.)

Nature of Surface underneath wires, conductors, or cables	Communication conductors and cables, guys, messengers, surge protection wires, neutral conductors meeting WAC 296-44-21209 (5)(a), supply cables meeting WAC 296-44-21209 (3)(a) and supply cables of 0 to 750 V meeting WAC 296-44-21209 (3)(b) or 296-44-21209 (3)(c)[11] (ft)	Open supply line conductors of 0 to 750 V and supply cables over 750 V meeting WAC 296-44-21209 (3)(b) or 296-44-21209 (3)(c) (ft)	Open supply line conductors		Trolley and electrified railroad contact conductors and associated span or messenger wires[1]	
			750 V to 22 kV (ft)	22 to 50 kV (ft)	0 to 750 V to ground (ft)	750 V to 50 kV to ground (ft)
Where wires, conductors, or cables cross over or overhang						
1. Track rails of railroads (except electrified railroads using over-head trolley conductors) [2 16 20]	[3 15]27	[3]27	[3]28	29	[4]22	[4]22
2. Roads, streets, alleys; nonresidential driveways, parking lots, and other areas subject to truck traffic [21 22]	[6 13 23]18	18	20	21	[5]18	[5]20
3. Residential driveways; commercial areas not subject to truck traffic [21 22]	[24]12	[8a]15	20	21	[5]18	[5]20
4. Other land traversed by vehicles such as cultivated, grazing, forest, orchard, etc.	18	18	20	21	—	—
5. Spaces or ways accessible to pedestrians only [9]	[8 7]15	[8a 14]15	15	16	16	18
6. Water areas not suitable for sailboating or where sailboating is prohibited [19]	15	15	17	17	—	—
7. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with an unobstructed surface area of: [17 18 19]						
(a) Less than 20 acres	18	18	20	21	—	—
(b) 20 to 200 acres	26	26	28	29	—	—
(c) 200 to 2000 acres	32	32	34	35	—	—
(d) Over 2000 acres	38	38	40	41	—	—

8. Public or private land and water areas posted for rigging or launching sailboats	Clearance above ground shall be 5 ft greater than in 7 above, for the type of water areas served by the launching site					
	Where wires, conductors, or cables run along and within the limits of highways or other road rights-of-way but do not overhang the roadway					
9. Roads, streets, or alleys	[13] [23] [25]18	18	20	21	[5]18	[5]20
10. Roads in rural districts where it is unlikely that vehicles will be crossing under the line	[10] [12]14	[10]15	18	19	[5]18	[5]20

[1] Where subways, tunnels, or bridges require it, less clearances above ground or rails than required by Table 232-1 may be used locally. The trolley and electrified railroad contact conductor should be graded very gradually from the regular construction down to the reduced elevation.

[2] For wire, conductors, or cables crossing over mine, logging, and similar railways which handle only cars lower than standard freight cars, the clearance may be reduced by an amount equal to the difference in height between the highest loaded car handled and twenty feet, but the clearances shall not be reduced below that required for street crossings.

[3] These clearances may be reduced to twenty-five feet where paralleled by trolley-contact conductor on the same street or highway.

[4] In communities where twenty-one feet has been established, this clearance may be continued if carefully maintained. The elevation of the contact conductor should be the same in the crossing and next adjacent spans. (See WAC 296-44-31792 (4)(b) for conditions which must be met where uniform height above rail is impractical.)

[5] In communities where sixteen feet has been established for trolley and electrified railroad contact conductors 0 to 750 V to ground, or eighteen feet for trolley and electrified railroad contact conductors exceeding 750 V, or where local conditions make it impractical to obtain the clearance given in the table, these reduced clearances may be used if carefully maintained.

[6] If a communication service drop or a guy which is effectively grounded or is insulated against the highest voltage to which it is exposed, up to 8.7 kV, crosses residential streets and roads, the clearance may be reduced to sixteen feet at the side of the traveled way provided the clearance at the center of the traveled way is at least eighteen feet. This reduction in clearance does not apply to arterial streets and highways which are primarily for through traffic, usually on a continuous route.

[7] This clearance may be reduced to the following values:

	feet
(a) For insulated communication conductors and communication cables	8
(b) For conductors of other communication circuits	10
(c) For guys	8
(d) For supply cables meeting WAC 296-44-21209 (3)(a).	10

[8] This clearance may be reduced to the following values:

(a) Twelve feet for supply conductors limited to 300 V to ground

(b) Ten feet for drip loops of service drop conductors limited to 150 V to ground and meeting WAC 296-44-21209 (3)(b) or (c) and the portion of the associated service drop span located within fifteen feet of the service entrance to buildings.

[9] Spaces and ways accessible to pedestrians only are areas where vehicular traffic is not normally encountered or not reasonably anticipated.

[10] Where a supply or communication line along a road is located relative to fences, ditches, embankments, etc., so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to the following values:

	feet
(a) Insulated communication conductor and communication cables	8
(b) Conductors of other communication circuits	10
(c) Supply cables of any voltage meeting WAC 296-44-21209 (3)(a) and supply cables limited to 150 V to ground meeting WAC 296-44-21209 (3)(b) or (c)	10
(d) Supply conductors limited to 300 V to ground	12
(e) Guys.	8

[11] No clearance from ground is required for anchor guys not crossing track rails, streets, driveways, roads, or pathways.

[12] This clearance may be reduced to thirteen feet for communication conductors.

[13] Where this construction crosses over or runs along alleys, driveways, or parking lots, this clearance may be reduced to fifteen feet for spans limited to one hundred fifty feet.

[14] Where supply circuits of 600 V or less, with transmitted power of 5000 W or less, are run along fenced (or otherwise guarded) private rights-of-way in accordance with the provisions specified in WAC 296-44-19409 (2)(b) this clearance may be reduced to ten feet.

[15] The value may be reduced to twenty-five feet for guys, for cables carried on messengers, and for supply cables meeting WAC 296-44-21209 (3)(a). This value may be reduced to twenty-five feet for conductors effectively grounded throughout their length and associated with supply circuits of 0 to 22 kV, only if such conductors are stranded, are of corrosion-resistant material, and conform to the strength and tension requirements for messengers given in WAC 296-44-27821(9).

[16] Adjacent to tunnels and overhead bridges which restrict the height of loaded rail cars to less than twenty feet, these clearances may be reduced by the difference between the highest loaded rail car handled and twenty feet, if mutually agreed to by the parties at interest.

[17] For controlled impoundments, the surface area and corresponding clearances shall be based upon the design high water level. For other waters, the surface area shall be that enclosed by its annual high water mark, and clearances shall be based on the normal flood level. The clearance over rivers, streams, and canals shall be based upon the largest surface area of any one mile long segment which includes the crossing. The clearance over a canal, river, or stream normally used to provide access for sailboats to a larger body of water shall be the same as that required for the larger body of water.

[18] Where an overwater obstruction restricts vessel height to less than the following:

For a surface area in acres of	A reference vessel height in feet of
less than 20	16
20 to 200	24
200 to 2000	30
over 2000	36

the required clearance may be reduced by the difference between the reference vessel height given above and the overwater obstruction height, except that the reduced clearance shall not be less than that required for the surface area on the line crossing side of the obstruction.

19 Where the United States Army Corps of Engineers, or the state, or a surrogate thereof has issued a crossing permit, clearances of that permit shall govern.

20 See WAC 296-44-21253(8) for the required horizontal and diagonal clearances to rail cars.

21 These clearances do not allow for the future road resurfacing.

22 For the purpose of this rule, trucks are defined as any vehicle exceeding eight feet in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered or not reasonably anticipated.

23 For communications cables supported on a messenger, and with span lengths not exceeding one hundred fifty feet, the clearance may be reduced to seventeen feet above or along local streets or roads. This reduction does not apply for arterial streets or highways which are primarily for through traffic, usually on a continuous route.

24 This clearance may be reduced to ten feet for communication conductors and cables, guys, messengers and supply cables meeting WAC 296-44-21209 (3)(a).

25 Communication cables supported on a steel messenger may have a 60°F clearance of fifteen feet where span lengths do not exceed one hundred fifty feet and poles are back of curbs or other deterrents to vehicular traffic.

(2) Additional clearances for wires, conductors and cables. Greater clearances than specified in Table 212-1, (subsection (1) of this section) shall be provided where required by (a) and (b) of this subsection. Increases are cumulative where more than one apply.

Note 1: Additional clearances are not required for guys.

Note 2: Additional clearances are not required for communication cables supported on messengers and communication wires which do not overhang the traveled way, but run along and within the limits of public highways or other public rights-of-way for traffic.

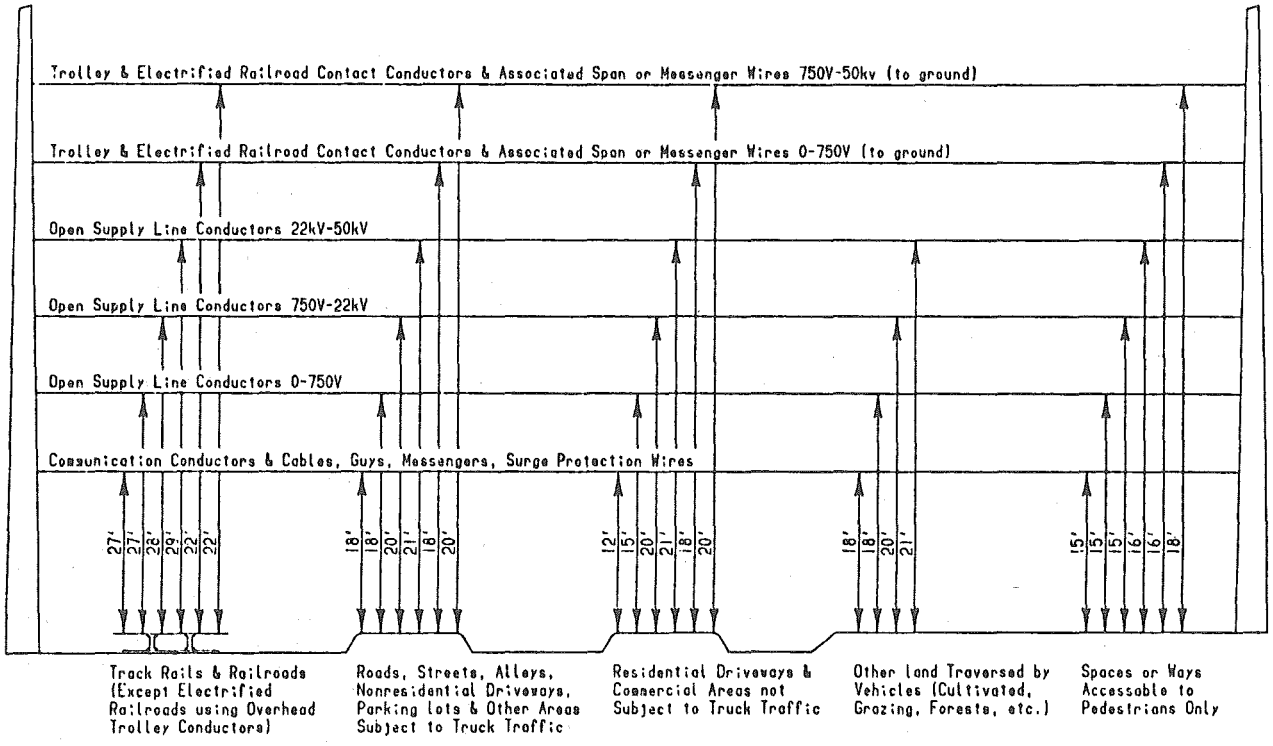


Fig 212-2a
Minimum Vertical Clearence Above Ground or Rails
(Re: Table 212-1)

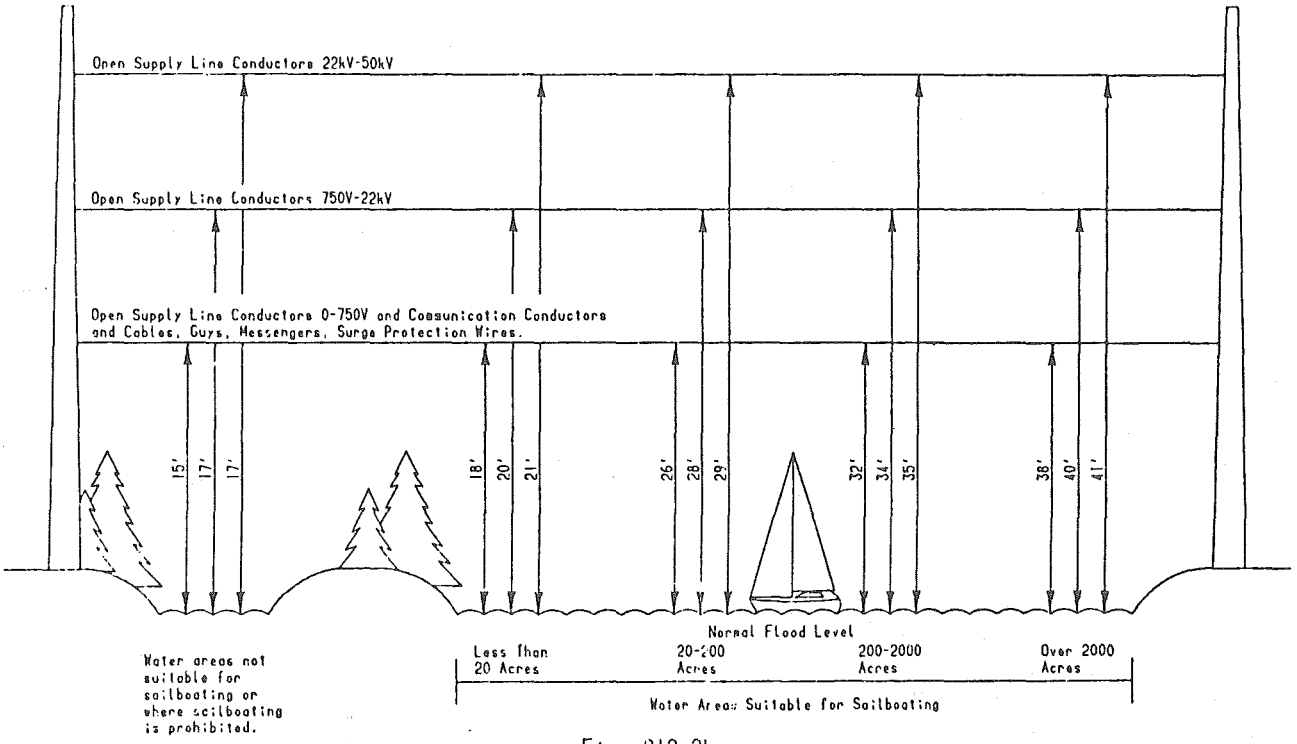


Fig. 212-2b
Minimum Vertical Clearances Above Water
(Re: Table 212-1)

(a) Voltages exceeding 50 kilovolts.

(i) For voltages between 50 and 470 kilovolts, the clearance specified in Table 212–1, (subsection (1) of this section) shall be increased at the rate of 0.4 in per kilovolt in excess of 50 kilovolts. For voltages exceeding 470 kV, the clearance shall be determined by the alternate method given by subsection (4) of this section. All clearances for lines over 50 kV shall be based on the maximum operating voltage.

Note: For voltages exceeding 98 kV alternating current to ground or 139 kV direct current to ground, clearances less than those required above are permitted for systems with known maximum switching surge factors (see subsection (4) of this section).

(ii) The additional clearance for voltages exceeding 50 kV specified in (a)(i) of this subsection shall be increased three percent for each one thousand feet in excess of thirty–three hundred feet (1000 m) above mean sea level.

(iii) For voltages exceeding 98 kV alternating current to ground, or 139 kV direct current to ground, either the clearances shall be increased or the electric field, or the effects thereof, shall be reduced by other means, as required, to limit the current due to electrostatic effects to 5.0 milliamperes, rms, if the largest anticipated truck, vehicle, or equipment under the line were shortcircuited to ground. For this determination, the conductors shall be at a final unloaded sag at 120°F.

(b) Sag increase.

(i) No additional clearance is required for trolley and electrified railroad contact conductors.

(ii) No additional clearance is required where span lengths are less than those listed in subsection (1)(b) of this section, and the maximum conductor temperature for which the supply line is designed to operate is 120°F or less.

(iii) Where supply lines are designed to operate at or below a conductor temperature of 120°F and spans are longer than specified in subsection (1)(b) of this section, the minimum clearance at midspan shall be increased by the following amounts.

(A) General.

For spans exceeding the limits specified in WAC 296–44–21230 (1)(b), the clearance specified in Table 212–1 shall be increased by 0.1 foot for each ten feet of the excess of span length over such limits. See (b)(iii)(C) of this subsection.

(B) Railroad crossings.

For spans exceeding the limits specified in subsection (1)(b) of this section, the clearance specified in Table 212–1 shall be increased by the following amounts for each ten feet by which the crossing span length exceeds such limits. See (b)(iii)(C) of this subsection.

Loading district	Amount of increase per 10 feet: Large conductors (ft)	Amount of increase per 10 feet: [1]Small conductors (ft)
Heavy and medium	0.15	0.30
Light	0.10	0.15

[1] A small conductor is a conductor having an overall diameter of metallic material equal to or less than the following values:

Material	Outside diameter of conductor Solid (inches)	Stranded (inches)
All copper	0.160	0.250
Other than all copper	0.250	0.275

(C) Limits.

The maximum additional clearance need not exceed the arithmetic difference between final unloaded sag at a conductor temperature of 60°F (15°C), no wind, and final sag at the following conductor temperature and condition, whichever difference is greater, computed for the crossing span.

(I) 32°F no wind, with radial thickness of ice, if any, specified in WAC 296-44-26309(2) for the loading district concerned.

(II) 120°F (50°C), no wind.

(iv) Where supply lines are designed to operate at conductor temperature above 120°F regardless of span length, the minimum clearance at midspan specified in subsections (1) and (2)(a) of this section shall be increased by the difference between final unloaded sag at a conductor temperature of 60°F no wind, and final sag at the following conductor temperature and condition, whichever difference is greater, computed for the crossing span.

(A) 32°F no wind, with radial thickness of ice, if any, specified in WAC 296-44-26309(2) for the loading district concerned.

(B) The maximum conductor temperature for which the supply line is designed to operate, with no horizontal displacement.

Note: The phase and neutral conductors of a supply line should be considered separately when determining the sag increases of each due to temperature rise.

(v) Where minimum clearance is not at midspan, the additional clearances specified in (b)(iii) and (iv) of this subsection may be reduced by multiplying by the following factors:

Distance from nearer support of crossing span to point of crossing in percentage of crossing span length	Factors[1]
5	0.19
10	0.36
15	0.51
20	0.64
25	0.75
30	0.84
35	0.91
40	0.96
45	0.99
50	1.00

[1] Interpolate for intermediate values.

In applying this rule, the "point of crossing" is the location under the conductors of any topographical feature which is the determinant of the clearance.

(3) Clearance to live parts of equipment mounted on structures.

(a) Basic clearances. The vertical clearance above ground for unguarded live parts such as potheads, transformer bushings, surge arresters, and short lengths of supply conductors connected thereto, which are not subject to variation in sag, shall be as shown in Table 212-2.

Table 212-2. Minimum Vertical Clearance of Rigid Live Parts Above Ground

(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.)

Nature of surface below live parts	0 to 750 V	750 V to 22 kV	22 to 50 kV
1. Where live parts overhang:			
a. Roads, streets, alleys; nonresidential driveways; parking lots and other areas subject to truck traffic [4 5]	16	18	19
b. Residential driveways; commercial areas not subject to truck traffic [4 5]	[1]13	18	19
c. Other land traversed by vehicles such as cultivated land, grazing land, forest, orchard, etc.	16	18	19
d. Spaces and ways accessible to pedestrians only. [6] [1 3 4]	[1]13	13	14
2. Where live parts are along and within the limits of highways or other road rights-of-way but do not overhang the roadway:			
a. Roads, streets, and alleys	[2]16	18	19
b. Roads in rural districts where it is unlikely that vehicles will be crossing under the line.	[2]13	16	17

[1] This clearance may be reduced to the following values:

	feet
(a) Live parts limited to 300 V to ground	12
(b) Live parts limited to 150 V to ground and drip loops of service drop conductors limited to 150 V to ground and meeting WAC 296-44-21209 (3)(b) or (c).	10

[2] Where a supply line along a road is limited to 300 V to ground and is located relative to fences, ditches, embankments, etc., so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to twelve feet.

[3] Where supply circuits of 600 V or less, with transmitted power of 5000 W or less, are run along fenced (or otherwise guarded) private rights-of-way in accordance with the provisions specified in WAC 296-44-19409 (2)(b), this clearance may be reduced to ten feet.

[4] For the purpose of this rule, trucks are defined as any vehicle exceeding eight feet in height.

[5] These clearances do not allow for future road resurfacing.

[6] Spaces and ways accessible to pedestrians only are areas where vehicular traffic is not normally encountered or not reasonably anticipated.

(b) Additional clearances for voltages exceeding 50 kilovolts.

(i) For voltages between 50 and 470 kilovolts, the clearance specified in Table 212–2 ((a) of this subsection) shall be increased at the rate of 0.4 in per kilovolt in excess of 50 kV. For voltages exceeding 470 kV, the clearances shall be determined by the alternate method given by subsection (4) of this section. All clearances for lines over 50 kV shall be based on the maximum operating voltage.

Note: For voltages exceeding 98 kV alternating current to ground or 139 kV direct current to ground, clearances less than those required above are permitted for systems with known maximum switching surge factors. (See subsection (4) of this section.)

(ii) The additional clearance for voltages exceeding 50 kV specified in (b)(i) of this subsection shall be increased three percent for each one thousand feet in excess of thirty–three hundred feet above mean sea level.

(iii) For voltages exceeding 98 kV alternating current to ground, or 139 kV direct current to ground either the clearances shall be increased or the electric field, or the effects thereof, shall be reduced by other means, as required, to limit the current due to electrostatic effects to 5.0 milliamperes, rms, if the largest anticipated truck, vehicle, or equipment under the line were short–circuited to ground.

(4) Alternate clearances for voltages exceeding 98 kilovolts alternating current to ground or 139 kilovolts direct current to ground. The clearances specified in subsections (1), (2) and (3) of this section may be reduced for circuits with known switching surge factors but shall not be less than the values computed by adding the reference height to the electrical component of clearance.

(a) Sag conditions of line conductors. Minimum vertical clearances shall be maintained under the following conductor temperatures and conditions:

(i) 32°F no wind, with radial thickness of ice specified in WAC 296–44–26309(2) for the loading district concerned.

(ii) 120°F, no wind.

(iii) Maximum conductor temperature, for which the line is designed to operate, if greater than 120°F, with no horizontal displacement.

(b) Reference heights are shown in Table 212–3.

(c) Electrical component of clearance.

(i) The clearance computed by the following equation and listed in Table 212–4 shall be added to the reference heights specified in Table 212–3.

$$D = 3.28\left[\frac{V \cdot (PU) \cdot a}{500\,K}\right]^{1.667} bc \quad \text{(ft)}$$

where

V maximum alternating current crest operating voltage to ground or maximum direct current operating voltage to ground in kilovolts;

PU maximum switching surge factor expressed in per–unit peak voltage to ground and defined as a switching surge level for circuit breakers corresponding to ninety–eight percent probability that the maximum switching surge generated per breaker operation does not exceed this surge level, or the maximum anticipated switching surge level generated by other means, whichever is greater;

a = 1.15, the allowance for three standard deviations;

b = 1.03, the allowance for nonstandard atmospheric conditions;

c = 1.2, the margin of safety;

K = 1.15, the configuration factor for conductor–to–plane gap.

(ii) The value of D shall be increased three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.

(iii) Either the clearances shall be increased or the electric field, or the effects thereof, shall be reduced by other means, as required, to limit the current due to electrostatic effects to 5.0 milliamperes, rms, if the largest anticipated truck, vehicle, or equipment under the line were shortcircuited to ground. For this determination, the conductors shall be at a final unloaded sag at 120°F.

(d) Limit. The clearances derived from (b) and (c) of this subsection shall be not less than the clearances given in Tables 212–1 or 212–2 computed for 98 kilovolts alternating current to ground in accordance with subsection (2)(a) or (3)(b) of this section, respectively.

Table 212–3 Reference Heights

Nature of surface underneath lines	Ft
a. Track rails of railroads (except electrified railroads using overhead trolley conductors) [1]	22
b. Streets, alleys, roads, driveways, and parking lots	14
c. Spaces and ways accessible to pedestrians only[2]	9
d. Other land, such as cultivated, grazing, forest or orchard, which is traversed by vehicles	14
e. Water areas not suitable for sailboating or where sailboating is prohibited	14
f. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with unobstructed surface area [3 4]	
(1) less than 20 acres	18
(2) 20 to 200 acres	26

Nature of surface underneath lines	Ft
(3) 200 to 2000 acres	32
(4) over 2000 acres	38
g. In public or private land and water areas posted for rigging or launching sailboats, the reference height shall be five feet greater than in f. above, for the type of water areas serviced by the launching site.	

[1] See WAC 296-44-21253(8) for the required horizontal and diagonal clearances to rail cars.

[2] Spaces and ways accessible to pedestrians only are areas where vehicular traffic is not normally encountered or not reasonably anticipated.

[3] For controlled impoundments, the surface area and corresponding clearances shall be based upon the design high water level. For other waters, the surface area shall be that enclosed by its annual high water mark, and clearances shall be based on the normal flood level. The clearance over rivers, streams, and canals shall be based upon the largest surface area of any one-mile-long segment which includes the crossing. The clearance over a canal or similar waterway providing access for sailboats to a larger body of water shall be the same as that required for the larger body of water.

[4] Where an overwater obstruction restricts vessel height to less than the following:

For a surface of	A reference vessel height of ft
(1) less than 20 acres	16
(2) 20 to 200 acres	24
(3) 200 to 2000 acres	30
(4) over 2000 acres (800 ha)	36

The required clearance may be reduced by the difference between the reference vessel height given above and the overwater obstruction height, except that the reduced clearance shall not be less than that required for the surface area on the line crossing side of the obstruction.

Table 212-4 Electrical Component of Clearance Above Ground or Rail in (c)(i) of this subsection (Add three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level. Increase clearance to limit electrostatic effects in accordance with (c)(iii) of this subsection.)

Maximum operating voltage phase-to-phase (kV)	Switching surge factor (per unit)	Switching surge (kV)	Electrical component of clearance (ft)
242	4.5 or less	839 or less	[1]8.6
362	2.8 or less	839 or less	[1]8.6
550	1.9 or less	839 or less	[1]8.6
	2.0	898	10.8
	2.2	988	12.7
	2.4	1079	14.6
	2.6	1168	16.7
800	1.6	1045	13.9
	1.8	1176	16.9
	2.0	1306	20.1
	2.1 or more	1372 or more	[2]21.8

[1] Limited by (d) of this subsection.

[2] Limited by subsections (1) and (2) of this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21230, filed 7/25/86.]

WAC 296-44-21241 Clearances between wires, conductors, and cables carried on different supporting structures. (1) General.

Crossings should be made on a common supporting structure, where practical. In other cases, the clearance between any two crossing or adjacent wires, conductors, or cables carried on different supporting structures shall not be any less at any location in the spans than that required by WAC 296-44-21241. The minimum clearance shall be as illustrated by a clearance envelope developed under WAC 296-44-21241 (1)(b) applied at the positions on or within conductor movement envelopes developed under WAC 296-44-21241 (1)(a) at which the two wires, conductors, or cables would be closest together. For purposes of this determination, the relevant positions of the wires, conductors, or cables on or within their respective conductor movement envelopes are those which can occur when (a) both are simultaneously subjected to the same ambient air temperature and wind loading conditions and (b) each is subjected individually to the full range of its icing conditions and applicable design electrical loading.

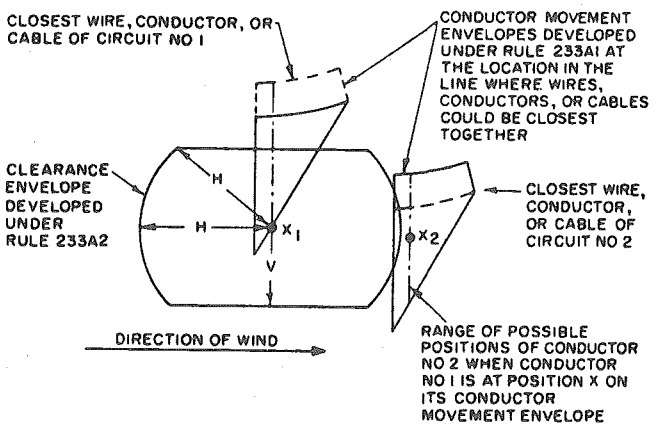


Fig. 212-3

Use of Clearance Envelope and Conductor Movement Envelopes to Determine Applicable Clearance

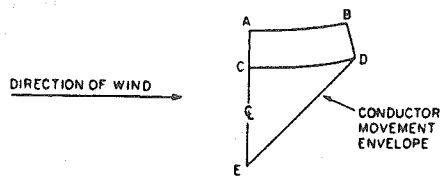
Note 1: In this illustration Conductor No. 2 is closest at position X_2 to Conductor No. 1, where the latter is at position X_1.

Note 2: Fig. 212-3 is a graphical illustration of the application of WAC 296-44-21241(1). Alternative methods which assure compliance with these rules may be used.

(a) Conductor movement envelope.

(i) Development. The conductor movement envelope shall be developed from the locus of the most displaced conductor positions shown in Fig. 212-4. The conductor positions A-E which define the conductor movement envelope include the effects of the basic conditions shown in Fig. 212-4 and the sag increases specified in WAC 296-44-21241 (1)(a)(ii) as applicable.

Fig. 212-4
Conductor Movement Envelope



Point	Conductor Temperature	Sag	Ice Loading	Wind Displacement[1]
A	60°F	initial	none	none
B	60°F	initial	none	6 lb per sq ft[2]
C	60°F	final	none	none
D	60°F	final	none	6 lb per sq ft[2]
E_1[3 4]	The greater of 120°F or maximum operating	final	none	none
E_2[3 4]	32°F	final	as applicable	none

[1] The direction of the wind shall be that which produces the minimum separation. The displacement of the wire, conductors or cables includes the deflection of suspension insulators and flexible structures.

[2] Wind loading may be reduced to four pounds per square foot in areas sheltered by buildings, terrain, or other obstacles.

[3] If no sag increase is required by WAC 296-44-21241 (1)(a)(ii) point E = point C.

[4] Line D-E shall be considered to be straight unless the actual concavity characteristics are known.

(ii) Sag increase.

(A) No sag increase is required for trolley and electrified railroad contact conductors.

(B) No sag increase is required where span lengths are less than those listed below and the maximum conductor temperature for which the supply line is designed to operate is 120°F or less.

Loading district	Span lengths (ft)
Heavy	[1]175
Medium	[1]250
Light	350

[1]One hundred fifty feet in heavy-loading district and two hundred twenty-five feet in medium-loading district for three-strand conductors, each of which is 0.09 in or less in diameter.

(C) Where supply lines are designed to operate at or below a conductor temperature of 120°F and spans are longer than specified in WAC 296-44-21241 (1)(a)(ii)(B), the sag at midspan shall be increased by the following:

(I) Where crossing occurs at midspan in the upper conductor sag shall be increased by the following amounts for each ten feet by which the crossing span length exceeds the limits specified in WAC 296-44-21241 (1)(a)(ii)(B).

Loading district	Amount of increase per 10 ft: Large conductors (ft)	Amount of increase per 10 ft: Small[1] conductors (ft)
Heavy and medium	0.15	0.30
Light	0.10	0.15

[1] A small conductor is a conductor having an overall diameter of metallic material equal to or less than the following values:

	Outside diameter of conductor: Solid (inches)	Outside diameter of conductor: Stranded (inches)
All copper	0.160	0.250
Other than all copper	0.250	0.275

(II) Limits. The maximum additional sag need not exceed the arithmetic difference between final unloaded sag at a conductor temperature of 60°F no wind, and final sag at the conductor temperature and condition (aa) or (bb) below, whichever difference is greater, computed for the crossing span.

(aa) 32°F, no wind, with radial thickness of ice, if any, specified in Rule 250B for the loading district concerned.

(bb) 120°F, no wind.

(D) Where upper conductors are designed to operate at a conductor temperature above 120°F, the minimum sag at midspan specified in WAC 296-44-21241 (1)(a)(i) and (1)(a)(ii)(B) shall be increased by the difference between final unloaded sag at a conductor temperature of 60°F, no wind, and final sag at the following conductor temperature and condition, whichever difference is greater, computed for the crossing span.

(I) 32°F, no wind, with radial thickness of ice, if any, specified in WAC 296-44-26309(2) for the loading district concerned.

(II) The maximum conductor temperature for which the supply line conductor is designed to operate, with no horizontal displacement.

(E) Where crossing is not at midspan of the upper conductor and under conditions where the upper span exceeds those specified in WAC 296-44-21241 (1)(a)(ii)(B), the additional sag may be reduced by multiplying the additional sag determined by WAC 296-44-21241 (1)(a)(ii)(C) and (D) by the following factors:

Distance from nearest support of crossing span to point of crossing in percentage of crossing span length	Factors[1]
5	0.19
10	0.36
15	0.51
20	0.64
25	0.75
30	0.84

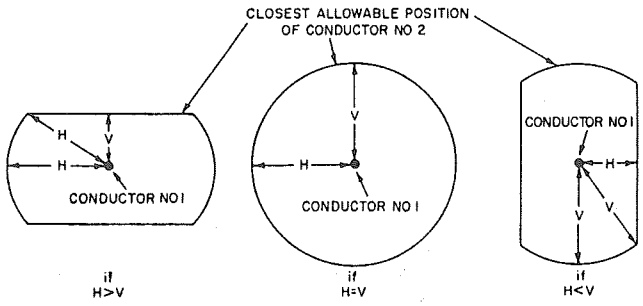
Distance from nearest support of crossing span to point of crossing in percentage of crossing span length	Factors[1]
35	0.91
40	0.96
45	0.99
50	1.00

[1] Interpolate for intermediate values.

(b) Clearance envelope.

The clearance envelope shown in Fig. 212–5 shall be determined by the horizontal clearance (H) required by WAC 296–44–21241(2) and the vertical clearance (V) required by WAC 296–44–21241(3).

Fig. 212–5
Clearance Envelope



(2) Horizontal clearance.

(a) Basic clearance requirements. The horizontal clearance between crossing or adjacent wires, conductors or cables carried on different supporting structures shall not be less than five feet. For voltages between the wires, conductors, or cables exceeding 129 kV, additional clearance of 0.4 inches per kV over 129 kV shall be provided.

Note: The horizontal clearance between anchor guys of different supporting structures may be reduced to six inches and may be reduced to two feet between other guys, span wires and neutral conductors meeting WAC 296–44–21209 (5)(a).

(b) Alternate clearances for voltages exceeding 98 kV alternating current to ground or 139 kV direct current to ground. The clearances specified in WAC 296–44–21241 (2)(a) may be reduced for circuits with known switching surge factors but shall not be less than the clearances derived from the computations required in WAC 296–44–21265 (2)(c)(i) and (ii).

(3) Vertical clearance.

(a) Basic clearance. The vertical clearance between any crossing or adjacent wires, conductors, or cables carried on different supporting structures shall not be less than those shown in Table 212–5.

Note: No vertical clearance is required between wires, conductors, or cables that are electrically interconnected at the crossing.

Table 212–5. Vertical Clearances of Wires, Conductors, and Cables Carried on Different Supporting Structures
(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly deenergizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.)
(The insertion of a given clearance in brackets indicates that in general, the lines operating at the voltage named above this clearance should not cross over the lines at the voltage to the left of the clearance in brackets.)

Upper level / Lower level	Communications conductors, cables, and messengers (ft)	Supply cables and messengers meeting WAC 296–44–21209 (3)(a) and supply cables of 0 to 750 V meeting WAC 296–44–21209 (3)(b) or (c) (ft)	Open supply conductors, 0 to 750 V; supply cables over 750 V meeting WAC 296–44–21209 (3)(a) or (b)		Open supply conductors		Guys, span wires, neutral[1] conductors meeting WAC 296–44–21209 (5)(a), and surge protection wires (ft)
			Line conductors (ft)	Service drops (ft)	750 V to 22 kV (ft)	22 to 50 kV (ft)	
Communications conductors, cables, and messengers	[2]2	2	4	[6]2	[5]6	6	2
Supply cables and messengers meeting WAC 296–44–21209 (3)(a) and supply cables of 0 to 750 V meeting WAC 296–44–21209 (3)(b) or (c)	[6]2	[6]2	[6]2	[6]2	[6]2	4	[6]2

Open supply con-conductors, 0 to 750 V; supply cables over 750 V meeting WAC 296-44-21209 (3)(b) or (c)	[4]	4	[6]2	[6]2	[6]2	4	2
Open supply con-ductors							
750 V to 22 kV	[5]6]	[4]	[6]2]	[4]	[6]2]	4	4
22 to 50 kV	[6]	[6]	[4]	[6]	[4]	4	4
Trolley and electrified railroad contact conductors and associated span and messenger wires	[3]4	[3]4	[3 4]4	[3]4	6	6	[3]4
Guys[7], span wires, neutral conductors meeting WAC 296-44-21209 (5)(a), and surge protection wires	[2]2	[2]2	[6]2	[6]2	4	4	[1 2]2

1 This clearance may be reduced where both guys are electrically interconnected.

2 The clearance of communication conductors and their guy, span, and messenger wires from each other in locations where no other classes of conductors are involved may be reduced by mutual consent of the parties concerned, subject to the approval of the regulatory body having jurisdiction, except for fire-alarm conductors and conductors used in the operation of railroads, or where one set of conductors is for public use and the other used in the operation of supply systems.

3 Trolley and electrified railroad contact conductors of more that 750 V should have at least six feet clearance. This clearance should also be provided over lower voltage trolley and electrified railroad contact conductors unless the crossover conductors are beyond reach of a trolley pole leaving the trolley-contact conductor or are suitably protected against damage from trolley poles leaving the trolley-contact conductor.

4 Trolley and electrified railroad feeders are exempt from this clearance requirement for contact conductors if they are of the same nominal voltage and of the same system.

5 This clearance may be reduced to four feet where supply conductors of 750 V to 8.7 kV cross a communication line more than six feet horizontally from a communication structure.

6 Where a two foot clearance is required at 60°F, and where conditions are such that the sag in the upper conductor would increase more than one and one-half feet at the crossing point under any condition of sag stated in WAC 296-44-21241 (1)(a)(ii), the two foot clearance shall be increased by the amount of sag increase less one and one-half feet.

7 These clearances may be reduced by not more than twenty-five percent to a guy insulator, provided that full clearance is maintained to its metallic end fittings and the guy wires. The clearance to an insulated section of a guy between two insulators may be reduced by not more than twenty-five percent provided that full clearance is maintained to the uninsulated portion of the guy.

Fig. 212-6
Minimum Vertical Clearance Between Wires on Difference Supports
(Re: Table 212-5)

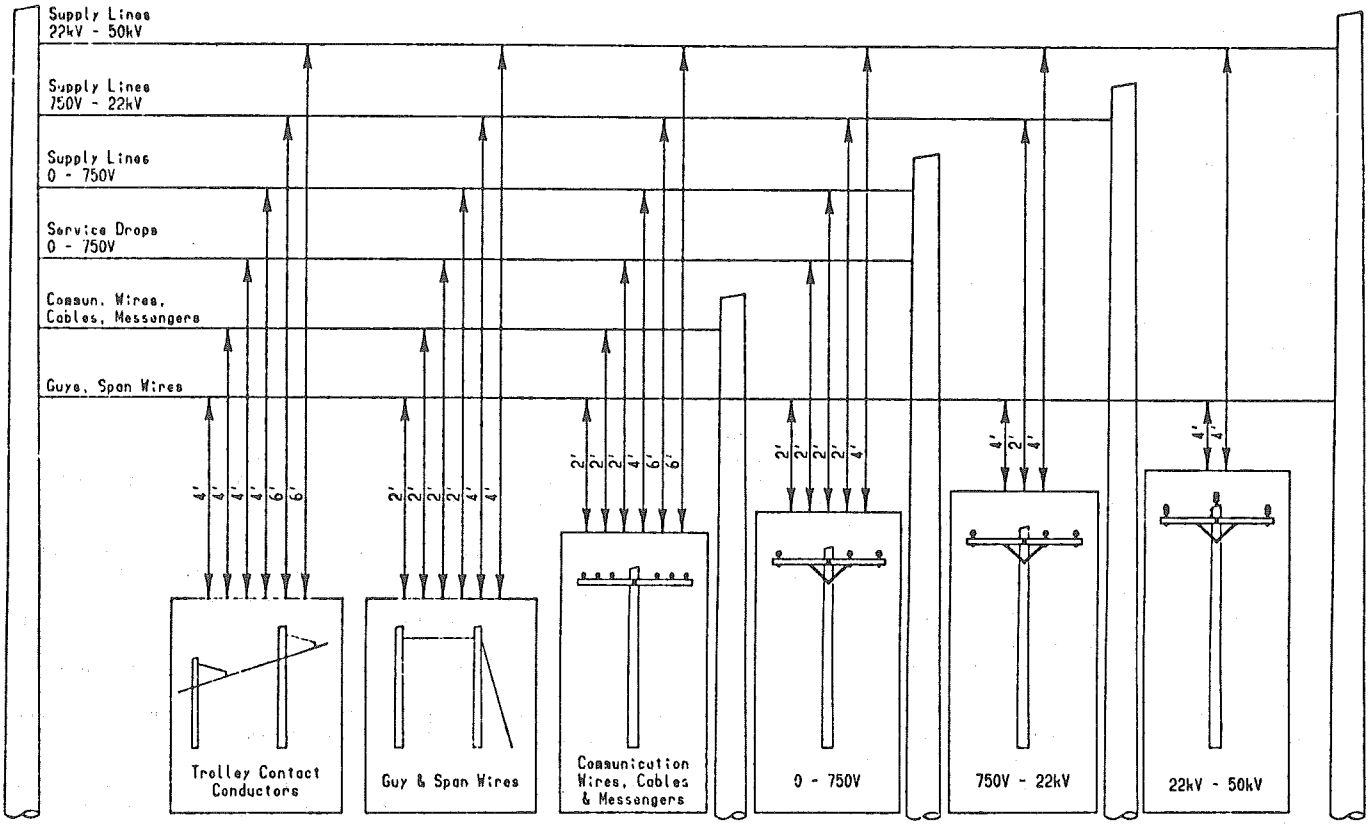


Fig 212-6
Minimum Vertical Clearance Between Wires on Different Supports
(Re: Table 212-5)

(b) Voltages exceeding 50 kilovolts.

(i) The clearance given in Table 212-5 shall be increased by the sum of the following: For the upper level conductors between 50 and 470 kilovolts, the clearance shall be increased at the rate of 0.4 inches per kilovolt in excess of 50 kilovolts. For the lower level conductors exceeding 50 kilovolts, the additional clearance shall be computed at the same rate. For voltages exceeding 470 kilovolts, the clearance shall be determined by the alternate method given in WAC 296-44-21241 (3)(c). The additional clearance shall be computed using the maximum operating voltage if above 50 kilovolts and nominal voltage if below 50 kilovolts.

Note: For voltages exceeding 98 kilovolts alternating current to ground or 139 kilovolts direct current to ground, clearances less than those required above are permitted for systems with known switching surge factors. (See WAC 296-44-21241 (3)(c).)

(ii) The additional clearance for voltages in excess of 50 kilovolts specified in WAC 296-44-21241 (3)(b)(i) shall be increased three percent for each one thousand feet in excess of thirty-three hundred feet above mean sea level.

(c) Alternate clearances for voltages exceeding 98 kilovolts alternating current to ground or 139 kilovolts direct current to ground. The clearances specified in WAC 296-44-21241 (3)(a) and (b) may be reduced where the higher voltage circuit has a known switching surge factor. For these computations, communication conductors and cables, guys, messengers, neutral conductors meeting WAC 296-44-21209 (5)(a), and supply cables meeting WAC 296-44-21209 (3)(a) shall be considered at zero voltage. The clearances shall not be less than the values computed by adding the reference heights to the electrical component of clearance.

(i) Reference heights.

Reference height	Ft
(1) Supply lines	0
(2) Communication lines	2

(ii) Electrical component of clearance.

(A) The alternate clearance is computed by the following equation and listed in Table 212-6.

$$D = 3.28 \left[\frac{[V_H \cdot (PU) + V_L]\, a}{500\, K} \right]^{1.667} bc \quad \text{(ft)}$$

where

V_H higher voltage circuit maximum alternating current crest operating voltage to ground or maximum direct current operating voltage to ground in kilovolts;

V_L lower voltage circuit maximum alternating current crest operating voltage to ground or maximum direct current operating voltage to ground in kilovolts;

PU higher voltage circuit maximum switching surge factor expressed in per-unit peak voltage to ground and defined as a switching surge level for circuit breakers corresponding to ninety-eight percent probability that the maximum switching surge generated per breaker operation does not exceed this surge level, or the maximum anticipated switching surge level generated by other means, whichever is greater;

a = 1.15, the allowance for three standard deviations;

b = 1.03, the allowance for nonstandard atmospheric conditions;

c = 1.2, the margin of safety;

K = 1.4, the configuration factor for conductor-to-conductor gap.

(B) The value of D calculated by WAC 296-44-21241 (3)(c)(ii)(A) shall be increased three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.

(iii) Limit. The value of D shall not be less than the clearance required by WAC 296-44-21241 (3)(a) and (b) with the lower voltage circuit at ground potential.

Table 212-6. Clearance Between Supply Wires, Conductors, and Cables in WAC 296-44-21241 (3)(c)(ii)(A) (Add three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.)

Higher voltage circuit		Lower voltage circuit						
Maximum operating voltage phase to phase (kV)	Switching surge factor (per unit)	Maximum operating voltage, phase to phase (kV) 121 (ft)	145 (ft)	169 (ft)	242 (ft)	362 (ft)	550 (ft)	800 (ft)
242	3.3 or less	[1]7.0	[1]7.0	[1]7.0	[1]7.0			
362	2.4	[1]9.3	[1]9.3	[1]9.3	[1]9.3	9.4		
	2.6	[1]9.3	[1]9.3	[1]9.3	[1]9.3	10.3		
	2.8	[1]9.3	[1]9.3	[1]9.3	9.7	11.3		
	3.0	[1]9.3	9.4	9.7	10.7	12.3		
550	1.8	[1]13.0	[1]13.0	[1]13.0	[1]13.0	[1]13.0	13.6	
	2.0	[1]13.0	[1]13.0	[1]13.0	[1]13.0	[1]13.0	15.3	
	2.2	[1]13.0	[1]13.0	[1]13.0	[1]13.0	14.1	17.0	
	2.4	[1]13.0	[1]13.0	[1]13.0	14.0	15.8	18.8	
	2.6	[2]13.6	[2]14.1	14.5	15.6	17.5	20.7	
800	1.6	[1]17.7	[1]17.7	[1]17.7	[1]17.7	[1]17.7	18.5	22.5
	1.8	[1]17.7	[1]17.7	[1]17.7	[1]17.7	[1]17.7	20.9	25.4
	2.0	[1]17.7	[1]17.7	[1]17.7	18.4	20.4	23.1	27.5
	2.2	[2]18.4	[2]18.9	[2]19.4	[2]20.8	[2]23.1	[2]26.7	[2]30.8

[1] Limited by WAC 296-44-21241 (3)(c)(iii).

[2] Need not be greater than the values specified in WAC 296-44-21241 (3)(a) and (b).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21241, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-21253 Clearance of wires, conductors, and cables from buildings, bridges, rail cars, swimming pools, and other installations. (1) Application. The basic vertical and horizontal clearances specified in WAC 296-44-21253 (2), (3), (4), (5), and (8) apply under the following conditions.

(a) Horizontal clearances. Clearances shall be applied with the wire, conductor, or cable displaced from rest by a six pound per square foot wind at final sag at 60°F. This may be reduced to four pounds per square foot (190 Pa) wind in areas sheltered by buildings, terrain, or other obstacles. The displacement of the wire, conductor, or cable shall include deflection of suspension insulators and flexible structures.

Note: No wind displacement is required for communication conductors and cables, guys, messengers, surge protection wires, neutral conductors meeting WAC 296-44-21209 (5)(a) supply cables of all voltages meeting WAC 296-44-21209 (3)(a) and supply cables of 0 to 750 V meeting WAC 296-44-21209 (3)(b) or (c).

(b) Vertical clearance.

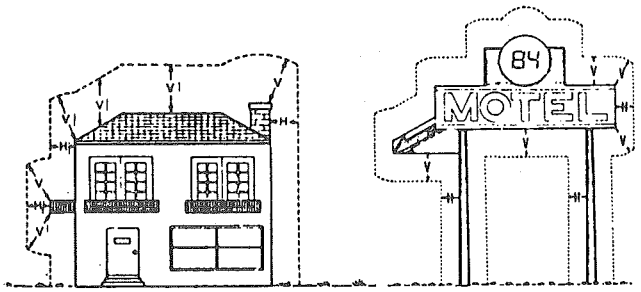
(i) Conductor temperature of 60°F, no wind, with final unloaded sag in the wire, conductors, or cables, or with initial unloaded sag in cases where these facilities are maintained approximately at initial unloaded sags.

(ii) Span lengths not greater than the following:

Loading District	Span Lengths (feet)
Heavy	[1]175
Medium	[1]250
Light	350

[1] One hundred fifty feet in heavy-loading district and two hundred twenty-five feet in medium-loading district for three-strand conductors, each of which is 0.09 inches or less in diameter.

(c) Diagonal clearance. The horizontal clearance governs above the roof level or top of an installation to the point where the diagonal equals the vertical clearance requirement. Similarly, the horizontal clearance governs above or below projections from buildings, signs, or other installations to the point where the diagonal equals the vertical clearance requirement. The fifteen feet for roofs accessible to pedestrians agrees with Table 212-1 for spaces and ways accessible to pedestrians only. From this point the diagonal clearance shall equal the vertical clearance as shown in Figure 212-7. This rule should not be interpreted as restricting the installation of a trolley-contact conductor over the approximate center line of the track it serves.



V = Minimum vertical clearance, measured either diagonally or vertically.
H = Minimum horizontal clearance.

Fig. 212-7
Clearance Diagram for Building and Other Structures
(Re: Table 212-7)

(2) Clearances of wires, conductors, and cables from other supporting structures.

Wires, conductors, or cables of one line passing near a lighting support, traffic signal support, or a supporting structure of a second line, without being attached thereto, shall have clearance from any part of such structure not less than the following:

(a) A minimum horizontal clearance of five feet for voltages up to 50 kilovolts.

(b) A minimum vertical clearance of six feet for voltages below 15 kilovolts and a minimum vertical clearance of seven feet for voltages between 15 and 50 kilovolts.

Note 1: Where the voltage does not exceed 300 V to ground and the cables meet the requirements of WAC 296-44-21209 (3)(a), (b) or (c), the vertical and horizontal clearances may be reduced to four feet measured at 60°F without wind deflection.

Note: Clearances of wires, conductors, and cables from adjacent line structure guy wires are given in WAC 296-44-21241.

Note 2: The vertical clearances may be reduced by two feet if both of the following conditions are met:

(i) The wires, conductors, or cables above and the supporting structure of another line below are operated and maintained by the same utility.

(ii) Employees do not work above the top of the supporting structure unless:

(A) The upper circuit is de-energized or temporarily insulated or repositioned, or

(B) Other equivalent measures are taken.

Table 212-7 Clearance of Wires, Conductors, and Cables Passing by but Not Attached to Building and Other Installations Except Bridges

(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly deenergizing the faulted section, both initially and following subsequent breaker operations. See the definitions section for voltages of other systems.)

Clearance of	Communication conductors and cables, guys, messengers, surge protection wires, neutral conductors meeting WAC 296-44-21209 (5)(a), supply cables of all voltages meeting WAC 296-44-21209 (3)(a), and supply cables of 0 to 750 V meeting WAC 296-44-21209 (3)(b) or (c) (ft)	Open supply line conductors 0 to 750 V, and supply cables over 750 V meeting WAC 296-44-21209 (3)(b) or (c) (ft)	Open supply line conductors 750 V to 8.7 kV (ft)	8.7 to 22 kV (ft)	22 to 50 kV (ft)
Buildings					
Horizontal					
To walls and projections	[7]3	[2 1]5	[1 2]5	6	7
To unguarded windows	3	[2 1]5	5	6	7
To balconies and areas accessible to pedestrians[3]	3	5	5	6	7
Vertical					
Above or below roofs or projections not accessible to pedestrians[3]	3	10	10	10	11

Above or below balconies and roofs accessible to pedestrians[3]	8	[5]15	15	15	16
Above roofs accessible to truck traffic[6]	18	18	20	20	21
Above roofs accessible to vehicles but not subject to truck traffic[6]	10	[5]15	20	20	21
Signs, chimneys, radio and television antennas, tanks, and other installations not classified as buildings or bridges[4]					
Horizontal	3	[1 2]5	[1 2]5	[3]6	7
Vertical above or below	3	[1]5	8	8	9

1 Where building, sign, chimney, antenna, tank, or other installation does not require maintenance such as painting, washing, changing of sign letters, or other operation which would require persons to work or pass between supply conductors and structure, the clearance may be reduced to three feet.

2 Where available space will not permit this value, the clearance may be reduced to the maximum practical clearance but the minimum clearance may not be less than three feet provided the conductors, including splices and taps, have covering which provides sufficient di-electric to prevent a short circuit in case of a momentary contact between the conductors and a grounded surface.

3 A roof, balcony, or area is considered accessible to pedestrians if the means of access is through a doorway, ramp, stairway, or permanently mounted ladder.

4 The required clearances shall be to the closest approach of motorized signs or moving portions of installations covered by WAC 296-44-21253.

5 This clearance may be reduced to twelve feet to supply conductors limited to 300 V to ground.

6 For the purpose of this rule, trucks are defined as any vehicles exceeding eight feet in height.

7 This clearance may be reduced to three in for the grounded portions of guys.

(3) Clearances of wires, conductors, and cables from buildings, signs, chimneys, radio and television antennas, tanks, and other installations except bridges.

(a) Ladder space. Where buildings or other installations exceed three stories (or fifty feet) in height, overhead lines should be arranged where practical so that a clear space or zone at least six feet wide will be left either adjacent to the building or beginning not over eight feet from the building, to facilitate the raising of ladders where necessary for fire fighting.

Note: This requirement does not apply where it is the unvarying rule of the local fire departments to exclude the use of ladders in alleys or other restricted places which are generally occupied by supply conductors and cables.

(b) Basic clearances. Unguarded or accessible supply wires, conductors, or cables may be run either beside or over buildings or other installations and any projections therefrom. The vertical and horizontal clearances of such wires, conductors, or cables shall be not less than the values given in Table 212-7.

(c) Guarding of supply conductors. Where the clearances set forth in Table 212-7 cannot be obtained, supply conductors shall be guarded.

Note: Metal-clad supply cables meeting WAC 296-44-21209 (3)(a) are considered to be guarded within the meaning of this rule.

(d) Supply conductors attached to buildings. Where the permanent attachment of supply conductors of any class to building is necessary for an entrance, such conductors shall meet the following requirements:

(i) Conductors of more than 300 volts to ground shall not be carried along or near the surface of the building unless they are guarded or made inaccessible.

(ii) Clearance of wires from building surface shall be not less than those required in Table 212-16 (WAC 296-44-21265 (5)(a)) for clearance of conductors from supports.

(iii) Service-drop conductors shall not be readily accessible and when not in excess of 600 volts they shall have a clearance of not less than the following:

(A) Eight feet from the highest point of roofs or balconies over which they pass.

Note 1: Where the voltage between conductors does not exceed 300 volts and the roof or balcony is not readily accessible, the clearance may be not less than three feet. A roof or balcony is considered readily accessible if the means of access is through a doorway, ramp, stairway, or permanently mounted ladder.

Note 2: Service-drop conductors of 300 volts or less which do not pass over other than a maximum of four feet of the overhang portion of the roof for the purpose of terminating at a (through-the-roof) service raceway or approved support may be maintained at a minimum of eighteen inches from any portion of the roof over which they pass.

(B) Three feet in any direction from windows, doors, porches, fire escapes, or similar locations.

Note 1: This does not apply to service-drop conductors meeting WAC 296-44-21209 (3)(c) above the top level of a window.

Note 2: This does not apply to windows that are not designed to open.

(e) Communications conductors attached to buildings. Communications conductors and cables may be attached directly to buildings.

(4) Clearances of wires, conductors, and cables from bridges.

(a) Basic clearances. Supply wires, conductors, and cables which pass under, over, or near a bridge shall have basic vertical and horizontal clearances therefrom not less than given in Table 212-8.

Note: This rule does not apply to guys, span wires, effectively grounded surge protection wires, neutrals meeting WAC 296-44-21209 (5)(a), and supply cables meeting WAC 296-44-21209 (3)(a).

Table 212-8. Clearance of Supply Wires Conductors and Cables from Bridges

(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly deenergizing the faulted section, both initially and following breaker operations. See definitions section for voltages of other systems.)

	Supply cables meeting WAC 296-44-21209 (3)(b) or (c)[7]	Open supply line conductors			
	(ft)	0 to 750 V (ft)	750 V to 8.7 kV (ft)	8.7 to 22 kV (ft)	22 to 50 kV (ft)
Clearance over bridges[1]					
Attached[3]	3	3	3	5	6
Not attached	10	10	10	10	10
Clearance beside, under, or within bridge structure[6]					
Readily accessible portions of any bridge including wing, walls, and bridge attachments[1]					
Attached[3]	3	3	3	5	6
Not attached	5	5	5	6	7
Ordinarily inaccessible portions of bridges (other than brick, concrete, or masonry) and from abutments[2]					
Attached[3 5]	0.5	0.5	3	5	6
Not attached[4 5]	3	3	3	6	7

1 Where over traveled ways on or near bridges, the clearances of WAC 296-44-21230 apply also.

2 Bridge seats of steel bridges carried on masonry, brick, or concrete abutments which require frequent access for inspection shall be considered as readily accessible portions.

3 Clearance from supply conductors to supporting arms and brackets attached to bridges shall be the same as specified in Table 212-16 (WAC 296-44-21265 (5)(a)) if the supporting arms and brackets are owned, operated, or maintained by the same utility.

4 Conductors should have the clearances given in this row increased as much as is practical.

5 Where conductors passing under bridges are adequately guarded against contact by unauthorized persons and can be deenergized for maintenance of the bridge, clearances of the conductors from the bridge, at any point, may have the clearances specified in Table 221-16 for clearance from surfaces of support arms plus one-half the final unloaded sag of the conductor at that point.

6 Where the bridge has moving parts, such as a lift bridge, the required clearances shall be maintained throughout the full range of movement of the bridge or any attachment thereto.

7 Where permitted by the bridge owner, supply cables may be run in rigid conduit attached directly to the bridge. Refer to WAC 296-44-350 through 296-44-49121 for installation rules.

(b) Guarding trolley-contact conductors located under bridges.

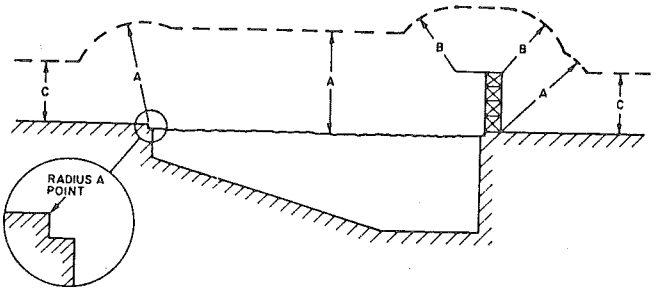
(i) Where guarding is required. Guarding is required where the trolley-contact conductor is located so that a trolley pole leaving the conductor can make simultaneous contact between it and the bridge structure.

(ii) Nature of guarding. Guarding shall consist of a substantial inverted trough of nonconducting material located above the contact conductor, or of other suitable means of preventing contact between the trolley support and the bridge structure.

(5) Minimum clearance of wires, conductors, or cables installed over or near swimming areas.

(a) Swimming pools. Where wires, conductors, or cables cross over a swimming pool or the surrounding area within twenty-five feet of the edge of the pool, the clearances in any direction shall be as shown in Fig. 212-8. The values of A, B, and C are specified in Table 212-9.

Fig. 212-8
Swimming Pool Clearances
(Re: Table 212-9)



Note 1: This rule does not apply to a pool fully enclosed by a solid or screened permanent structure.

Note 2: This rule does not apply to: Communication conductors and cables, guys and messengers, supply cables meeting WAC 296-44-21209 (3)(a), supply cables of 0 to 750 V meeting WAC 296-44-21209 (3)(b) or (c); when these facilities are ten feet or more horizontally from the edge of the pool, diving platform, or diving tower.

(b) Beaches and waterways restricted to swimming. Where rescue poles are used by lifeguards at supervised swimming beaches, the required vertical and horizontal clearances shall be as specified in Table 212-9. Where rescue poles are not used, the minimum clearances shall be as specified in WAC 296-44-21230.

(c) Waterways subject to water skiing. The minimum vertical clearance shall be the same as that specified in WAC 296-44-21230.

Table 212-9. Clearance of Wires, Conductors, and Cables Passing Over or Near Swimming Areas
(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly deenergizing the faulted section, both initially and following subsequent breaker operations. See the definitions section for voltages of other systems.)

	Communication conductors and cables, guys, messengers, effectively grounded surge protection wires, neutral conductors meeting WAC 296-44-21209 (5)(a), supply cables meeting WAC 296-44-21209 (3)(a), and supply cables of 0 to 750 V meeting WAC 296-44-21209 (3)(b) or (c) (ft)	Open supply line conductors of 0 to 22 kV and supply cables over 750 V meeting WAC 296-44-21209 (3)(b) or (c) (ft)	Open supply line conductors
			22 to 50 kV (ft)
A: Clearance in any direction from the water level, edge of pool, base of diving platform, or anchored raft	18	25	25

B:	Clearance in any direction to the diving platform or tower	14	16	16
C:	Vertical clearance over adjacent land	Clearance shall be as required by WAC 296-44-21230.		

[1] A, B, and C are shown in Figure 212-8.

(6) Additional clearance. Greater clearances than the basic clearances specified in WAC 296-44-21253 (2), (3), (4) and (5) shall be provided where the conditions exceed the basic conditions specified in Rule 234A. All increases are cumulative.

(a) Voltages exceeding 50 kilovolts. The basic vertical and horizontal clearances specified in WAC 296-44-21253 (2), (3), (4) and (5) shall be increased at the following rates:

(i) For voltages between 50 and 470 kilovolts, the clearances specified in WAC 296-44-21253 (2), (3), (4) and (5) shall be increased at the rate of 0.4 inch per kilovolt in excess of 50 kilovolts. For voltages exceeding 470 kilovolts, the clearance shall be determined by the alternate method given by WAC 296-44-21253(7). All clearances for lines over 50 kilovolts shall be based on the maximum operating voltage.

Note: For voltages exceeding 98 kilovolts alternating current to ground or 139 kilovolts direct current to ground, clearances less than those required above are permitted for systems with known maximum switching surge factor (WAC 296-44-21253(7)).

(ii) The additional clearance for voltages in excess of 50 kilovolts specified in WAC 296-44-21253 (6)(a)(i) shall be increased three percent for each one thousand feet in excess of thirty-three hundred feet above mean sea level.

(iii) For voltages exceeding 98 kilovolts alternating current to ground, or 139 kilovolts direct current to ground, either the clearances shall be increased or the electric field, or the effects thereof, shall be reduced by other means, as required, to limit the current due to electrostatic effects to 5.0 milliamperes, rms, if any ungrounded metal fence, building, sign, chimney, radio or television antenna, tank containing nonflammables or other installation, or any ungrounded metal attachments thereto where short-circuited to ground. For this determination, the conductor sag shall be at final unloaded sag at 120°F.

(b) Sag increase.

(i) No additional clearance is required for trolley and electrified railroad contact conductors.

(ii) No additional clearance is required where span lengths are less than those listed in WAC 296-44-21253 (1)(b)(ii) and the maximum conductor temperature for which the supply line is designed to operate is 120°F or less.

(iii) Where supply lines are designed to operate at or below a conductor temperature of 120°F and spans are longer than specified in WAC 296-44-21253 (1)(b)(ii) the minimum vertical clearance at midspan shall be increased by 0.1 foot for each ten feet in excess of span length over such limits. The maximum additional clearance need not exceed the arithmetic difference between final unloaded sag at a conductor temperature of 60°F, no wind, and final sag at the following conductor temperature and condition, whichever difference is greater, computed for the crossing span.

(A) 32°F, no wind, with radial thickness of ice, if any, specified in WAC 296-44-26309(2) for the loading district concerned.

Note: The additional clearances for ice loadings are not applicable to swimming pools (WAC 296-44-21253 (5)(a)).

(B) 120°F, no wind.

(iv) Where supply lines are designed to operate at conductor temperature above 120°F regardless of span length, the minimum vertical clearance at midspan specified in WAC 296-44-21253 (2), (3), (4), (5) and (6)(a) shall be increased by the difference between final unloaded sag at a conductor temperature of 60°F, no wind, and final sag at the following conductor temperature and condition, whichever difference is greater computed for the crossing span.

(A) 32°F, no wind, with radial thickness of ice, if any, specified in WAC 296-44-26309(2) for the loading district concerned.

Note: The additional clearances for ice loadings are not applicable to swimming pools (WAC 296-44-21253 (5)(a)).

(B) The maximum conductor temperature for which the supply line is designed to operate, with no horizontal displacement.

(v) Where minimum clearance is not at midspan, the additional clearances specified in WAC 296-44-21253 (6)(b)(iii) and (iv) may be reduced by multiplying by the following factors:

Distance from nearer support of crossing span to point of crossing in percentage of crossing span length	Factors[1]
5	0.19
10	0.36
15	0.51
20	0.64
25	0.75
30	0.84
35	0.91
40	0.96
45	0.99
50	1.00

[1] Interpolate for intermediate values.

In applying the above rules, the "point of crossing" is the location of any topographical feature which is the determinant of the clearance.

(7) Alternate clearances for voltages exceeding 98 kilovolts alternating current to ground or 139 kilovolts direct current to ground. The clearances specified in WAC 296-44-21253 (2), (3), (4), (5) and (6) may be reduced for circuits with known switching surge factors

but shall not be less than the values computed by adding the reference distance to the electrical component of clearance.

(a) Sag conditions.

(i) Minimum vertical clearances shall be maintained under the following conductor temperatures and conditions:

(A) 32°F, no wind, with radial thickness of ice specified in WAC 296-44-26309(2) for the loading district concerned.

(B) 120°F, no wind.

(C) Maximum conductor temperature for which the line is designed to operate, if greater than 120°F.

(ii) Horizontal and diagonal clearances shall be maintained under the conditions specified in WAC 296-44-21253 (1)(a) and (c).

(b) Reference distances.

	Reference distance	Horizontal (ft)	Vertical (ft)
(i)	Buildings	5	9
(ii)	Signs, chimneys, radio and television antennas, tanks, and other installations not classified as bridges or buildings	5	9
(iii)	Superstructure of bridges [1] [2]	5	9
(iv)	Supporting structures of another line	5	6
(v)	Dimension A of Figure 234-2	—	18
(vi)	Dimension B of Figure 234-2	14	14

[1] Where overtraveled ways on or near bridges, the clearances of WAC 296-44-21230 apply also.

[2] Where the bridge has moving parts, such as a lift bridge, the required clearances shall be maintained throughout the full range of movement of the bridge or any attachment thereto.

(c) Electrical component of clearance.

(i) The clearance computed by the following equation and listed in Table 212-10 shall be added to the reference distance specified in WAC 296-44-21253 (7)(b):

$$D = 3.28\left[\frac{V \cdot (PU) \cdot a}{500\,K}\right]^{1.667} bc \quad \text{(feet)}$$

where

V = maximum alternating current crest operating voltage to ground or maximum direct current operating voltage to ground in kilovolts;

PU = maximum switching surge factor expressed in per-unit peak voltage to ground and defined as a switching surge level for circuit breakers corresponding to ninety-eight percent probability that the maximum switching surge generated per breaker operation does not exceed this surge level, or the maximum anticipated switching surge level generated by other means, whichever is greater;

a = 1.15, the allowance for three standard deviations;

b = 1.03, the allowance for nonstandard atmospheric conditions;

c = margin of safety
1.2 for vertical clearances
1.0 for horizontal clearances

K = 1.15, the configuration factor for conductor-to-plane gap.

(ii) The value of D above shall be increased by three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.

(d) Limit. The clearances derived from WAC 296-44-21253 (7)(b) and (c) shall not be less than the basic clearances of WAC 296-44-21253(2), Tables 212-7 and 212-8, computed for 98 kilovolts alternating current rms to ground by WAC 296-44-21253 (6)(a).

Table 212-10. Electrical Component of Clearance to Buildings, Bridges, and Other Installations in WAC 296-44-21253 (7)(c)(iii) (Add three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.)

Maximum operating voltage phase to phase (kV)	Switching surge factor (per unit)	Switching surge (kV)	Electrical component of clearances V (ft)	Electrical component of clearances H (ft)
242	2.0	395	2.7	2.3
	2.2	435	3.2	2.7
	2.4	474	3.7	3.1
	2.6	514	4.2	3.5
	2.8	553	4.8	4.0
	3.0	593	5.4	4.5
362	1.8	532	4.5	3.7
	2.0	591	5.4	4.5
	2.2	650	6.3	5.2
	2.4	709	7.3	6.1
	2.6	768	8.3	6.9
	2.8	828	9.4	7.8
	3.0	887	10.6	8.8
550	1.6	719	7.5	6.2
	1.8	808	9.1	7.6
	2.0	898	10.8	9.0
	2.2	988	12.7	10.6
	2.4	1079	14.6	12.2
	2.6	1168	16.7	13.9
800	1.6	1045	13.9	11.6
	1.8	1176	16.9	14.1
	2.0	1306	20.1	16.7
	2.2	1437	23.6	19.7
	2.4	1568	27.3	22.7

(8) Clearance to rail cars. Where overhead wires, conductors, or cables run along railroad tracks, the minimum clearance in any direction shall be as shown in Figure 212–9. The values of V and H are defined as follows:

V minimum vertical clearance from the wire, conductor, or cable above the top of the rail as specified in WAC 296–44–21230 minus twenty feet the assumed height of the rail car;

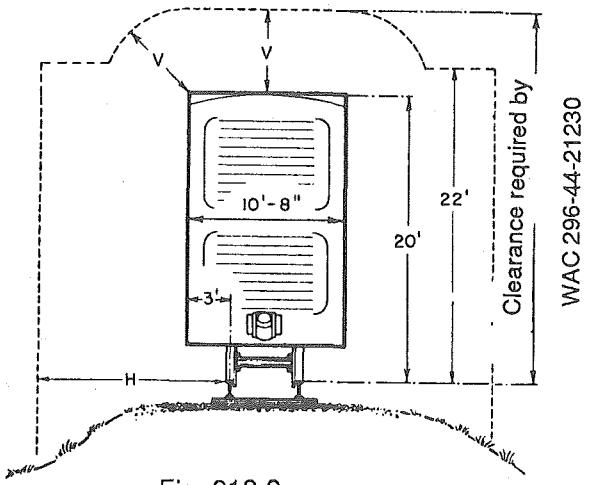


Fig. 212-9

Rail Car Clearances

H minimum horizontal clearance from the wire, conductor, or cable to the nearest rail, which is equal to the required vertical clearance above the rail minus fifteen feet as computed by the lesser of the following:
1. WAC 296–44–21230 (1) and (2)(a).
2. WAC 296–44–21230(4).

These clearances are computed for railroads handling standard rail cars as common carriers in interchange service with other railroads. Where wires, conductors, or cables run along mine, logging, and similar railways which handle only cars smaller than standard freight cars, the value of H may be reduced by one–half the difference between the width of a standard rail car (ten feet, eight inches) and the width of the narrower car.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–21253, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296–44–21265 Clearance for wires, conductors, or cables carried on the same supporting structure. (1) Application of rule.

(a) Multiconductor wires or cables. Cables, and duplex, triple, or paired conductors supported on insulators or messengers, meeting WAC 296–44–21209 (3) or (4) whether single or grouped, are for the purposes of this rule considered single conductors even though they may contain individual conductors not of the same phase or polarity.

(b) Conductors supported by messengers or span wires. Clearances between individual wires, conductors, or cables supported by the same messenger, or between any group and its supporting messenger, or between a trolley feeder, supply conductor, or communication conductor, and their respective supporting span wires, are not subject to the provisions of this rule.

(c) Line conductors of different phases on different circuits. Unless otherwise stated, the voltage between line conductors of different phases of different circuits shall be the phasor difference of the voltages of both circuits or the line–to–ground voltage of the higher voltage circuit, whichever is greater.

(2) Horizontal clearance between line conductors.

(a) Fixed supports. Line conductors attached to fixed supports shall have horizontal clearances from each other not less than the larger value required by either WAC 296–44–21265 (2)(a)(i) or (ii) for the situation concerned.

Note 1: The pin spacing at buckarm construction may be reduced as specified in WAC 296–44–21273(6) to provide climbing space.

Note 2: Grades D and N need meet only the requirements of WAC 296–44–21265 (2)(a)(i).

Note 3: These clearances do not apply to cables meeting WAC 296–44–21209(3) or covered conductors of the same circuit meeting WAC 296–44–21209(4).

Note 4: For voltages to ground exceeding 98 kilovolts alternating current or 139 kilovolts direct current, clearances less than those required by (i) and (ii) below are permitted for systems with known maximum switching surge factors. (See WAC 296–44–21265 (2)(c).)

(i) Minimum horizontal clearance between line conductors of the same or different circuits. Clearances shall be not less than given in Table 212–11.

(ii) Clearance according to sags. The clearance at the supports of conductors of the same or different circuits of Grade B or C shall in no case be less than the values given by the following formulas, at a conductor temperature of 60°F, at final unloaded sag, no wind. All voltages are between the two conductors for which the clearance is being determined except for railway feeders which are to ground. The requirements of WAC 296–44–21265 (2)(a)(i) apply if they give a greater separation than this rule.

Note: No requirement is specified for clearance between conductors of the same circuit when rated above 50 kilovolts.

In the following, S is the apparent sag in inches of the conductor having the greater sag, and the clearance is in inches.

(A) For line conductors smaller than AWG No. 2: Clearance = 0.3 in per kilovolt + $7\sqrt{((S/3)-8)}$. (Table 212–12 shows selected values up to 46 kV.)

(B) For line conductors of AWG No. 2 or larger: Clearance = 0.3 in per kilovolt + $8\sqrt{(S/12)}$. (Table 212–13 shows selected values up to 46 kV.)

(C) For voltages exceeding 814 kilovolts, the clearance shall be determined by the alternate method given by WAC 296–44–21265 (2)(c).

Table 212–11. Minimum Horizontal Clearance at Supports Between Wires, Conductors, or Cables

(All voltages are between conductors involved except for railway feeders, which are to ground. The voltage between line conductors of different phases of different circuits shall be the phasor difference of the voltages of both circuits. If the two conductors of different circuits are of like phase, the lower voltage conductor shall be considered grounded for the purpose of determining the clearance between them.)

Class of circuit	Clearance (in)	Notes
Open communication conductors	6	Preferable minimum. Does not apply at conductor transposition points.
	3	Permitted where pin spacings less than 6 in have been in regular use. Does not apply at conductor transposition points.
Railway feeders:		Where 10 to 12 in clearance has already been established by practice, it may be continued, subject to the provisions of WAC 296-44-21265 (2)(a)(ii) for conductors having apparent sags not over 3 ft and for voltages not exceeding 8.7 kV.
0 to 750 V, AWG No 4/0 or larger	6	
0 to 750 V, smaller than AWG No 4/0	12	
750 V to 8.7 kV	12	
Supply conductors of the same circuit:		
0 to 8.7 kV	12	
8.7 to 50 kV	12 plus 0.4 per kV over 8.7 kV	
Above 50 kV	no value specified	
Supply conductors of different circuits:		For all voltages above 50 kV, the additional clearance shall be increased 3% for each 1000 ft in excess of 3300 ft above mean sea level. All clearances for voltages above 50 kV shall be based on the maximum operating voltage.
0 to 8.7 kV	12	
8.7 to 50 kV	12 plus 0.4 per kV over 8.7 kV	
50 to 814 kV	28.5 plus 0.4 per kV over 50 kV	

Table 212–12. Horizontal Clearances at Supports Between Line Conductors Smaller than AWG No. 2 Based on Sags

Voltage between conductors (kV)	Sag (in): 36	48	72	96	120	180	240	But not less than[1]
	Horizontal clearance (in)							
2.4	14.7	20.5	28.7	35.0	40.3	51.2	60.1	12.0
4.16	15.3	21.1	29.3	35.6	40.9	51.8	60.7	12.0
12.47	17.7	23.5	31.7	38.0	43.3	54.2	63.1	13.5
13.2	18.0	23.8	32.0	38.3	43.6	54.5	63.4	13.8
13.8	18.1	23.9	32.1	38.4	43.7	54.6	63.5	14.0
14.4	18.3	24.1	32.3	38.6	43.9	54.8	63.7	14.3
24.94	21.5	27.3	35.5	41.8	47.1	58.0	66.9	18.5
34.5	24.4	30.2	38.4	44.7	50.0	60.9	69.8	22.4
46	27.8	33.6	41.8	48.1	53.4	64.3	73.2	26.9

[1] Clearance determined by Table 212–11, WAC 296-44-21265 (2)(a)(i).

Note: Clearance = 0.3 in/kV + 7 $\surd$ ((S/3)–8), where S is the sag in inches.

Table 212–13. Horizontal Clearances at Supports Between Line Conductors AWG No. 2 or Larger Based on Sags

Voltage between conductors (kV)	Sag (in): 36	48	72	96	120	180	240	But not less than[1]
	Horizontal clearance (in)							
2	14.6	16.7	20.2	23.3	26.0	31.7	36.5	12.0
4.16	15.1	17.3	20.8	23.8	26.5	32.2	37.0	12.0
12.47	17.6	19.7	23.6	26.3	29.0	34.7	39.5	13.5
13.2	17.8	20.0	23.5	26.5	29.2	34.9	39.7	13.8
13.8	18.0	20.1	23.7	26.7	29.4	35.1	39.9	14.0
14.4	18.2	20.3	23.8	26.9	29.6	35.3	40.1	14.3
24.94	21.3	23.5	27.0	30.0	32.8	38.4	43.2	18.5
34.5	24.2	26.4	29.9	32.9	35.6	41.3	46.1	22.4
46	27.7	29.8	33.3	36.4	39.1	44.8	49.6	26.9

[1] Clearance determined by Table 212–11, WAC 296-44-21265 (2)(a)(i).

Note: Clearance = 0.3 in/kV + 8 $\surd$ (S/12), where S is the sag in inches.

(D) The clearance for voltages exceeding 50 kilovolts specified in WAC 296-44-21265 (2)(a)(ii)(A) and (B) shall be increased three percent for each one thousand feet in excess of thirty-three hundred feet above mean sea level. All clearances for lines over 50 kilovolts shall be based on the maximum operating voltage.

(b) Suspension insulators. Where suspension insulators are used and are not restrained from movement, the clearance between conductors shall be increased so that one string of insulators may swing transversely throughout a range of insulator swing up to its maximum design swing angle without reducing the values given in WAC 296-44-21265 (2)(a). The maximum design swing angle shall be based on a six pound per square foot wind on the conductor at final sag at 60°F. This may be reduced to a four pound per square foot wind in areas sheltered by buildings, terrains, or other obstacles. The displacement of the wires, conductors, and cables shall include deflection of flexible structures and fittings, where such

deflection would reduce the horizontal clearance between two wires, conductors, or cables.

(c) Alternate clearances for different circuits where one or both circuits exceed 98 kilovolts, alternating current, to ground or 139 kilovolts direct current to ground. The clearances specified in WAC 296-44-21265 (2)(a) and (b) may be reduced for circuits with known switching surge factors but shall not be less than the clearances derived from the following computations. For these computations, communication conductors and cables, guys, messengers, neutral conductors meeting WAC 296-44-21209 (5)(a), and supply cables, meeting WAC 296-44-21209 (3)(a) shall be considered line conductors at zero voltage.

(i) Clearance.

(A) The alternate basic clearance computed from the following equation and listed in Table 212-14 is the minimum electrical clearance between conductors of different circuits which shall be maintained under the expected loading conditions:

$$D = 3.28\left[\frac{V_{L-L} \cdot (PU) \cdot a}{500\,K}\right]^{1.667} b \quad \text{(feet)}$$

Table 212-14. Electrical Clearances in WAC 296-44-21265 (2)(c)(i)(A)
(Add three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.)

Maximum operating voltage phase to phase (kV)	Switching surge factor (per unit)	Switching surge (kV)	Electrical component of clearance (ft)
242	2.6 or less	890 or less	[1]6.3
	2.8	958	7.2
	3.0	1027	8.1
	3.2 or more	1095 or more	[2]8.8
362	1.8	893 or less	[1]6.4
	2.0	1024	8.0
	2.2	1126	9.5
	2.4	1228	10.9
	2.6	1330	12.5
	2.7 or more	1382 or more	[2]12.8
550	1.6	1245	11.2
	1.8	1399	13.6
	2.0	1555	16.2
	2.2	1711	19.0
	2.3	1789 or more	[2]19.1
800	1.6	1810	20.8
	1.8	2037	25.3
	1.9 or more	2149 or more	[2]27.4

[1] Limited by WAC 296-44-21265 (2)(c)(ii).
[2] Need not be greater than specified in WAC 296-44-21265 (2)(a) and (b).

where

V_{L-L} maximum alternating current crest operating voltage in kilovolts between phases of different circuits or maximum direct current operating voltage between poles of different circuits. If the phases are of the same phase and voltage magnitude one phase conductor shall be considered grounded;

PU maximum switching surge factor expressed in per-unit peak operating voltage between phases of different circuits and defined as a switching surge level between phases for circuit breakers corresponding to ninety-eight percent probability that the maximum switching surge generated per breaker operation does not exceed this surge level, or the maximum anticipated switching surge level generated by other means, whichever is greater;

a = 1.15, the allowance for three standard deviations;

b = 1.03, the allowance for nonstandard atmospheric conditions;

K = 1.4, the configuration factor for a conductor-to-conductor gap.

(B) The value of D shall be increased three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.

(ii) Limit. The clearance derived from WAC 296-44-21265 (2)(c)(i) shall not be less than the basic clearances given in Table 212-11 computed for 169 kilovolts alternating current.

(3) Vertical clearance between line conductors. All line wires, conductors, and cables located at different levels on the same supporting structure shall have vertical clearances not less than the following.

(a) Basic clearance for conductors of same or different circuits. The clearances given in Table 212-15 shall apply to linewires, conductors, or cables of 0 to 50 kV attached to supports. No value is specified for clearances between conductors of the same circuit exceeding 50 kV.

Note 1: Line wires, conductors, or cables on vertical racks or separate brackets placed vertically and meeting the requirements of WAC 296-44-21265(7) may have spacings as specified in that rule.

Note 2: Where communication service drops cross under supply conductors on a common crossing structure, the clearance between the communication conductor and an effectively grounded supply conductor may be reduced to four inches provided the clearance between the communication conductor and supply conductors not effectively grounded meets the requirements of WAC 296-44-21265(3) as appropriate.

Note 3: Supply service drops of 0-750 V running above and parallel to communication service drops may have a minimum spacing of twelve inches at any point in the span including the point of and at their attachment to the building provided the nongrounded conductors are insulated and that a clearance of forty inches is maintained between the two services at the pole.

Note 4: This rule does not apply to conductors of the same circuit meeting WAC 296-44-21209(4).

(b) Additional clearances. Greater clearances than given in Table 212-15 (WAC 296-44-21265 (3)(a)) shall be provided under the following conditions. The increases are cumulative where more than one is applicable.

(i) Voltages exceeding 50 kilovolts.

(A) For voltages between 50 and 814 kilovolts, the clearance between conductors of different circuits shall be increased 0.4 inches per kilovolt in excess of 50 kV.

Note: For voltages to ground exceeding 98 kV alternating current or 139 kV direct current, clearances less than those required above are permitted for systems with known switching surge factors. (See WAC 296-44-21265 (3)(c).)

(B) The increase in clearance for voltages in excess of 50 kV specified in WAC 296-44-21265 (3)(b)(ii)(A) shall be increased three percent for each one thousand feet in excess of thirty-three hundred feet above mean sea level.

(C) All clearances for lines over 50 kV shall be based on the maximum operating voltage.

(D) No value is specified for clearances between conductors of the same circuit.

(ii) Conductors of different sags on same support.

(A) Line conductors, supported at different levels on the same structure shall have vertical clearances at the supporting structures so adjusted that the minimum clearance at any point in the span shall be not less than any of the following with the upper conductor at its final unloaded sag at the maximum temperature for which the conductor is designed to operate and the lower conductor at its final unloaded sag under the same ambient conditions and without electrical loading.

(I) For voltages less than 50 kilovolts between conductors, seventy-five percent of that required at the supports by Table 212-15.

(II) For voltages more than 50 kilovolts between conductors, the value specified in WAC 296-44-21265 (3)(b)(ii)(A)(I) increased in accordance with WAC 296-44-21265 (3)(b)(i).

(B) Sags should be readjusted when necessary to accomplish the foregoing, but not reduced sufficiently to conflict with the requirements of WAC 296-44-27821 (8)(b). In cases where conductors of different sizes are strung to the same sag for the sake of appearance or to maintain unreduced clearance throughout storms, the chosen sag should be such as will keep the smallest conductor involved in compliance with the sag requirements of WAC 296-44-27821 (8)(b).

(C) For span lengths in excess of one hundred fifty feet, vertical clearance at the structure between open supply conductors and communication cables or conductors shall be adjusted so that under conditions of conductor temperature of 60°F, no wind and final unloaded sag, no open supply conductor of 750 volts or less shall be lower in the span than a straight line joining the points of support of the highest communications cable or conductor, and no open supply conductor of over 750 volts but less than 50 kilovolts shall be lower in the span than thirty inches above such a straight line.

Note: Effectively grounded supply conductors associated with systems of 50 kilovolts or less need meet only the provisions of WAC 296-44-21265 (3)(b)(ii)(A).

(c) Alternate clearances for different circuits where one or both exceed 98 kilovolts, alternating current, or 139 kilovolts direct current to ground. The clearances specified in WAC 296-44-21265 (3)(a) and (b) may be reduced for circuits with known switching surge factors, but shall not be less than the crossing clearances required by WAC 296-44-21241 (3)(c).

Table 212-15. Minimum Vertical Clearance at Supports Between Line Conductors
(All voltages are between conductors.)

		Supply conductors; preferably at higher levels			
				15,000 to 50,000 volts	
Conductors usually at lower levels	Open wires, 0 to 750 volts; cables, all voltages, having effectively grounded continuous metal sheath or messenger	750 to 8,700 volts	8,700 to 15,000 volts	Same utility	Different utilities
Communication conductors:	Feet	Feet	Feet	Feet	Feet
General	[1] [2]4	4	7	—	7
Used in operation of supply lines	2	3	4	7	7
Supply conductors:					

0 to 750 volts	2	[3]3	[5 6]7	[5]7	7
750 volts to 5,000 volts	—	[3]2	[6]7	7	7
5,000 volts to 8,700 volts	—	[3]2	4	4	7
8,700 volts to 15,000 volts:					
If worked on alive with long-handled tools, and adjacent circuits are neither killed nor covered with shields or protectors	—	—	4	4	6
If not worked on alive except when adjacent circuits (either above or below) are killed or covered by shields or protectors, or by the use of long-handled tools not requiring linemen to go between live wires	—	—	2	[4]4	[4]4
Exceeding 15,000 volts, but not exceeding 50,000 volts	—	—	—	[4]4	[4]4

[1] Where supply circuits of 600 volts or less, with transmitted power of 5000 watts or less, are run below communication circuits in accordance with WAC 296-44-19409 (2)(b) the clearance may be reduced to two feet.

[2] In localities where the practice has been established of placing on jointly used poles, crossarms carrying supply circuits of less than 300 volts to ground and crossarms carrying communication circuits at a vertical separation less than specified in the table, such existing construction may be continued until the said poles are replaced provided that:

The minimum separation between existing crossarms is not less than two feet, and that:

Extensions to the existing construction shall conform to the clearance requirements specified in Table 212-15.

When communication conductors are all in cable, a supply crossarm carrying only wires of not more than 300 volts to ground may be placed at not less than two feet above the point of attachment of the cable to the pole provided that:

The nearest supply wire on such crossarm shall be at least thirty inches horizontally from the center of the pole, and that:

The cable be placed so as not otherwise to obstruct the climbing space.

[3] Where conductors are operated by different utilities, a minimum vertical spacing of four feet is required.

[4] These values do not apply to adjacent crossarms carrying phases of the same circuit or circuits.

[5] This value may be reduced to four feet where secondary vertical-rack construction is used on one side or face of pole, or on two sides where conductors are deadened, only. Service contacts are permitted in addition.

[6] A primary buckarm not less than eight feet long supporting not more than two conductors in the end pin positions or one lateral primary conductor dead-ended on the pole, may be placed in the seven foot spacing provided that this spacing is not reduced to less than five feet.

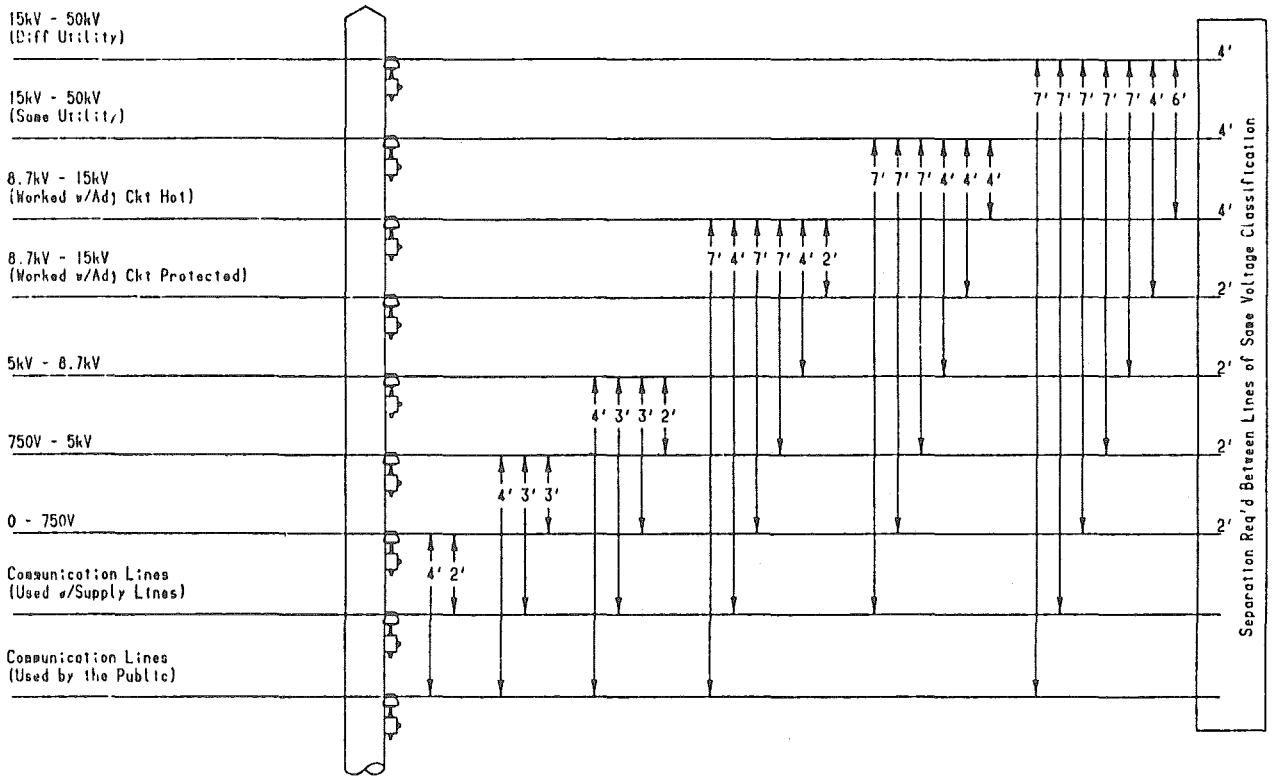


Fig 212-10
Minimum Vertical Clearance at Supports Between Line Conductors.
(Re: Table 212-15)

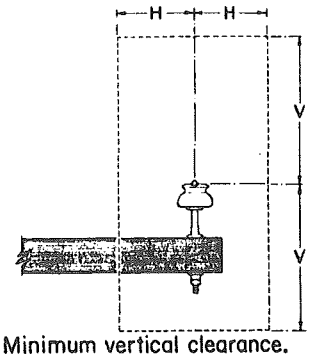
(4) Diagonal clearance between line wires, conductors, and cables located at different levels on the same supporting structure. No wire, conductor, or cable may be closer to any other wire, conductor, or cable than defined by the dashed line in Fig. 212–11, where V and H are determined in accordance with other parts of WAC 296–44–21265.

(5) Clearances in any direction from line conductors to supports, and to vertical or lateral conductors, span or guy wires attached to the same support.

(a) Fixed supports. Clearances shall not be less than given in Table 212–16.

Note: For voltages exceeding 98 kilovolts alternating current to ground or 139 kilovolts direct current to ground, clearances less than those required by Table 212–16 are permitted to systems with known switching surge factor. (See WAC 296–44–21265 (5)(c).)

(b) Suspension insulators. Where suspension insulators are used and are not restrained from movement, the clearance shall be increased so that the string of insulators may swing transversely throughout a range of insulator swing up to its maximum design swing angle without reducing the values given in WAC 296–44–21265 (5)(a). The maximum design swing angle shall be based on a six pound per square foot wind on the conductor at final sag at 60°F. This may be reduced to a four pound per square foot wind in areas sheltered by buildings, terrain, or other obstacles. The displacement of the wires, conductors, and cables shall include deflection of flexible structures and fittings, where such deflection would reduce the clearance.



V = Minimum vertical clearance.

H = Minimum horizontal clearance.

Clearance Diagram for Energized Conductor

Table 212-16. Minimum Clearance in Any Direction from Line Conductors to Supports and to Vertical or Lateral Conductors, Span, or Guy Wires Attached to the Same Support

Clearance of line conductors from	Communication lines		Supply lines		
			Circuit phase-to-phase voltage		
	In general (in)	On jointly used structures (in)	0 to 8.7 kV (in)	8.7 to 50 kV (in)	50 to 814 kV[4 9] (in)
Vertical and lateral conductors:					
Of the same circuit	3	3	3	3 plus 0.25 per kV over 8.7 kV	no value specified
Of other circuits	3	3	[5]6	6 plus 0.4 per kV over 8.7 kV	23 plus 0.4 per kV over 50 kV
Span or guy wires,[11] or messengers attached to same structure:					
When parallel to line	[7]3	[1 7]6	[1]12	12 plus 0.4 per kV over 8.7 kV	29 plus 0.4 per kV over 50 kV
Anchor guys	[7]3	[1 7]6	[1]6	6 plus 0.25 per kV over 8.7 kV	16 plus 0.25 per kV over 50 kV
All other	[7]3	[1 7]6	6	6 plus 0.4 per kV over 8.7 kV	23 plus 0.4 per kV over 50 kV
Surface of support arms	[2]3	[2]3	[6 8]3	3 plus 0.2 per kV over 8.7 kV[6 8 10]	11 plus 0.2 per kV over 50 kV
Surface of structures:					
On jointly used structures	—	[2]5	[3 6 8]5	5 plus 0.2 per kV over 8.7 kV[6 8]	13 plus 0.2 per kV over 50 kV
All other	[2]3	—	[6 8]3	3 plus 0.2 per kV over 8.7 kV[6 8]	11 plus 0.2 per kV over 50 kV

1 For guy wires, if practical. For clearances between span wires and communication conductors, see WAC 296-44-21287(3).
On jointly used structures, guys which pass within twelve inches of supply conductors, and also pass within twelve inches of communication cables, shall be protected with a suitable insulating covering where the guy passes the supply conductors, unless the guy is effectively grounded or insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.
The minimum clearance from an insulated or effectively grounded guy to a communication cable may be reduced to three inches when abrasion protection is provided on the guy or communication cable.

2 Communication conductors may be attached to supports on the sides or bottom of crossarms or surfaces of poles with less clearances.

3 This clearance applies only to supply conductors at the support below communication conductors, on jointly used structures.
Where supply conductors are above communication conductors, this clearance may be reduced to three inches except for supply conductors of 0 to 750 V whose clearance may be reduced to one inch.

4 All clearances for line over 50 kV shall be based on the maximum operating voltage. For voltages exceeding 814 kV, the clearance shall be determined by the alternate method given by WAC 296-44-21265 (5)(c).

5 For supply circuits of 0 to 750 V, this clearance may be reduced to three inches.

6 A neutral conductor meeting WAC 296-44-21209 (5)(a) may be attached directly to the structure surface.

7 Guys and messengers may be attached to the same strain plates or to the same through bolts.

8 For open supply circuits of 0 to 750 V and supply cables of all voltages meeting WAC 296-44-21209 (3)(a), (b) or (c), this clearance may be reduced to one inch.

9 The additional clearance for voltages in excess of 50 kV specified in Table 212-16 shall be increased three percent for each one thousand feet in excess of thirty-three hundred feet above mean sea level.

10 Where circuit is effectively grounded and neutral conductor meets WAC 296-44-21209 (5)(a), phase-to-neutral voltage shall be used to determine clearance from phase conductor to surface of support arms.

11 These clearances may be reduced by not more than twenty-five percent to a guy insulator, provided that full clearance is maintained to its metallic end fittings and the guy wires. The clearance to an insulated section of a guy between two insulators may be reduced by not more than twenty-five percent provided that full clearance is maintained to the uninsulated portion of the guy.

(c) Alternate clearances for voltages exceeding 98 kV alternating current to ground or 139 kV direct current to ground. The clearances specified in WAC 296-44-21265 (5)(a) and (b) may be reduced for circuits with known switching surge factors but shall not be less than the following.

(i) Alternate clearances to anchor guys, and vertical or lateral conductors. The alternate clearances shall not be less than the crossing clearances required by WAC 296-44-21241 (2)(b) and (3)(c) for the conductor voltages concerned. For the purpose of this rule, anchor guys shall be assumed to be at ground potential.

(ii) Alternate clearance to surface of support arms and structures.

(A) Alternate clearance.

(I) Basic computation. The alternate clearance computed from the following equation is the minimum electrical clearance which shall be maintained under the expected loading conditions. For convenience, clearances for typical system voltages are shown in Table 212-17.

$$D = 39.37 \left[\frac{V \cdot (PU) \cdot a}{500\,K}\right]^{1.667} b \quad \text{(in)}$$

where

V maximum alternating current crest operating voltage to ground or maximum direct current operating voltage to ground in kilovolts;

PU maximum switching surge factor expressed in per-unit peak voltage to ground and defined as a switching surge level for circuit breakers corresponding to ninety-eight percent probability that the maximum switching surge generated per breaker operation does not exceed this surge level, or the maximum anticipated switching surge level generated by other means, whichever is greater;

a =1.15, the allowance for three standard deviations with fixed insulator supports;

a =1.05, the allowance for one standard deviation with free swinging insulators;

b =1.03, the allowance for nonstandard atmospheric conditions;

K =1.2, the configuration factor for conductor-to-tower window.

(II) Atmospheric correction. The value of D shall be increased three percent for each one thousand feet in excess of fifteen hundred feet above mean sea level.

(B) Limits. The alternate clearance shall not be less than the clearance of Table 212-16 for 169 kV alternating current. The alternate clearance shall be checked for adequacy of clearance to workmen and increased, if necessary, where work is to be done on the structure while the circuit is energized. (Also see chapter 296-45 WAC.)

(6) Clearance between supply circuits of different voltage classifications on the same support arm. Supply circuits of any one voltage classification as given in Table 212-15 may be maintained on the same support arm with supply circuits of the next consecutive voltage classification only under one or more of the following conditions:

(a) If they occupy positions on opposite sides of the structure.

Table 212-17. Minimum Clearance in Any Direction from Line Conductors to Supports

Maximum operating voltage phase to phase (kV)	Switching surge factor (per unit)	Switching surge (kV)	Minimum clearance to supports	
			Fixed (in)	Free swinging at maximum angle (in)
242	2.4	474	[1]35	[1]35
	2.6	514	40	[1]35
	2.8	553	45	38
	3.0	593	[2]50	43
	3.2	632	[2]50	48
362	1.6	473	[1]35	[1]35
	1.8	532	42	36
	2.0	591	50	48
	2.2	650	59	51
	2.4	709	68	59
	2.5	739	[2]73	63
550	1.6	719	70	60
	1.8	808	85	73
	2.0	898	101	87
	2.2	988	[2]111	101
800	1.6	1045	130	111
	1.8	1176	158	135
	1.9	1241	[2]161	148
	2.0	1306	[2]161	[2]161

[1] Limited by WAC 296-44-21265 (5)(c)(iii)(B).

[2] Need not be greater than specified in WAC 296-44-21265 (5)(a) and (b).

(b) If in bridge-arm or sidearm construction, the clearance is not less than the climbing space required for the higher voltage concerned and provided for in WAC 296-44-21273.

(c) If the higher voltage conductors occupy the outer positions and the lower voltage conductors occupy the inner positions.

(d) If series lighting or similar supply circuits are ordinarily dead during periods of work on or above the support arm concerned.

(e) If the two circuits concerned are communication circuits used in the operation of supply lines, and supply circuits of less than 8.7 kilovolts, and are owned by the same utility, provided they are installed as specified in WAC 296-44-21265 (6)(a) or (b).

(7) Conductor spacing: Vertical racks. Conductors or cables may be carried on vertical racks or separate

brackets other than wood placed vertically on one side of the structure and securely attached thereto with less clearance between the wires, conductors, or cables than specified in WAC 296-44-21265(3) if all the following conditions are met:

(a) The voltage shall not be more than 750 volts, except supply cables and conductors meeting WAC 296-44-21209 (3)(a) or (b) which may carry any voltage.

(b) Conductors shall be of the same material or materials, except that different materials may be used if their sag-tension characteristics and arrangement are such that the spacing specified in WAC 296-44-21265 (7)(c) is maintained under all service conditions.

(c) Vertical spacing between conductors shall be not less than the following:

Span length (ft)	Vertical spacing between conductors (in)
0 to 150	4
150 to 200	6
200 to 250	8
250 to 300	12

Note: The vertical spacing may be reduced where the conductors are held apart by intermediate spacers, but may not be less than four inches.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21265, filed 7/25/86.]

WAC 296-44-21273 Climbing space. (1) Location and dimensions.

(a) A climbing space having the horizontal dimensions specified in subsection (5) of this section shall be provided past any conductors, crossarms, or other parts.

(b) The climbing space shall be provided on all poles and structures.

(c) The climbing space shall extend vertically past any conductor or other part between levels above and below the conductor as specified in subsections (5), (6), (7), and (8) of this section. The position of the climbing space shall be maintained for at least forty inches above and below any limiting conductor level and where the limiting conductor levels are separated six feet or more, the climbing space may be rotated by not more than one-fourth of the distance around the pole between any such levels. Where the climbing space is on the face or back of the pole, this space may be considered as in either quadrant to the right or left for the purpose of interpreting this rule.

(d) The climbing space shall include not less than one quadrant nor more than one-half of the pole cross-section.

(2) Portions of supporting structures in climbing space. Portions of the pole or structure when included in one side or corner of the climbing space, are not considered to obstruct the climbing space, providing that such inclusion into the climbing space does not exceed twenty-five percent of the total area of the specified climbing space. Where such a condition exists, additional space shall be added to the original spacing to compensate for the loss of clearances.

(3) Crossarm location relative to climbing space. All single crossarms should be located on the same face and side of the pole to avoid unnecessarily obstructing the climbing space through the different conductor levels. One arm of sets of double crossarms protruding into the climbing space shall not be considered as an obstruction in the climbing space.

(4) Location of supply and communication apparatus relative to climbing space. Transformers, regulators, lightening arresters, fuse mountings, switches, service brackets, communication terminal cans, and service drop hooks and other attachments shall be mounted outside the climbing space. Pole steps shall be placed so that they do not interfere with the climbing space.

(5) Climbing space through conductors on crossarms.

(a) Conductors of same voltage classification on same crossarm. Climbing space between conductors shall be of the horizontal dimensions specified in Table 212-18 of this section, and shall be provided both along and across the line, and shall be projected vertically not less than forty inches above and below the limiting conductors. Where communication conductors are above supply conductors of more than 8,700 volts, the climbing space shall be projected vertically at least sixty inches above the highest supply conductor.

Note: This rule does not apply if it is the unvarying practice of the employers concerned to prohibit employees from ascending beyond the conductors of the given line, unless the line is killed.

(b) Conductors of different voltage classifications on same crossarm. The climbing space shall be that required by Table 212-18 of this section for the highest voltage of any conductor bounding the climbing space. The climbing space shall extend vertically to the limits specified in (a) of this subsection, and the exception thereto.

(6) Climbing space on buckarm construction. The full width of climbing space shall be maintained on buckarm construction and shall extend vertically in the same position at least forty inches (or sixty inches where required by subsection (5)(a)) above and below any limiting conductor.

Method of providing climbing space on buckarm construction. With circuits of less than 5,000 volts and span lengths not exceeding one hundred fifty feet and sags not exceeding fifteen inches for wires of No. 2 and larger sizes, or thirty inches for wires smaller than No. 2, a six-pin crossarm having pin spacing of fourteen and one-half inches may be used to provide a thirty-inch climbing space on one corner of a junction pole by omitting the pole pins on all arms, and inserting pins midway between the remaining pins so as to give a spacing of seven and one-fourth inches, provided that each conductor on the end of every arm is tied to the same side of its insulator, and that the spacing on the next pole is not less than fourteen and one-half inches.

(7) Climbing space past vertical conductors. One vertical run or riser encased in suitable conduit or other protective covering not over two inches outside diameter

and securely attached to the surface of the pole or structure and/or a ground wire attached to the surface of the pole, are allowed in the climbing space. It is recommended that this practice be avoided whenever practical.

(8) Climbing space near ridge-pin conductors. The climbing space specified in Table 212-18 shall be provided above the top crossarm to the ridge-pin conductor but need not be carried past it.

Table 212-18. Minimum Horizontal Clearance Between Conductors Bounding the Climbing Space
(All voltages are between the two conductors bounding the climbing space except for communications conductors which are voltage to ground. Where the two conductors are in different circuits, the voltage between conductors shall be the arithmetic sum of the voltages of each conductor to ground for a grounded circuit or phase to phase for an ungrounded circuit.)

Horizontal clearance between conductors bounding the climbing space
On jointly used structures

Character of conductors adjacent to climbing space	Voltage of conductors	On structures used solely by: Communication conductors (in)	On structures used solely by: Supply conductors (in)	Supply conductors above communication conductors (in)	Communication conductors above supply conductors[1] (in)
Communication conductors	0 to 150 V	no requirements	—	[2]	no requirements
	exceeding 150 V	24 recommended	—	[2]	24 recommended
Supply cables meeting WAC 296-44-21209 (3)(a)	all voltages		—	[2]	no requirements
Supply cables meeting WAC 296-44-21209 (3)(b) or (c)	all voltages	—	24	24	30
Open supply line conductors and supply cables meeting WAC 296-44-21209(4)	0 to 300 V	—	24	24	30
	300 V to 8.7 kV	—	30	30	30
	8.7 kV to 28 kV	—	36	36	36
	28 kV to 38 kV	—	40	40	
	38 kV to 50 kV	—	46	46	
	50 kV to 73 kV	—	54	54	
	exceeding 73 kV	—	54		

1 This relation of levels is not, in general, desirable and should be avoided.

2 Climbing space shall be the same as required for the supply conductors immediately above, with a maximum of thirty inches except that a climbing space of sixteen inches across the line may be employed for communication cables or conductors where the only supply conductors at a higher level are secondaries (0 to 750 V) supplying airport or airway marker lights or crossing over the communication line and attached to the pole top or to a pole top extension fixture.

Climbing Space

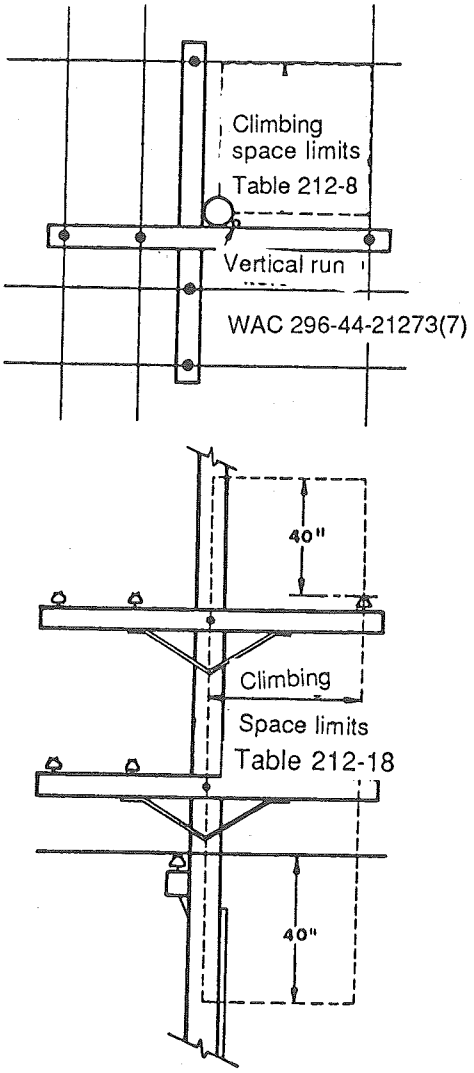


Fig. 212-12

Climbing Space

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21273, filed 7/25/86.]

WAC 296-44-21279 Working space. (1) Location of working spaces. Working spaces shall be provided on the climbing face of the structure at each side of the climbing space.

(2) Dimensions of working spaces.

(a) Along the support arm. The working space shall extend from the climbing space to the outmost conductor position on the support arm.

(b) At right angles to the support arm. The working space shall have the same dimension as the climbing space (see WAC 296-44-21273(5)). This dimension shall be measured horizontally from the face of the support arm.

(c) Vertically. The working space shall have a height not less than that required by WAC 296-44-21265 for the vertical separation of line conductors carried at different levels on the same support.

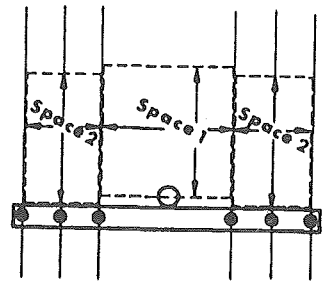
(3) Location of vertical and lateral conductors relative to working spaces. The working spaces shall not be obstructed by vertical or lateral conductors. Such conductors shall be located on the opposite side of the pole from the climbing side or on the climbing side of the pole at a distance from the support arm at least as great as the width of climbing space required for the highest voltage conductors concerned. Vertical conductors enclosed in suitable conduit may be attached on the climbing side of the structure, in compliance with WAC 296-44-21273(7).

(4) Location of buckarms relative to working spaces. Buckarms may be used under any of the following conditions, provided the climbing space is maintained. Climbing space may be obtained as in WAC 296-44-21273(6).

(a) Standard height of working space. Lateral working space of the height required by Table 212-15 shall be provided between the lateral conductors attached to the buckarm and the line conductors. This may be accomplished by increasing the spacing between the line support arms as shown in Figure 212-14.

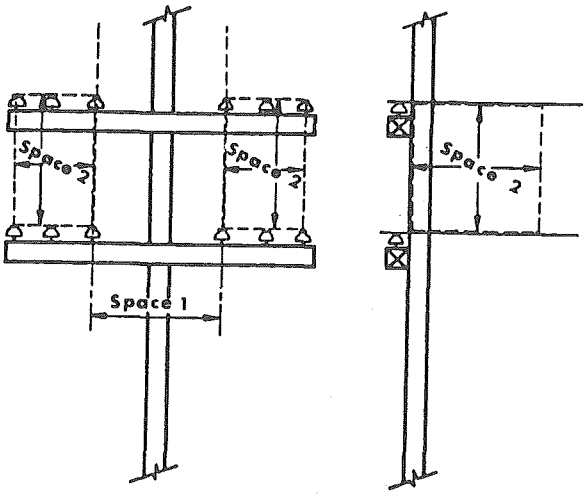
(b) Reduced height of working space. Buckarms may be inserted at reduced spacing when the conductors on the buckarms are attached to conductors on one adjacent linearm as follows: Where wires are of 0 to 750 volts spacing may be reduced to twelve inches; where wires are of 750 to 15,000 volts spacing may be reduced to eighteen inches.

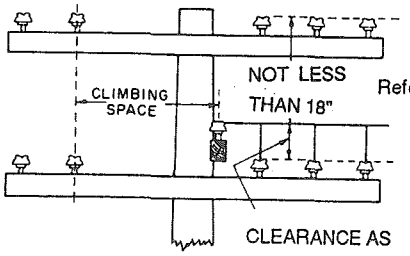
Working Space



Space 1 = Climbing Space Limits WAC 296-44-21273

Space 2 = Working Space Limits WAC 296-44-21279





Refer to WAC 296-44-21279(4)(b)

Fig. 212-14

Obstruction of working Space by Buckarm

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21279, filed 7/25/86.]

WAC 296-44-21287 Vertical clearance between certain communication and supply facilities located on the same structure. (1) Equipment. For the purpose of measuring clearances under this rule, "equipment" shall be taken to mean noncurrent-carrying metal parts of equipment, including metal supports for cables or conductors, and metal support braces which are attached to metal supports or are less than one inch from transformer cases or hangers which are not effectively grounded.

(2) Clearances in general. Vertical clearances between supply conductors and communication equipment, between communication conductors and supply equipment, and between supply and communication equipment shall be as specified in Table 212-19 except as provided in WAC 296-44-21287(3).

Table 212-19. Vertical Clearances Between Supply Conductors and Communication Equipment, Between Communication Conductors and Supply Equipment, and Between Supply and Communication Equipment

(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly deenergizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.)

Supply voltage (kV)	Vertical clearance (in)
0 to 8.7	[1]40
8.7 to 50	[1]60
over 50	60 plus 0.4 per kV over 50 kV

[1] Where noncurrent carrying parts of equipment are effectively grounded consistently throughout well-defined areas and where communication is at lower levels, clearances may be reduced to thirty inches.

(3) Clearances for span wires or brackets. Span wires or brackets carrying luminaires or trolley conductors shall have at least the vertical clearances in inches from communication equipment set forth in Table 212-20.

(4) Clearance from drip loops of luminaire brackets. If a drip loop of conductors entering a luminaire bracket from the surface of the structure is above a communication cable, the lowest point of the loop shall be at least twelve inches above communication cable or through bolt.

Note: The above clearance may be reduced to three inches if the loop is covered by a suitable nonmetallic covering which extends at least two inches beyond the loop.

Table 212-20. Vertical Clearance of Span Wires and Brackets from Communications Lines

	Carrying luminaires		Carrying trolley conductors	
	Not effectively grounded (inches)	Effectively grounded (inches)	Not effectively grounded (inches)	Effectively grounded (inches)
Above communication support arms	[1]20	[1]20	[1]20	[1]20
Below communication support arms	[3]40	24	24	24

	Carrying luminaires		Carrying trolley conductors	
	Not effectively grounded (inches)	Effectively grounded (inches)	Not effectively grounded (inches)	Effectively grounded (inches)
Above messengers carrying communication cables	[1]20	4	12	4
Below messengers carrying communication cables	[4]40	4	12	4
From terminal box of communication cables	[1]20	4	[2]12	4
From communication brackets, bridle wire rings, or drive hooks	[1]16	4	4	4

1 This may be reduced to twelve inches for either span wires or metal parts of brackets at points forty inches or more from the structure surface.

2 Where it is not practical to obtain a clearance of one foot from terminal boxes of communication cables, all metal parts of terminals shall have the greatest possible separation from fixtures or span wires including all supporting screws and bolts of both attachments.

3 This may be reduced to twenty-four inches for luminaires operating at less than 150 V to ground.

4 This may be reduced to twenty inches for luminaires operating at less than 150 volts to ground.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21287, filed 7/25/86.]

WAC 296-44-21295 Clearances of vertical and lateral conductors from other wires and surfaces on the same support. Vertical and lateral conductors shall have the clearances and separations required by this rule from other conductors, wires, or surfaces on the same support.

Note 1: This rule does not prohibit the placing of supply circuits of the same or next voltage classification in the same duct, if each circuit or set of wires is enclosed in a metal sheath.

Note 2: This rule does not prohibit the placing of paired communication conductors in rings attached directly to the structure or to messenger.

Note 3: This rule does not prohibit placing grounding conductors, neutral conductors meeting WAC 296-44-21209 (5)(a), supply cables meeting WAC 296-44-21209 (3)(a), or conductors physically protected by enclosing in conduit, directly on the support.

Note 4: This rule does not prohibit placing properly insulated supply circuits of 600 volts or less and not exceeding 5000 watts in the same cable with control circuits with which they are associated.

(1) Location of vertical or lateral conductors relative to climbing spaces, working spaces, and pole steps. Vertical or lateral conductors shall be located so that they do not obstruct climbing spaces, or lateral working spaces between line conductors at different levels, or interfere with the safe use of pole steps.

Note: This rule does not apply to portions of the structure which workers do not ascend while the conductors in question are alive.

(2) Conductors not in conduit. Conductors not encased in conduit shall have the same clearances from conduits as from other surfaces of structures.

(3) Mechanical protection near ground. Where within eight feet of the ground, all vertical conductors, cables, and grounding wires shall be protected by a covering which gives suitable mechanical protection. For grounding wires from surge arresters, the protective covering just specified shall be of wood molding or of other nonmetallic material giving equivalent mechanical protection.

Note 1: This covering may be omitted from armored cables or cables installed in a grounded metal conduit.

Note 2: This covering may be omitted from lead-sheathed cables used in rural districts.

Note 3: This covering may be omitted from vertical runs of communication cables or conductors.

Note 4: This covering may be omitted from grounding wires used in rural districts or in any area where the grounding wire is one of a number of grounding wires used to provide multiple grounds.

Note 5: This covering may be omitted from wires which are used solely to protect poles from lightning.

(4) Requirements for vertical and lateral supply conductors on supply line structures or within supply space on jointly used structures.

(a) General clearances. In general, clearances shall be not less than the values specified in Table 212-21 or WAC 296-44-21265(5).

(b) Special cases. The following requirements apply only to portions of a structure which workers ascend while the conductors in question are alive.

(i) Sidearm construction. Vertical conductors in cables meeting WAC 296-44-21209 (3)(a) and grounding wires may be run without insulating protection from supply line conductors on structures used only for supply lines and employing sidearm construction on the side of the structure opposite to the line conductors if climbing space is provided on the line-conductor side of the structure.

(ii) Conductors to luminaires. On structures used only for supply lines, open wires may be run from the supply line arm directly to the head of a luminaire, provided the clearances of Table 212-21 are obtained and the open wires are substantially supported at both ends.

(iii) Conductors of less than 300 volts. Vertical or lateral secondary supply conductors of not more than 300 volts to ground may be run in multiple-conductor cable attached directly to the structure surface or to support arms in such a manner as to avoid abrasion at the point of attachment. Each conductor of such cable which is not effectively grounded, or the entire cable assembly, shall have an insulating covering required for a conductor of at least 600 volts.

(iv) Other conditions. If open wire conductors are within four feet of the pole, vertical conductors shall be run in one of the following ways.

Table 212-21. Clearance of Vertical and Lateral Conductors
(Circuit Phase-to-Phase Voltage)

Clearance of vertical and lateral conductors	0 to 8.7 kV (inches)	8.7 to 50 kV (inches)	Over 50 kV[4] (inches)
From surfaces of supports	[1] [2]3	3 plus 0.2 per kV over 8.7 kV	11 plus 0.2 per kV over 50 kV
From span, guy, and messenger wires	[5]6	6 plus 0.4 per kV over 8.7 kV[3]	23 plus 0.4 per kV over 50 kV[3]

1 A neutral conductor meeting WAC 296-44-21209 (5)(a) may be attached directly to the structure surface.

2 For supply circuits of 0 to 750 V this clearance may be reduced to one inch.

3 Multiplier may be reduced to 0.25 inch/kV for anchor guys.

4 The additional clearance for voltages in excess of 50 kV specified in Table 212-21, shall be increased three percent for each one thousand feet in excess of thirty-three hundred feet above mean sea level.

5 For cables meeting WAC 296-44-21209 (3)(c) and operating at 0 to 750 V, this may be reduced to two inches.

Table 212-22. Clearances Between Open Vertical Conductors and Pole Center
(Voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly deenergizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.)

Voltage (kV)	Distance above and below open supply conductors where clearances apply (feet)	Minimum clearance between vertical conductor and pole center (inches)
0 to 8.7	4	15
8.7 to 16	6	20
16 to 22	6	23
22 to 30	6	26
30 to 50	6	34

(A) Open vertical conductors shall have the clearances given in Table 212-22 within the zone specified in the table.

(B) Within the zone above and below open supply conductor as given in Table 212-22 vertical and lateral conductors may be enclosed in nonmetallic conduit, or in cable protected by an insulating covering and may be run on the pole surface.

(C) Supply grounding conductors may be run on the pole surface without molding except as required by WAC 296-44-21295(3) for mechanical protection near the ground.

(5) Requirements for vertical and lateral communications conductors on communication line structures or within the communication space on jointly used structures.

(a) Clearances from wires. The clearances of uninsulated vertical and lateral conductors from other conductors (except those in the same ring run) and from guy, span, or messenger wires shall be three inches.

(b) Clearances from supporting structure surfaces. Vertical and lateral insulated communication conductors may be attached directly to a structure. They shall have a vertical clearance of at least forty inches from any supply conductors (other than vertical runs or luminaire leads) of 8.7 kilovolts or less, or sixty inches if more than 8.7 kilovolts.

Note: These clearances do not apply where the supply circuits involved are those carried in the manner specified in WAC 296-44-19409 (2)(b).

(6) Requirements for vertical supply conductors passing through communication space on jointly used line structures.

(a) Grounded metal-sheathed cables. Grounded metal-sheathed cables may be fastened directly to the surface of the line structure. Such cables shall be protected with suitable nonmetallic covering when the line structure also carries trolley attachments or when an ungrounded luminaire is attached below the communication cable. The grounded metal-sheathed cable shall be protected with a nonmetallic covering for a distance of forty inches above the highest communication wire and six feet below the lowest trolley attachment or ungrounded luminaire fixture.

(b) Jacketed multiple-conductor cables. Jacketed multiple-conductor cables operating at voltages not exceeding 300 volts to ground may be attached directly to the surface of the line structure. Each conductor shall be insulated for a potential of at least 600 volts. Where used as aerial services, the point where such cables leave the structure shall be at least forty inches above the highest or forty inches below the lowest communication attachment. All splices and connections in the cable shall be insulated. No additional protection is required.

(c) Grounded metal covering. Conductors of all voltages may be run in effectively grounded metal covering. Such metal covering shall be protected with a nonmetallic covering under the same conditions and to the same extent as required for grounded metal-sheathed cables in WAC 296-44-21295 (6)(a).

(d) Suspended from supply support arm. Lamp leads of lighting circuits may be run from supply support arms directly to a bracket or luminaire under the following conditions:

(i) The vertical run shall consist of paired wires or multiple-conductor cable securely attached at both ends to suitable brackets and insulators.

(ii) The vertical run shall be held taut at least forty inches from the surface of the pole through the communication space at least twelve inches beyond the end of any communication support arm by which it passes, and at least six inches from communication drop wires, and at least twenty inches from any communication cable.

(iii) Insulators attached to luminaire brackets for supporting the vertical run shall be capable of meeting, in the position in which they are installed, the same flashover requirements as the luminaire insulators.

(iv) Each conductor of the vertical run shall be AWG No. 10 or larger.

(e) Supply grounding conductors.

(i) Supply grounding conductors may be run bare where there are no trolley attachments or ungrounded street lighting fixtures, or both, located below the communication attachment provided:

(A) The grounding conductor is directly (metallically) connected to a conductor which forms part of an effective grounding system; and

(B) The grounding conductor has no connection to supply equipment between the grounding electrode and the effectively grounded conductor unless the supply equipment has additional connections to the effectively grounded conductor.

(ii) Supply grounding conductors not conforming to WAC 296-44-21295 (6)(e)(i) shall be protected with a suitable nonmetallic covering to the same extent as required for grounded metal-sheathed cables in WAC 296-44-21295 (6)(a).

(f) Clearance from through bolts. Vertical runs of supply conductors or cables shall have a clearance of not less than two inches from exposed through bolts and other exposed metal objects attached thereto which are associated with communication line equipment.

Note: Vertical runs of effectively grounded supply conductors may have a clearance of one inch from the end of exposed communication through bolts.

(g) Multiple conductor cables. Multiple conductor cables operating at voltages not exceeding 600 V between conductors may be attached directly to the surface of the line structure if protected by nonmetallic covering. Each conductor shall be insulated for a potential of at least 600 V. Where used as aerial services, the point where such cables leave the structure shall be at least forty inches above the highest or forty inches below the lowest communications attachment. All splices and connections in the cable shall be insulated.

(7) Requirements for vertical communication conductors passing through supply space on jointly used structures. All vertical runs of communication conductors passing through supply space shall be installed as follows.

(a) Metal-sheathed communication cables. Vertical runs of metal-sheath communication cables shall be covered with wood molding, or other suitable nonmetallic material, where they pass trolley feeders or other supply line conductors. This nonmetallic covering shall extend from a point forty inches above the highest trolley feeders, or other supply conductors, to a point six feet below the lowest trolley feeders or other supply conductors, but need not extend below the top of any mechanical protection which may be provided near the ground.

Note: Communication cables may be run vertically on the pole through space occupied by railroad signal supply circuits in the lower position, as permitted in WAC 296-44-19409 (2)(b), without nonmetallic covering within the supply space.

(b) Communication conductors. Vertical runs of insulated communication conductors shall be covered with wood molding, or other suitable nonmetallic material, to the extent required for metal-sheathed communication cables in WAC 296-44-21295 (7)(a) where such conductors pass trolley feeders or other supply conductors.

Note: Communication conductors may be run vertically on the structure through space occupied by railroad-signal supply circuits in the lower position, as permitted in WAC 296-44-19409 (2)(b), without nonmetallic covering within the supply space.

(c) Communication grounding conductors. Vertical communication grounding conductors shall be covered with wood molding or other nonmetallic material between points at least six feet below and forty inches above any trolley feeders or other supply line conductors by which they pass.

Note: Communication grounding conductors may be run vertically on the structure through space occupied by railroad-signal supply circuits in the lower position, as permitted in WAC 296-44-19409 (2)(b), without nonmetallic covering within the supply space.

(d) Separation from through bolts. Vertical runs of communication conductors shall have a clearance of one-eighth of the pole circumference but not less than two inches from through bolts and other metal objects attached thereto which are associated with supply line equipment.

Note: Vertical runs of effectively grounded communications conductors may have a separation of one inch from the end of supply through bolts.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-21295, filed 7/25/86.]

WAC 296-44-242 Grades of construction.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-242, filed 7/25/86.]

WAC 296-44-24205 General. (1) The grades of construction are specified in this section on the basis of the required strengths for safety. Where two or more conditions define the grade of construction required, the grade used shall be the highest one required by any of the conditions.

(2) For the purposes of this section, the voltage values for direct-current circuits shall be considered equivalent to the rms values for alternating-current circuits.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-24205, filed 7/25/86.]

WAC 296-44-24213 Application of grades of construction to different situations. (1) Supply cables. For the purposes of these rules, supply cables are classified by two types as follows:

Type 1

Supply cables conforming to WAC 296-44-21209 (3)(a), (b) or (c) shall be installed in accordance with WAC 296-44-27821 (9)(a).

Type 2

All other supply cables are required to have the same grade of construction as open-wire supply conductors of the same voltage.

(2) Order of grades. The relative order of grades for supply and communication conductors and supporting structures is B, C, and N, Grade B being the highest.

Grade D is specified only for communication lines, and here it is higher than Grade N. Grade D cannot be directly compared with Grades B and C, but subsection (3)(c)(ii) of this section provides for conditions when such a combination of construction requirements exists.

(3) At crossings. Wires, conductors, or other cables of one line are considered to be at crossings when they cross over another line, whether or not on a common supporting structure, or when they cross over or overhang a railroad track or the traveled way of a limited access highway. Joint–use or collinear construction in itself is not considered to be at crossings.

Table 242–1. Grades of Construction for Communication Conductors Crossing Over Railroad Tracks and Supply Lines

When crossing over	Communication conductor grades
Railroad tracks and supply lines of 0 to 750 V to ground, or Type 1 supply cables of all voltages	D
Railroad tracks and supply lines exceeding 750 V to ground	B

(a) Grade of upper line. Conductors and supporting structures of a line crossing over another line shall have the grade of construction specified in subsection (3)(c) of this section, WAC 296–44–24221 and 296–44–24233.

(b) Grade of lower line. Conductors and supporting structures of a line crossing under another line need only have the grades of construction which would be required if the line at the higher level were not there.

(c) Multiple crossings.

(i) Where a line crosses in one span over two or more other lines, or where one line crosses over a span of a second line, which span in turn crosses a span of a third line, the grade of construction of the uppermost line shall be not less than the highest grade which would be required of either one of the lower lines when crossing the other lower line.

(ii) Where communication conductors cross over supply conductors and railroad tracks in the same span, the grades of construction shall be in accordance with those listed in Table 242–1. It is recommended that the placing of communication conductors above supply conductors generally be avoided unless the supply conductors are trolley–contact conductors and their associated feeders.

(4) Conflicts (see definitions). The grade of construction of the conflicting structure shall be as required by WAC 296–44–24233 (1)(e).

Table 242–1. Grades of Construction for Communication Conductors Crossing Over Railroad Tracks and Supply Lines

When crossing over	Communication conductor grades
Railroad tracks and supply lines of 0 to 750 V to ground, or Type 1 supply cables of all voltages	D
Railroad tracks and supply lines exceeding 750 V to ground	B

TABLE 242-2

GRADES OF CONSTRUCTION FOR SUPPLY CONDUCTORS ALONE, AT CROSSING, OR ON THE SAME STRUCTURES WITH OTHER CONDUCTORS

(The voltages listed in this table are phase to ground values for: effectively grounded a. c. circuits, two wire grounded circuits, or center grounded d. c. circuits; otherwise phase to phase values shall be used. The grade of construction for supply conductors, as indicated across the top of the table, must also meet the requirements for any lines at lower levels except when otherwise noted).

Supply Conductors at higher levels [1] / Conductors, tracks and rights of way at lower levels	Constant-potential supply conductors								Constant current supply conductors		Communication conductors used exclusively in the operation of and run as supply lines
	0 - 0.75 kV		0.75 - 8.7 kV				Exceeding 8.7 kV				
	Urban	Rural	Urban		Rural		Urban		Rural				
	Open or Cable	Open or Cable	Open	Cable	Open	Cable	Open	Cable	Open	Cable	Open	Cable	Open or Cable
Exclusive private rights-of-way	N	N	[2]N	N	N	N	[2]N	[2]N	N	N	B, C, or N; see WAC 296-44-24221(1)		C or N; see WAC 296-44-24221(3)
Common or public rights-of-way	N	N	C	N	N	N	[3]C	C	N	N			
Railroad tracks and limited access highways	B	B	B	B	B	B	B	B	B	B	B	B	B
Constant potential supply conductors 0 to 750 V Open or cable	N	N	C	N	N	N	[3]C	C	[4]C	N	B, C, or N; see WAC 296-44-24221(1)		B, C, or N; see WAC 296-44-242221(3)
750 V to 8.7 kV Open	[5]C	N	C	C	N	N	[3]C	C	N	N			
Cable	N	N	C	N	N	N	[3]C	C	N	N			
Exceeding 8.7 kV Open	[5]B	[5]C	B	B	N	N	[3]C	C	N	N			
Cable	[5]C	N	C	N	N	N	[3]C	C	N	N			
Constant current supply conductors: Open or cable	B, C, or N; see WAC 296-44-24221(1)										B,C,or N; see WAC 296-44-24221(1)		B,C,or N; see WAC 296-44-24221(1) & 296-24-24221(3)
Communication conductors: Open or cable, used exclusively in the operation of supply lines [10]	B, C, or N; see WAC 296-44-24221(3)										B,C,or N; see WAC 296-44-24221(1) & 296-44-24221(3)		B,C,or N; see WAC 296-44-24221(3)
Communication conductor: Urban or rural, open or cable [6]	N	N	[7][8]B C		[7][8]B C		[8]B C		[8]B C		[8][9] B	C or N; see WAC 296-44-24221(1)	B, C, or N; see WAC 296-44-24221(3)

[1] The words "open" and "cable" appearing in the headings have the following meanings as applied to supply conductors: Cable means the Type 1 cables described in subsection (1) of this section; open means open wire and Type 2 cables.

[2] Lines that can fall outside the exclusive private rights-of-way shall comply with the grades specified for lines not on exclusive private rights-of-way.

[3] Supply conductors shall meet the requirements of Grade B construction if the supply circuits will not be promptly deenergized, both initially and following subsequent breaker operations, in the event of a contact with lower supply conductors or other grounded objects.

[4] Grade N construction may be used if crossing over supply services only.

[5] If the wires are service drops, they may have Grade N sizes and tensions as set forth in Table 278-14.

[6] Grade N construction may be used where the communication conductors consist only of not more than one insulated twisted-pair or parallel-lay conductor, or where service drops only are involved.

[7] Grade C construction may be used if the voltage does not exceed 5.0 kV phase to phase or 2.9 kV phase to ground.

[8] The supply conductors need only meet the requirements of Grade C construction if both of the following conditions are fulfilled:

(1) The supply voltage will be promptly removed from the communication plant by deenergization or other means, both initially and following subsequent circuit breaker operations in the event of a contact with the communication plant.

(2) The voltage and current impressed on the communication plant in the event of a contact with the supply conductors are not in excess of the safe operating limit of the communication protective devices.

[9] Grade C construction may be used if the current cannot exceed 7.5 A or the open-circuit voltage of the transformer supplying the circuit does not exceed 2.9 kV.

[10] Communication circuits located below supply conductors shall not affect the grade of construction of the supply circuits.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-24213, filed 7/25/86.]

WAC 296-44-24221 Grades of construction for conductors. The grades of construction required for conductors are given in Tables 242-2 and 242-3. For the purpose of these tables certain classes of circuits are treated as follows:

(1) Constant-current circuit conductors. The grade of construction for conductors of a constant-current supply circuit involved with a communication circuit and not in Type 1 cable shall be based on either its current rating or on the open-circuit voltage rating of the transformer supplying such circuit, as set forth in Tables 242-2 and 242-3. When the constant current supply circuit is in Type 1 cable, the grade of construction shall be based on its nominal full-load voltage.

(2) Railway feeder and trolley-contact circuit conductors. Railway feeder and trolley contact circuit conductors shall be considered as supply conductors for the purpose of determining the required grade of construction.

(3) Communication circuit conductors used exclusively in the operation of supply lines. Communication circuit conductors used exclusively in the operation of supply lines shall have their grade of construction determined as follows:

(a) By the requirements for ordinary communication circuits when conforming to WAC 296-44-31783 (1)(c).

(b) By the requirements for supply circuits when defined by WAC 296-44-31783 (1)(d).

(4) Fire alarm circuit conductors. Fire alarm circuit conductors shall be considered as other communication circuit conductors except that they shall always meet Grade D construction where the span length is from zero to one hundred fifty feet and Grade C construction where the span length exceeds one hundred fifty feet.

(5) Neutral conductors of supply circuits. Supply-circuit neutral conductors, which are effectively grounded throughout their length and are not located above supply conductors of more than 750 volts to ground, shall have the same grade of construction as supply conductors of not more than 750 volts to ground, except that they need not meet any insulation requirements. Other neutral conductors shall have the same grade of construction as the phase conductors of the supply circuits with which they are associated.

Table 242-3. Grades of Construction for Communication Conductors Alone, or in Upper Position of Crossing or on Joint Poles

(The voltages listed in this table are phase to ground values for: effectively grounded ac circuits, two wire grounded circuits, or center grounded dc circuits; otherwise phase to phase values shall be used. The grade of construction for supply conductors, as indicated across the top of the table, must also meet the requirements for any lines at lower levels except when otherwise noted.) (Placing of communication conductors at higher levels at crossings, or on jointly used poles should generally be avoided, unless the supply conductors are trolley-contact conductors and their associated feeders.)

Conductors, tracks, and rights-of-way at lower levels	Communication conductors (Communication conductors, rural or urban, open or cable, including communication conductors run as such, but used exclusively in the operation of supply lines.)
Exclusive private right-of-way	N
Common or public rights-of-way	N
Railroad tracks and limited access highways	D
Constant potential supply conductors[1]	
0 to 750 V	
Open or cable	N
750 V to 2.9 kV	
Open or cable	C
Exceeding 2.9 kV	
Open	B
Cable	C
Constant current supply conductors[1]	
0 to 7.5 A	
Open[2]	C
Exceeding 7.5 A	
Open[2]	[3]B
Communication conductors, open or cable, used exclusively in the operation of supply lines	[4]B, C, or N
Communication conductors, open or cable, urban or rural	N

1 The words "open" and "cable" appearing in the headlines have the following meaning as applied to supply conductors: Cable means Type 1 cables as described in WAC 296-44-24213 (1)(a); open means open wire and also Type 2 cables, as described in WAC 296-44-24213 (1)(b).

2 Where constant current circuits are in Type 1 cable, the grade of construction shall be based on the nominal full-load voltage.

3 Grade C construction may be used if the open circuit voltage of the transformer supplying the circuit does not exceed 2.9 kV.

4 See subsection (3) of this section.

(6) Surge protection wires. Surge protection wires shall be of the same grade of construction as the supply conductors with which they are associated.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-24221, filed 7/25/86.]

WAC 296-44-24233 Grades of construction for line supports. (1) Structures. The grade of construction shall be that required for the highest grade of conductors supported except as modified by the following:

(a) The grade of construction of jointly used structures, or structures used only by communication lines, need not be increased merely because the communication wires carried on such structures cross over trolley-contact conductors of 0 to 750 volts to ground.

(b) Structures carrying Grade C or D fire alarm conductors, where alone, or where concerned only with other communication conductors, need meet only the requirements of Grade N.

(c) Structures carrying supply service drops of 0 to 750 volts to ground shall have at least the grade of construction required for supply line conductors of the same voltage.

(d) Where the communication lines cross over supply conductors and a railroad in the same span and Grade B is required by WAC 296-44-24213 (3)(c)(ii) for the communication conductors, due to the presence of railroad tracks, the grade of the structures shall be D.

(e) The grade of construction required for a conflicting structure (first circuit) shall be determined from the requirements of WAC 296-44-24221 for crossings. The conflicting structure's conductors (first circuit) shall be assumed to cross the other circuit's conductors (second circuit) for the purposes of determining the grade of construction required for the conflicting structure.

Note: The resulting structure grade requirement could result in a higher grade of construction for the structure than for the conductors carried thereon.

(2) Crossarms and support arms. The grade of construction shall be that required for the highest grade of conductors carried by the arm concerned except as modified by the following:

(a) The grade of construction of arms carrying only communication conductors need not be increased merely because the conductors cross over trolley-contact conductors of 0 to 750 volts to ground.

(b) Arms carrying Grade C or D fire alarm conductors, where alone or where concerned with other communication conductors, need meet only the requirements for Grade N.

(c) Arms carrying supply service drops of 0 to 750 volts to ground shall have at least the grade of construction required for supply line conductors of the same voltage.

(d) Where communication lines cross over supply conductors and a railroad in the same span and Grade B is required by WAC 296-44-24213 (3)(c)(ii) for the communication conductors due to the presence of railroad tracks, the grade of the arm shall be D.

(3) Pins, armless construction brackets, insulators, and conductor fastenings. The grade of construction for pins and armless construction brackets, insulators, and conductor fastenings shall be that required for the conductor concerned except as modified by the following:

(a) The grade of construction need not be increased merely because the supported conductors cross over trolley-contact conductors of 0 to 750 volts to ground.

(b) Grade N construction is sufficient when only Grade C or D fire alarm conductors or other communication conductors are concerned.

(c) Supply service drops of 0 to 750 volts to ground only require the same grade of construction as supply-line conductors of the same voltage.

(d) When Grade B construction is required by WAC 296-44-24213 (3)(c)(ii) for the communication conductors due to the presence of railroad tracks, Grade D construction shall be used when supporting communication lines which cross over supply conductors and a railroad in the same span.

(e) When communication conductors are required to meet Grade B or C, only the requirements for mechanical strength for these grades is required.

(f) Insulators for use on open conductor supply lines shall meet the requirements of WAC 296-44-295 for all grades of construction.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-24233, filed 7/25/86.]

WAC 296-44-263 Loading for Grades B, C, and D.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-263, filed 7/25/86.]

WAC 296-44-26309 General loading requirements and maps. (1) General.

(a) It is necessary to assume the loadings which may be expected to occur on a line because of wind and ice during all seasons of the year. These minimum weather loadings shall be the values of loading resulting from the application of subsection (2) or (3) of this section. Where both rules apply, the required loading shall be that which, when combined with the appropriate overload capacity factors, has the greater effect on strength requirements.

(b) Where construction or maintenance loads exceed those imposed by (a) of this subsection, which may occur more frequently in light loading areas, the assumed loadings shall be increased accordingly.

(c) It is recognized that loadings actually experienced in certain areas in each of the loading districts may be greater, or in some cases, may be less than those specified in these rules. In the absence of a detailed loading

analysis, no reduction in the loadings specified therein shall be made without approval of the administrative authority.

(2) Combined ice and wind loading. Three general degrees of loading due to weather conditions are recognized and are designated as heavy, medium, and light loading. Figure 263–1 shows the districts in the states in which these loadings are normally applicable.

Note: The localities are classified in the different loading districts according to the relative simultaneous prevalence of wind velocity and thickness of ice which accumulates on wires. Light loading is for places where little, if any, ice accumulates on wires.

Table 263–1 shows the minimum radial thicknesses of ice and the wind pressures to be used in calculating loadings. Ice is assumed to weigh fifty–seven pounds per cubic foot.

(3) Extreme wind loading. Figure 263–2 is a wind map of the United States which shows the minimum horizontal wind pressures to be used for calculating loads upon tall structures. For wind pressure at a specific location use a value not less than that of the nearest pressure line. If any portion of a structure or supported facilities is located in excess of sixty feet above ground or water level, these wind pressures shall be applied to the entire structure and supported facilities without ice covering.

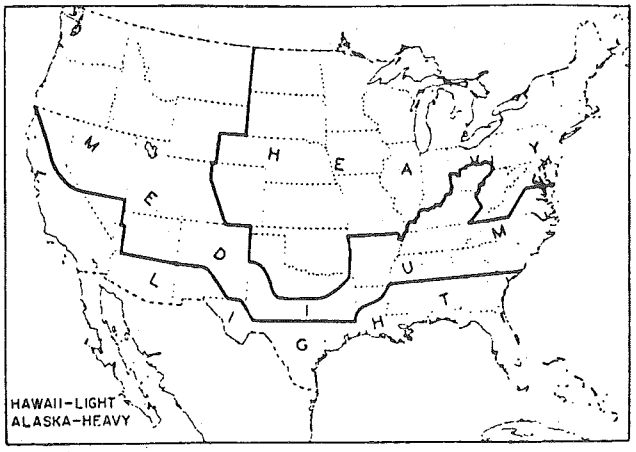
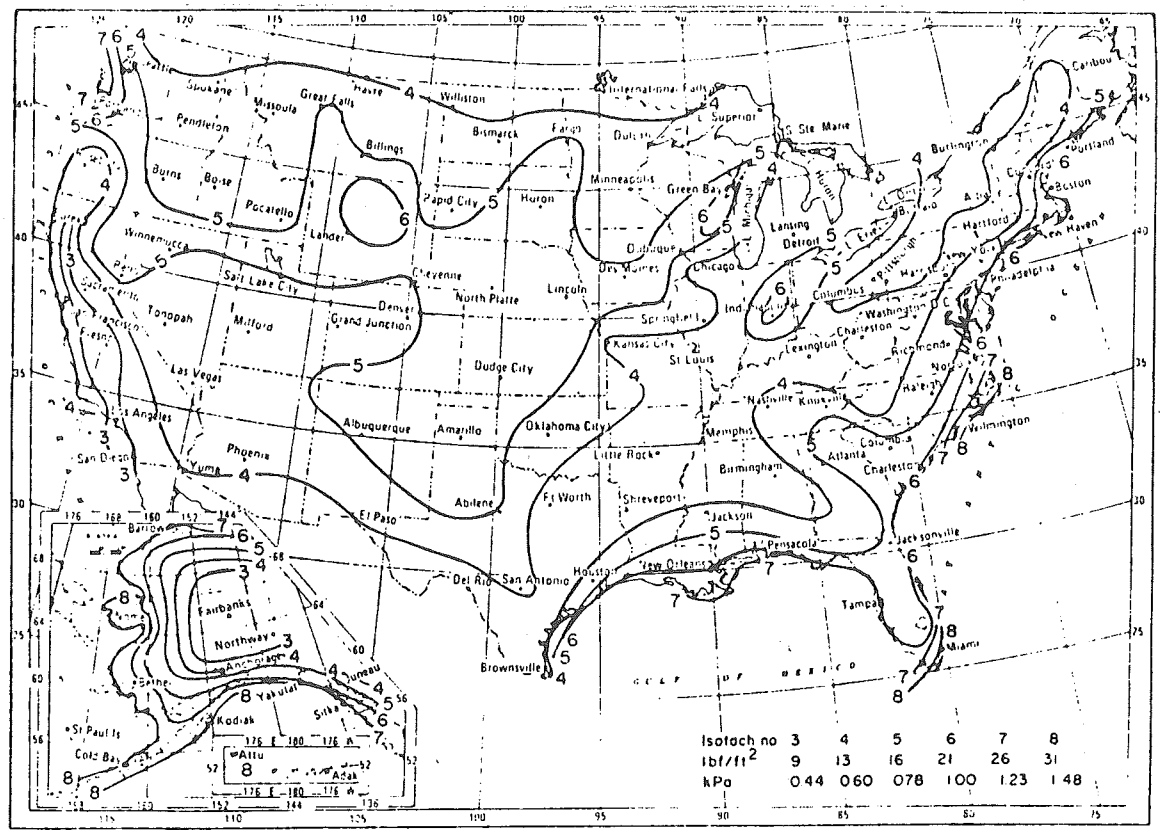


Fig. 263–1
General Loading Map of United States with Respect to Loading of Overhead Lines

Table 263–1 Ice, Wind and Temperature

	Loading Districts (for use with WAC 296-44-26309(2))			Extreme Wind Loading (for use with WAC 296-44-26309(3))
	Heavy	Medium	Light	
Radial thickness of ice (in)	0.50	0.25	0	0
Horizontal wind pressure in pounds per square foot	4	4	9	See Fig 250–2
Temperature (°F)	0	+15	+30	+60



Extreme Wind Pressure and Force Per Unit Area at 30 Feet Above Ground
(Based on Fastest Wind)

Note 1: The values of wind pressure given in Figure 263–2 represent the loading of wind upon cylindrical surfaces at thirty feet above ground level. They are based upon fifty year isotachs given in ANSI A58.1–1972 [6]. These have been converted from miles per hour to pressure on cylindrical surfaces by the formulas

pressure in lb/ft^2 $= 0.00256 \bullet (V mi/h)^2$
and rounding the values obtained.

Note 2: Wind velocity usually increases with height; therefore, experience may show that the wind pressures specified herein need to be further increased.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–26309, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296–44–26321 Conductor loading. (1) General. Ice and wind loads shall be as specified in WAC 296–44–26309.

(a) Where a cable is attached to a messenger, the specified loadings shall be applied to both cable and messenger.

(b) In determining wind loadings on a bare stranded conductor or multiconductor cable, the assumed projected area shall be that of a smooth cylinder whose outside diameter is the same as that of the conductor or cable.

Note: Experience has shown that as the size of multiconductor cable decreases, the actual projected area decreases, but the roughness factor increases and offsets the reduction in projected area.

(c) In determining loadings on ice–covered bare stranded conductor or multiconductor cables, the coating of ice shall be considered a hollow cylinder touching the outer strands of the bare stranded conductor or the outer circumference of the multiconductor cable. For bundled conductors, the coating of ice shall be considered as individual hollow cylinders around each subconductor.

(2) Loading components. The components of loading and total loading shall be as follows:

(a) Vertical loading component. The vertical load on a conductor or messenger shall be its own weight plus the

weight of conductors, spacers, or

Table 263-2 Temperatures and Constants

	Loading districts (for use with WAC 296-44-26309(2))			Extreme wind loading (for use with WAC 296-44-26309(3))
	Heavy	Medium	Light	
Temperature (°F)	0	+15	+30	+60
Constant to be added to the resultant (all conductors) in pounds per ft	0.30	0.20	0.05	0.0

equipment which it supports, ice covered where specified in WAC 296-44-26309.

(b) Horizontal loading component. The horizontal load shall be the horizontal wind pressure specified in WAC 296-44-26309 applied at right angles to the direction of the line to the projected area of the conductor or messenger and conductors, spacers, or equipment which it supports, ice covered where specified in WAC 296-44-26309.

(c) Total loading. The total load on a conductor or messenger shall be the resultant of Components 1 and 2 above, calculated at the temperature specified in Table 263-2, to which resultant has been added the constant specified in Table 263-2. In all cases the conductor or messenger tension shall be computed from this total loading.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-26321, filed 7/25/86.]

WAC 296-44-26333 Loads upon line supports. (1) Assumed vertical loading. The vertical loads upon poles, towers, foundations, crossarms, pins, insulators, and conductor fastenings shall be their own weight plus the superimposed weight which they support, including all wires and cables, in accordance with WAC 296-44-26321 (1) and (2)(a), together with the effect of any difference in elevation of supports. The radial thickness of ice shall be computed only upon wires, cables, and messengers, and not upon supports.

(2) Assumed transverse loading. The total transverse loading upon poles, towers, foundations, crossarms, pins, insulators, and conductor fastenings shall include the following.

(a) Transverse loading from conductors and messengers. The transverse loading from conductors and messengers shall be the horizontal loading specified in WAC 296-44-26321. For supporting structures carrying more than ten wires, not including cables supported by messengers, where the pin spacing does not exceed fifteen inches, the transverse wind load shall be calculated on two-thirds of the total number of such wires with a minimum of ten wires, except in light loading areas defined by WAC 296-44-26309.

(b) Structure loading. The transverse loading upon structures and equipment shall be computed by applying, at right angles to the direction of the line, the appropriate horizontal wind pressure given in WAC 296-44-26309. This pressure shall be applied upon the projected surfaces of the structures and equipment supported thereon, without ice covering. The following shape factors shall be applied.

(i) Cylindrical structures and components. Wind loads on straight or tapered cylindrical structures or structures composed of numerous narrow relatively flat panels which combine to form a total cross section that is approximately circular or elliptical in shape shall be computed from the assumed unit wind pressure specified in WAC 296-44-26309 applied to the projected area multiplied by a shape factor of 1.0.

(ii) Flat surfaced structures and components. Wind loads on flat surfaced structures, having solid or enclosed flat sides and an overall cross section that is substantially square or rectangular, shall be computed from the assumed unit wind pressures specified in WAC 296-44-26309 applied to the projected area of one face multiplied by a shape factor of 1.6 to allow for pressure on flat surfaces.

(iii) Latticed structures. Wind loads on essentially square or rectangular latticed structures or components shall be computed from the assumed unit wind pressures specified in WAC 296-44-26309 applied to the sum of the projected areas of the members of the front face multiplied by a shape factor of 3.2 to allow for wind pressure if structural members are flat surfaced or 2.0 if structural surfaces are cylindrical. The total, however, need not exceed the load which would occur on a solid structure of the same outside dimension.

Note: The shape factors listed under (b)(i), (ii) and (iii) of this subsection may be reduced if wind tunnel tests or rational aerodynamic analysis produce evidence that such a reduction is justifiable. In the absence of such tests or analyses, the factors given above shall be considered to be minimum values.

(c) At angles. Where a change in direction of wires occurs, the loading upon the structure, including guys, shall be assumed to be a resultant load equal to the vector sum of the transverse wind load as derived above and the resultant load imposed by the wires due to their change in direction. In deriving these loadings, a wind direction shall be assumed which will give the maximum resultant load, proper reduction being made in loading to account for the reduced wind pressure on the wires resulting from the angularity of the application of the wind to the wires.

(d) Span lengths. The calculated transverse load shall be based upon the average of the actual lengths of the two spans adjacent to the structure concerned.

(3) Assumed longitudinal loading.

(a) Change in grade of construction. The longitudinal loading upon supporting structures, including poles, towers, and guys at the ends of sections required to be of Grade B construction, when located in lines of lower than Grade B construction, shall be taken as an unbalanced pull in the direction of the higher grade section equal to the larger of the following values:

(i) The pull of two-thirds, and in no case less than two of the conductors which have rated breaking strength of three thousand pounds or less, such two-

thirds of the conductors being selected so as to produce the maximum stress in the support.

(ii) The pull of one conductor when there are eight or less conductors (including overhead ground wires) having rated breaking strength of more than three thousand pounds and the pull of two conductors when there are more than eight conductors, such conductors being selected so as to produce the maximum stress in the support.

(b) Jointly used poles at crossings over railroads, communication lines, or limited access highways. Where a joint line crosses over a railroad, a communication line, or a limited access highway, and Grade B is required for the crossing span, the tension in the communication conductors of the joint line shall be considered as limited to one–half their rated breaking strength, provided they are smaller than WG No. 8 Stl, if of steel, or AWG No. 6 if of copper.

(c) Dead ends. The longitudinal loading upon supporting structures at dead ends for line terminations shall be taken as an unbalanced pull equal to the tensions of all conductors and messengers (including overhead ground wires); except that with spans in each direction from the dead–end structure, the unbalance pull shall be taken as the difference in tensions.

(d) Unequal spans and unequal vertical loading. Where longitudinal loads can be created by the difference in tensions in the wires in adjacent spans caused by unequal vertical loading or unequal spans, the structures should be capable of supporting this unbalanced longitudinal loading.

(e) Stringing loads. Proper allowance should be made for longitudinal loads which may be produced on the structures by wire stringing operations.

(f) Longitudinal capability. It is recommended that structures having a longitudinal strength capability be provided at reasonable intervals along the line.

(g) Communication conductors on unguyed supports at railroad crossings and limited access highways. The longitudinal loading shall be assumed equal to an unbalanced pull in the direction of the crossing of all open–wire conductors supported, the pull of each conductor being taken as fifty percent of its rated breaking strength in the heavy loading district, thirty–three and one–third percent in the medium loading district, and twenty–two and one–fourth percent in the light loading district.

(4) Simultaneous application of loads. Where a combination of vertical, transverse, or longitudinal loads may occur simultaneously, the structure shall be designed to withstand the simultaneous application of these loads.

Note: Under the extreme wind conditions of WAC 296–44–26309(3), an oblique wind may require greater structural strength than that computed under subsections (2) and (3) of this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–26333, filed 7/25/86.]

PART F--INSTALLATION AND MAINTENANCE OF ELECTRIC SUPPLY AND COMMUNICATION LINES

WAC 296-44-278 Strength requirements.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–278, filed 7/25/86.]

WAC 296-44-27809 Preliminary assumptions. (1) It is recognized that deformation, deflections, or displacement of parts of the structure will, in some cases, change the effects of the loads assumed. In the calculation of stresses, allowance may be made for such deformation, deflection or displacement of supporting structures including poles, towers, guys, crossarms, pins, conductor fastenings, and insulators when the effects can be accurately evaluated. Such deformation, deflection, or displacement should be calculated using the WAC 296–44–26309 loads prior to application of the overload factors required by this section. For crossings or conflicts, the calculations shall be subject to mutual agreement.

(2) It is recognized that newly developed materials may become available. It is further recognized that, while these materials are in the process of development, they must be tested and evaluated. Trial installations are permitted where qualified supervision is provided.

(3) The overload capacity factors shown in the tables of this section apply for the combined ice and wind loading conditions specified in WAC 296–44–26309(2). For the extreme wind loading condition specified in WAC 296–44–26309(3), an overload capacity factor of not less than 1.0 shall be applied for structures and their foundations, and 1.25 for other supported facilities.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–27809, filed 7/25/86.]

WAC 296-44-27821 Grades B and C construction. (1) Supporting structure. The strength requirements for supporting structures may be met by the structures alone or with the aid of guys and/or braces.

(a) Metal, prestressed, and reinforced concrete structures. The structures shall be designed to withstand the loads in WAC 296–44–26333 multiplied by the appropriate overload capacity factors given in Tables 278–1 or 278–2. (Where guys are used, see WAC 296–44–27821(3).)

(i) Minimum strength. All structures (including those below sixty feet) shall withstand, without conductors, the extreme wind pressure in WAC 296–44–26333, applied in any direction on the structure times an overload capacity factor of 1.0. A gust factor appropriate for the wind pressure and structure height should be considered.

(ii) Strength at angles in a line. At an angle in a line, the strength of the support shall be sufficient to withstand the total transverse loadings specified in WAC 296–44–26333 multiplied by the appropriate overload capacity factor for transverse strength given in Tables 278–1 or 278–2.

(b) Wood structures. Wood structures shall be of such material and dimensions as to meet the following requirements. (Where guys are used, see WAC 296-44-27821(3).)

(i) Designated fiber stress.

(A) Natural wood poles of various species meeting the requirements of ANSI 05.1-1979 [18], shall be considered as having the designated fiber stresses set forth in that standard.

(B) Appropriate adjustments in designated fiber stresses shall be made for sawn or laminated wood.

Table 278-1. Overload Capacity Factors for Reinforced Concrete Structures (Not Prestressed)

	Overload capacity factors	
	Grade B	Grade C
Vertical strength	4.0	2.67
Transverse strength		
Wind load	4.0	2.67
Wire tension load at angles	2.0	1.33
Longitudinal strength		
In general	1.0	no requirement
At dead ends	2.0	1.33

Note: The factors in this table apply for the loading conditions of WAC 296-44-26309(2). For extreme wind loading conditions see WAC 296-44-27809(3).

Table 278-2. Overload Capacity Factors for Metal and Prestressed Concrete Structures

	Overload capacity factors	
	Grade B	Grade C
Vertical strength	1.50	1.10
Transverse strength		
Wind load	2.50	2.20
Wire tension load at angles	1.65	1.10
Longitudinal strength		
At crossings		
In general	1.10	no requirement
At dead ends	1.65	1.10
Elsewhere		
In general	1.00	no requirement
At dead ends	1.65	1.10

Note: The factors in this table apply for the loading conditions of WAC 296-44-26309(2). For extreme wind loading conditions, see WAC 296-44-27809(3).

(ii) Transverse and vertical strength. Wood structures shall be designed to withstand the transverse and vertical loads in WAC 296-44-26333, multiplied by the appropriate overload capacity factor given in Table 278-3, without exceeding the designated fiber stress.

Note: When installed, naturally grown wood poles acting as single based structures or unbraced multiple pole structures, shall meet the requirements of WAC 296-44-27821 (1)(b)(ii) or (iii) without exceeding the designated fiber stress at the ground line for unguyed poles or at the point of attachment for guyed poles.

(iii) Longitudinal and dead-end strength. Wood structures shall be designed to withstand the longitudinal and dead-end loadings in WAC 296-44-26333 multiplied by the appropriate overload capacity factor in Table 278-3 without exceeding the designated fiber stress.

Note 1: At a Grade B crossing, in a straight section of line, wood structures complying with the transverse strength requirements of WAC 296-44-27821 (1)(b)(ii), without the use of transverse guys shall be considered as having the required longitudinal strength, providing the longitudinal strength is comparable to the transverse strength of the structure. This exception does not modify the requirements of this rule for dead-ends.

Note 2: At a Grade B crossing of a supply line over a highway or a communication line where there is an angle in the supply line, wood structures shall be considered as having the required longitudinal strength if all of the following conditions are met:

(A) The angle is not over twenty degrees.

(B) The angle structure is guyed in the plane of the resultant of the conductor tensions. The tension in this guy under the loading in WAC 296-44-26333 multiplied by an overload capacity factor of 2.0 shall not exceed the allowable guy value specified in WAC 296-44-27821(3).

(C) The angle structure has sufficient strength to withstand, without guys, the transverse loading of WAC 296-44-26333, which would exist if there were no angle at that structure with an overload capacity factor of 4.0 when installed or 2.67 at replacement.

Note 3: When installed, naturally grown wood poles acting as single based structures or unbraced multiple pole structures, shall meet the requirements of WAC 296-44-27821 (1)(b)(ii) or (iii) without exceeding the designated fiber stress at the ground line for unguyed poles or at the point of attachment for guyed poles.

(iv) Strength at angles in a line. At an angle in the line, the wood structure shall be designed to withstand the total transverse loading in WAC 296-44-26333 multiplied by the appropriate overload capacity factor given in Table 278-3 without exceeding the designated fiber stress.

Table 278-3 Overload Capacity Factors for Wood Structures

	Grade B		Grade C	
	When installed	At replacement	When installed	At replacement
Transverse (wind) and Vertical strength				
At crossings	4.0	2.67	2.67	1.33
Elsewhere	4.0	2.67	2.00	1.33

	Grade B		Grade C	
	When installed	At replacement	When installed	At replacement
Transverse (wire tension load) strength				
At crossings	2.0	1.33	1.33	1.00
Elsewhere	2.0	1.33	1.33	1.00
Longitudinal Strength				
In general	1.33	1.00	no requirement	no requirement
At dead-ends	2.00	1.33	1.33	1.00

Notes: (1) Where structures are built for temporary service the overload capacity factors at replacement may be used provided that the designated fiber stress is not exceeded during the life of the structure.
(2) The factors in this table apply for the loading conditions of WAC 296-44-26309(2). For extreme wind loading conditions, see WAC 296-44-27809(3).
(3) Metal portions of a structure, except guys, may use the overload capacity factors for metal shown in Table 278-2.

(v) Strength of guyed poles. Guyed poles shall be designed as columns, resisting the vertical component of the tension in the guy plus any other vertical loads on such poles.

(vi) Spliced and stub-reinforced poles. The use of stub reinforcements or permanent splices at any section along the pole that develops the required strength of the pole is permitted, provided the remainder of the pole is in good condition and is of sufficient size to develop its required strength.

(vii) Average strength of three poles. A pole (single-base structure) not individually meeting the transverse strength requirements will be permitted when reinforced by a stronger pole on each side, if the average strength of the three poles meets the transverse strength requirements, and the weak pole has not less than seventy-five percent of the required strength. An extra pole inserted in a normal span for the purpose of supporting a service drop may be ignored.

Note: This rule does not apply to crossings over railroads, communication lines, or limited access highways.

(c) Transverse-strength requirements for structures where side guying is required, but can only be installed at a distance.

Grade B: In the case of structures where, because of very heavy or numerous conductors or relatively long spans, the transverse-strength requirements of this section cannot be met except by the use of side guys or special structures, and if it is physically impractical to employ side guys, the transverse-strength requirements may be met by side-guying the line at each side of, and as near as practical to, the crossing, or other transversely weak structure, and with a distance between such side-guyed structures of not over eight hundred feet provided that:

(i) The side-guyed structures for each such section of eight hundred feet or less shall be constructed to withstand the calculated transverse load due to wind on the supports and ice-covered conductors, on the entire section between the side-guyed structures.

(ii) The line between such side-guyed structures shall be substantially in a straight line and the average length of span between the side-guyed structures shall not exceed one hundred fifty feet.

(iii) The entire section between the transversely strong structures shall comply with the highest grade of construction concerned in the given section, except as to the transverse strength of the intermediate poles or towers.

Grade C: The above provisions do not apply to Grade C.

(d) Longitudinal-strength requirements for sections of higher grade in lines of a lower grade construction.

(i) Methods of providing longitudinal-strength.

Grade B: The longitudinal-strength requirements for sections of line of higher grade in lines of a lower grade (for assumed longitudinal loading, see WAC 296-44-26333) may be met by placing supporting structures of the required longitudinal-strength at either end of the higher grade section of the line.

Where this is impractical, the supporting structures of the required longitudinal-strength may be located one or more span lengths away from the section of higher grade, within five hundred feet on either side and with not more than eight hundred feet between the longitudinally strong structures, provided such structures and the line between them meet the requirements as to transverse strength and stringing of conductors, of the highest grade occurring in the section, and provided that the line between the longitudinally strong structure is approximately straight or suitably guyed.

The requirements may also be met by distributing the head guys over two or more structures on either side of the crossing, such structures and the line between them complying with the requirements for the crossing as to transverse strength and as to conductors and their fastenings. Where it is impractical to provide the longitudinal-strength, the longitudinal loads shall be reduced by increasing the conductor sags. This may require greater conductor separations. (See WAC 296-44-21265(2).)

Grade C: The above provisions do not apply to Grade C.

(ii) Flexible supports.

Grade B: When supports of the section of higher grade are capable of considerable deflection in the direction of the line, as with wood or concrete poles, or some types of metal poles and towers, it may be necessary to increase the normal clearances specified in WAC 296-44-212 or to provide head guys or special reinforcement to prevent such deflection.

Flexible metal structures may have to be head-guyed or otherwise reinforced to prevent reduction in the clearances required in WAC 296-44-212.

Grade C: The above provision does not apply to Grade C.

Table 278–4. Overload Capacity Factors for Foundations and Settings

	Overload capacity factors	
	Grade B	Grade C
Vertical strength	1.5	1.1
Transverse strength		
Wind load	2.5	2.2
Wire tension load	1.65	1.1
Longitudinal strength		
In general	1.1	1.0
At dead ends	1.65	1.1

Note: The factors in this table apply for the loading conditions of WAC 296–44–26309(2). For extreme wind loading conditions, see WAC 296–44–27809(3).

(2) Strength of foundations and settings. The loadings in WAC 296–44–26333 multiplied by the overload factors given in Table 278–4 shall be applied to the structure. Foundations and settings shall be designed or be determined by experience to withstand the reactions resulting from these applied loadings.

Note: Excessive movement of foundations and guy anchors may reduce structure strength or impair clearances.

(3) Strength of guys and guy anchors. The general requirements for guys and guy insulators are covered under WAC 296–44–31729 and 296–44–31738, respectively. Guy anchors shall withstand the loads in WAC 296–44–26333 multiplied by the overload factors given in Table 278–5.

(a) Metal and prestressed concrete structures. Guys shall be considered as an integral part of the structure and shall withstand the loads in WAC 296–44–26333, multiplied by the overload factors given in Table 278–2, without exceeding ninety percent of the rated breaking strength of the guy.

(b) Wood and reinforced concrete poles and structures. When guys are used to meet the strength requirements they shall be considered as taking the entire load in the direction in which they act, the structure acting as a strut only, except for those structures considered to possess sufficient rigidity so that the guy can be considered an integral part of the structure.

Table 278–5. Overload Capacity Factors for Guys

	Overload capacity factors	
	Grade B	Grade C
Transverse strength		
Wind load	2.67	2.0
Wire tension load	1.5	1.15
Longitudinal strength (except at angles)		
In general	1.0	no requirement
At dead ends	[1]1.5	[1]1.15

[1] If deflection of supporting structures is taken into account in the computations, the overload capacity factors of 1.5 shall be increased to 1.67; 1.15 shall be increased to 1.33.

Note: The factors in the table apply for the loading conditions of WAC 296–44–26309(2). For extreme wind loading conditions, see WAC 296–44–27809(3).

(i) Guys shall be of such material and dimension to withstand the loads in WAC 296–44–26333, multiplied by the overload capacity factors given in Table 278–5 without exceeding ninety percent of the rated breaking strength of the guy.

(ii) At an angle in the line, the guy shall be of such material and dimension to withstand the total transverse loads in WAC 296–44–26333, multiplied by the overload capacity factors given in Table 278–5 without exceeding ninety percent of the rated breaking strength of the guy.

(4) Crossarms.

(a) Vertical strength. Crossarms shall withstand the vertical loads specified in WAC 296–44–26333 without exceeding fifty percent of the designated fiber stress of the material (or ultimate strength) where applicable.

(b) Bracing. Crossarms shall be securely supported by bracing, if necessary, so as to support safely all expected loads to which they may be subjected in use including line personnel working on them.

Table 278–6. Minimum Dimensions of Crossarm Cross Section

Number of pins	Grades of construction		
	Grade B	Grade C	
		Supply	Communication
2 or 4 in:	3 X 4	2 3/4 X 3 3/4	—
6 or 8 in:	3 1/4 X 4 1/4	3 X 4	—
6 in:	—	—	2 3/4 X 3 3/4
10 in:	—	—	3 X 4

(c) Longitudinal strength.

(i) General. Crossarms shall withstand without exceeding their designated fiber stress (or ultimate strength), the applicable longitudinal loads given in WAC 296–44–26333, or seven hundred pounds applied at the outer conductor attachment points, whichever is greater. At each end of a transversely weak section, as described in WAC 296–44–27821 (1)(c), the longitudinal load shall be applied in the direction of the weak section.

(ii) Methods of meeting WAC 296–44–27821 (4)(c).
Grade B: Where conductor tensions are limited to a maximum of two thousand pounds per conductor, double wood crossarms having cross sections specified in Table 278–6 and properly assembled, will be considered as meeting the strength requirements specified in WAC 296–44–27821 (4)(d)(i).
Grade C: This requirement is not applicable.

(d) Material and minimum size. Wood crossarms of selected Southern pine or Douglas fir shall have a cross section of not less than those shown in Table 278–6. Crossarms of other suitable timber or of other materials may be used provided they are of equivalent strength.

(e) Double crossarms or brackets.

Grade B: Where pin type construction is used, double crossarms or a support assembly of equivalent strength shall be used at each crossing structure, at ends of joint use or conflict sections, at dead ends and at corners where the angle of departure from a straight line exceeds twenty degrees. Under similar conditions, where a bracket supports a conductor operated at more than 750 volts to ground and there is no crossarm below, double brackets shall be used.

Note: The above does not apply where communication cables or conductors cross below supply conductors and either are attached to the same pole, or where supply conductors are continuous and of uniform tension in the crossing span and each adjacent span. This exception does not apply to railroad crossings and limited access highways except by mutual agreement.

Grade C: The above requirement is not applicable.

(f) Location. At crossings, crossarms should be attached to the face of the structure away from the crossing, unless special bracing or double crossarms are used.

(5) Metal crossarms. Metal crossarms shall withstand the loads in WAC 296-44-26333 multiplied by the overload capacity factors in Table 278-2.

(6) Strength of pin type or similar construction and conductor fastenings.

(a) Longitudinal strength.

(i) General. Pin type or similar construction and ties or other conductor fastenings shall withstand the applicable longitudinal loads given in WAC 296-44-26333, or seven hundred pounds applied at the pin, whichever is greater. At each end of a transversely weak section as described in WAC 296-44-27821 (1)(c), the longitudinal load shall be applied in the direction of the weak section.

Grade C: No requirement.

(ii) Method of meeting WAC 296-44-27821 (6)(a)(i).

Grade B: Where conductor tensions are limited to two thousand pounds and such conductors are supported on pin insulators, double wood pins and ties or their equivalent, will be considered to meet the requirements of WAC 296-44-27821 (6)(a)(i).

Grade C: No requirement.

(iii) At dead ends and at ends of higher grade construction in line of lower grade.

Grade B: Pins and ties or other conductor fastenings connected to the structure at a dead end or at each end of the higher grade section shall be of sufficient strength to withstand at all times without exceeding their ultimate strength, an unbalanced pull due to the conductor loading specified in WAC 296-44-26321.

Grade C: This requirement is not applicable except for dead ends.

(iv) At ends of transversely weak sections.

Grade B: Pins and ties or other conductor fastenings connected to the structure at each end of the transversely weak section as described in WAC 296-44-27821 (1)(c) shall be such as to withstand at all times without exceeding their ultimate strength, the unbalanced pull in the direction of the transversely weak section of the conductor supported, under the loading prescribed in WAC 296-44-26321.

Grade C: No requirement.

(b) Double pins and conductor fastenings.

Grade B: Where wood pins are used, double pins and conductor fastenings shall be used where double crossarms or brackets are required by WAC 296-44-27821 (4)(e).

Note: The above does not apply where communication cables or conductors cross below supply conductors and either are attached to the same pole, or where supply conductors are continuous and of uniform tension in a crossing span and each adjacent span. This exception does not apply in the case of railroad crossings and limited access highway crossings except by mutual agreement.

Grade C: No requirement.

(c) Single supports used in lieu of double wood pins. A single conductor support and its conductor fastening when used in lieu of double wood pins shall develop strength equivalent to double wood pins and their conductor fastenings as specified in WAC 296-44-27821 (6)(a)(i).

(7) Armless construction.

(a) General. Open conductor armless construction is a type of open conductor supply line construction in which conductors are individually supported at the structure without the use of crossarms.

(b) Insulating material. Strength of insulating material shall meet the requirements of WAC 296-44-295.

(c) Other components. Strengths of other components shall meet the appropriate requirements of WAC 296-44-27809 and 296-44-27821.

(8) Open supply conductors.

(a) Minimum sizes of supply conductors. Supply conductors shall have a rated breaking strength and an overall diameter of metallic conductor not less than that of medium-hard-drawn copper of the AWG size shown in Table 278-7 except that conductors made entirely of bare or galvanized iron or steel shall have an overall diameter not less than Stl. WG of the gage sizes shown.

Note 1: At railroad crossings, for stranded conductors, other than those in which a central core is entirely covered by the outside wires, any individual wire of such a stranded conductor containing steel shall be not less than 0.100 inch in diameter if copper or aluminum clad and not less than 0.115 inch in diameter if otherwise protected or if bare.

Note 2: Service drops of 0 to 750 volts to ground may have the sizes set forth in WAC 296-44-27847(5).

(b) Sags and tensions. Conductor sags shall be such that, under the assumed loading of WAC 296-44-26321 for the district concerned, the tensions of the conductor shall not be more than sixty percent of its rated breaking strength. Also the tension at 60°F without external load, shall not exceed the following percentages of the conductor rated breaking strength:

Initial unloaded tension	35 percent
Final unloaded tension	25 percent

Table 278-7. Minimum Conductor Sizes

Grade of Construction	Gage Size[1]
B	6
C	8

[1] For No. 6 and No. 8 medium-hard-drawn copper wire, the nominal diameters are 0.1620 and 0.1285 inches and the minimum values of breaking load are one thousand ten pounds and 643.9 pounds respectively. For steel wire gage, the nominal diameters are 0.192 inches for No. 6 and 0.162 inches for No. 8.

Note: In the case of conductors having a cross-section of a generally triangular shape, such as cables composed of three wires, the final unloaded tension at 60°F shall not exceed thirty percent of the rated breaking strength of the conductor.

Note 1: The above limitations are based on the use of recognized methods for avoiding fatigue failures by minimizing chafing and stress concentration. If such practices are not followed, lower tensions should be employed.

Note 2: The factors listed above apply for the loading conditions of WAC 296-44-26309(2). For extreme wind loading conditions, see WAC 296-44-27809(3).

(c) Splices, taps, and dead-end fittings.

(i) Splices should be avoided in crossings and adjacent spans. If it is impractical to avoid such splices, they shall be of such a type and so made as to have a strength substantially equal to that of the conductor on which they are placed.

(ii) Taps should be avoided in crossing spans but if required shall be of a type which will not impair the strength of the conductors to which they are attached.

(iii) Dead-end fittings, including the attachment hardware, shall have sufficient strength to withstand the maximum tension resulting from the loads in WAC 296-44-26321 multiplied by an overload factor of 1.65.

(d) Trolley-contact conductors. In order to provide for wear, no trolley-contact conductor shall be installed of less size than AWG No. 0, if of copper, or AWG No. 4, if of silicon bronze.

(9) Supply cable messengers. Messengers shall be stranded and shall not be stressed beyond sixty percent of their rated breaking strength under the loadings specified in WAC 296-44-26321.

Note 1: There are no strength requirements for cables supported by messengers.

Note 2: Bonding and grounding requirements for Type 1 supply cables are in WAC 296-44-182.

Note 3: The factor in WAC 296-44-27821 (9)(a) applies for the loading conditions of WAC 296-44-26321, except when the extreme wind loading conditions, WAC 296-44-27809(3), apply.

(10) Open-wire communication conductors. Open-wire communication conductors in Grade B or C construction shall have the sizes and sags given in WAC 296-44-27821 (8)(a) and (b) for supply conductors of the same grade.

Note: When open-wire communication conductors in spans of one hundred fifty feet or less are above supply circuits of 5 kilovolts or less between conductors, Grade C sizes and sags may be replaced by Grade D sizes and sags, except that where the supply conductors are trolley-contact conductors of 0 to 750 volts to ground, WG No. 12 Stl. may be used for spans of zero to one hundred feet and WG No. 9 Stl. may be used for spans of one hundred twenty-five to one hundred fifty feet.

(11) Communication cables.

(a) Communication cables. There are no strength requirements for such cables supported by messengers.

(b) Messenger. The messenger shall not be stressed beyond sixty percent of its rated breaking strength under the loadings specified in WAC 296-44-26321.

(12) Paired communication conductors.

(a) Paired conductors supported on messenger.

(i) Use of messenger. A messenger may be used for supporting paired conductors in any location, but is only required for paired conductors crossing over trolley-contact conductors of more than 7.5 kilovolts to ground.

(ii) Sag of messenger. Messenger used for supporting paired conductors required to meet Grade B construction because of crossing over trolley-contact conductors shall meet the sag requirements for Grade D messengers.

(iii) Size and sag of conductors. There are no requirements for paired conductors when supported on messenger.

(b) Paired conductors not supported on messenger.

(i) Above supply lines.

Grade B: Sizes and sags shall be not less than those required by WAC 296-44-27821 (8)(a) and (b) for supply conductors of similar grade.

Grade C: Sizes and sags shall be not less than the following:

Spans zero to one hundred feet—No sag requirements.

Each conductor shall have a rated breaking strength of not less than one hundred seventy pounds.

Spans one hundred to one hundred fifty feet—Sizes and sags shall be not less than required for Grade D communication conductors.

Spans exceeding one hundred fifty feet—Sizes and sags shall be not less than required for Grade C supply conductors. (See WAC 296-44-27821 (8)(b).)

(ii) Above trolley-contact conductors.

Grade B: Sizes and sags shall be not less than the following:

Spans zero to one hundred feet—No size requirements.

Sags shall be not less than for AWG No. 8 hard-drawn copper. (See WAC 296-44-27821 (8)(b).)

Spans exceeding one hundred feet—Each conductor shall have a rated breaking strength of not less than one hundred seventy pounds.

Sags shall be not less than for AWG No. 8 hard-drawn copper. (See WAC 296-44-27821 (8)(b).)

Grade C: Sizes and sags shall be as follows:

Spans zero to one hundred feet—No requirements.

Spans exceeding one hundred feet—No sag requirements.

Each conductor shall have a rated breaking strength of not less than one hundred seventy pounds.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-27821, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-27833 Grade D construction. (1) Poles.

(a) Designated fiber stress. Natural wood poles of various species meeting the requirements of ANSI 05.1-1979 [18] shall be considered as having the designated fiber stresses set forth in that standard.

(b) Strength of unguyed poles. Unguyed poles shall withstand the vertical and transverse loads in WAC 296-44-26333 (1) and (2), and the longitudinal loads in WAC 296-44-26333 (3)(g), multiplied by the overload capacity factors given in Table 278-8 without exceeding the designated fiber stress.

(c) Strength of guyed poles. Guyed poles shall be designed as columns, resisting the vertical component of the tension in the guy plus any other vertical loads on such poles.

(d) Spliced and stub-reinforced poles. The use of stub-reinforcements or permanent splices at any section along the pole that develops the required strength of the pole is permitted, provided the remainder of the pole is in good condition and is of sufficient size to develop its required strength.

Table 278-8. Overload Capacity Factors for Unguyed Wood Poles

	Overload capacity factors
Vertical and transverse strength	
When installed	4.0
At replacement	2.67
Longitudinal strength	
When installed	1.33
At replacement	1.0

Note: The factors in this table apply for the loading conditions of WAC 296-44-26309(2). For extreme wind loading conditions, see WAC 296-44-27809(3).

(2) Pole settings. Foundations and settings for unguyed poles shall be such as to withstand the loads assumed in WAC 296-44-26333 (1), (2) and (3).

(3) Guys.

(a) General. The general requirements for guys are covered in WAC 296-44-31729 and 296-44-31738.

(b) Side guys. Side guys or braces shall be installed on poles supporting the crossing span where required to withstand the loads specified in WAC 296-44-26333.

Note 1: Side guys are not required where the crossing poles have the transverse strength specified in WAC 296-44-27833 (1)(b) without the reduction for conductor shielding otherwise allowed in WAC 296-44-26333 (2)(a).

Note 2: Where a line crossing a railroad or highway changes direction more than ten degrees at either crossing support, the side guy within the angle may be omitted.

Note 3: This rule does not apply to crossing poles under the special conditions set forth in WAC 296-44-27833 (3)(e).

(c) Longitudinal guys. Longitudinal (head) guys shall be provided where required to meet the longitudinal strength requirements of WAC 296-44-26333.

Note: Longitudinal guys are not required where the crossing poles have the longitudinal strength specified in WAC 296-44-27833 (1)(b), or for lines carrying only aerial cable. For lines carrying both open wire and aerial cable, head guying is required only for the number of open wires in excess of ten if the cable is supported by a six thousand pound messenger, or for the number of open wires in excess of twenty if the cable is supported by a ten thousand pound or stronger messenger.

(d) Strength of guys.

(i) Guys shall be of such material and dimensions to withstand the transverse and longitudinal loads in WAC 296-44-26333, multiplied by the overload capacity factors given in Table 278-9, without exceeding ninety percent of their rated breaking strength.

(ii) At an angle in the line, the guy shall be of such material and dimension to withstand the total transverse loads in WAC 296-44-26333, multiplied by the overload capacity factors given in Table 278-10 without exceeding ninety percent of the rated breaking strength of the guy.

Table 278-9. Overload Capacity Factors for Guys

	Overload capacity factors
Transverse strength	2.67
Longitudinal strength	
In general	1.0
At dead ends	1.5

Note: The factors in the table apply for the loading conditions of WAC 296-44-26309(2). For extreme wind loading conditions, see WAC 296-44-27809(3).

Table 278-10. Overload Capacity Factors for Guys at Angles in the Line

	Overload capacity factors Grade B
Transverse strength	
Wind load	2.67
Wire tension load	1.5

(e) Where guying is required but cannot be installed on the crossing pole. When the transverse-strength requirements cannot be met except by side-guys and it is physically impractical to employ side-guys, the transverse-strength requirements may be met by side-guying the line at each side of, and as near as is practical to, the crossing or other transversely weak structure, and with a distance between such side-guyed structures of not over eight hundred feet provided that:

(i) The side-guyed structures for each such section of eight hundred feet or less shall be constructed to withstand the calculated transverse load due to wind on the supports and ice covered conductors, on the entire section between the side-guyed structures.

(ii) The line between such side-guyed structures shall be substantially in a straight line and the average length

of span between the side-guyed structures shall not exceed one hundred fifty feet.

(iii) The entire section between the transversely strong structures shall comply with the highest grade of construction concerned in the given section, except as to the transverse strength of the intermediate structures.

(4) Crossarms.

(a) Material and minimum size. Wood crossarms of Southern pine or Douglas fir supporting the crossing span shall have a cross section not less than those shown in Table 278-11. Crossarms of other suitable timber or of other materials may be used provided they are of equivalent strength.

(b) Double crossarms. Double crossarms or a support of equivalent strength shall be used at each crossing pole.

Note: Single dead-end type crossarms may be used where it is necessary to dead-end conductors of the crossing span, provided such crossarms and associated dead-end fastenings are of sufficient size and strength to withstand the maximum tension of the conductors under the loading specified in WAC 296-44-26321 and provided further that the conductors are dead-ended on insulators so designed and installed that the conductor will not fall in the event of insulator breakage.

Table 278-11. Minimum Dimensions of Crossarm Cross Sections

Maximum number of wires to be carried	Nominal length		Cross section
	(ft)	(in)	(in)
2	1	4 1/2	2 5/16 by 3 5/16
4	3	4 1/2	2 5/16 by 3 5/16
6	6	0	2 3/4 by 3 3/4
10	8	6	2 3/4 by 3 3/4
10	10	0	3 by 4
[1]12	10	0	3 1/4 by 4 1/4
[2]16	10	0	3 1/4 by 4 1/4

[1] Where crossarms are bored for one-half inch steel pins, three inch by four and one-half inch crossarms may be used.

[2] Permitted in medium and light-loading districts only.

(5) Brackets and racks. Wood brackets may be used only in duplicate or if otherwise designed so as to afford two points of support for each conductor. Single metal brackets, racks, drive hooks or other fixtures may be used if designed and attached in such manner as to withstand the full dead-end pull of the wires supported.

(6) Pins.

(a) Strength. Insulator pins shall have sufficient strength to withstand all expected loads to which they may be subjected.

(b) Size.

(i) Wood pins. Wood pins shall be sound and straight grained with a diameter of shank not less than one and one-fourth inch.

(ii) Metal pins. Steel or iron pins shall have diameters of shank not less than one-half inch.

(7) Insulators. Each insulator shall be of such pattern, design, and material that when mounted it will withstand without injury and without being pulled off the pin, all expected loads to which they may be subjected.

(8) Conductors.

(a) Size. Conductors of the crossing span, if of hard-drawn copper or galvanized steel, shall have sizes not less than given in the specifications (i) and (ii) that follow. Conductors of material other than the above shall be of such size and so strung as to have a mechanical strength not less than that of the sizes of copper conductors given in specifications (i) and (ii) that follow.

(i) Ordinary span lengths. The sizes in Table 278-12 apply.

(ii) Long spans. If spans in excess of those specified in Table 278-12 are necessary, the size of conductors shall be increased so that the stress in the conductor will not exceed the limitations of WAC 296-44-27833 (8)(c).

(b) Paired conductors without messengers. Paired wires without a supporting messenger shall be eliminated as far as practical but where used shall meet the following requirements.

Table 278-12. Minimum Wire Sizes With Respect to Loading District and Span Length

	Spans (ft)	
Heavy-loading district	0-125	126-150
Medium-loading district	0-150	151-175
Light-loading district	0-175	176-200
	Minimum wire sizes	
Copper, hard-drawn (AWG)	10	9
Steel, galvanized (steel WG)		
In general	10	8
In rural districts of arid regions	12	10
Aluminum or copper clad steel (AWG)	10	9

(i) Strength. Each conductor shall have a rated breaking strength of one hundred seventy pounds.

(ii) Limiting span lengths. Paired wires shall not be used without a supporting messenger in spans longer than one hundred feet in the heavy loading district, one hundred twenty-five feet in the medium loading district, and one hundred fifty feet in the light loading district.

(c) Sags. Conductor sags shall be such that, under the assumed loading or WAC 296-44-26321 for the district concerned, and assuming rigid structures for the purpose of calculations, the tension of the conductor shall not be more than sixty percent of its rated breaking strength. Also the final unloaded tensions at 60°F shall not exceed twenty-five percent of the conductor rated breaking strength.

Note: The factors in WAC 296-44-27833 (8)(c) apply for the loading conditions of WAC 296-44-26309(2). For extreme wind loading conditions see WAC 296-44-27809(3).

(d) Splices and taps. Splices shall, as far as practical, be avoided in the crossing and adjacent spans. If it is impractical to avoid such splices, they shall be of such type and so made as to have a strength substantially equal to that of the conductor in which they are placed.

Taps shall be avoided in the crossing span where practical, but if required shall be of a type which will not impair the strength of the conductors to which they are attached.

(9) Messengers.

(a) Minimum size. Messengers shall be stranded material with a rated breaking strength of six thousand pounds.

(b) Sags and tensions. Multiple-conductor cables and their messengers shall be so suspended that when they are subjected to the loading prescribed in WAC 296-44-26321, the tension in the messenger shall not exceed sixty percent of its rated breaking strength.

Note: The factor in WAC 296-44-27833 (9)(b) applies for the loading conditions of WAC 296-44-26321, except for extreme windloading conditions where WAC 296-44-27809(3) applies.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-27833, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-27847 Grade N construction. (1) Poles. Poles used for lines for which neither Grade B, C, or D is required shall be of such initial size and so guyed or braced, where necessary, as to withstand all expected loads to which they may be subjected, including line personnel working on them. Such poles and stubs on highways shall be located as far as is practical from the traveled portion of highways. The number of crossings over highways should be kept to a minimum. Such poles and stubs located within falling distance of the traveled way of highways, or so located that their failure would permit wires, cables, guys, or other equipment to fall into the traveled way of the highway, or would reduce the clearances specified in Table 212-1 over the highway, shall be periodically inspected and maintained in safe condition.

(2) Guys. The general requirements for guys are covered in WAC 296-44-31729 and 296-44-31738.

(3) Crossarm strength. Crossarms shall be securely supported by bracing, if necessary, to withstand all expected loads to which they may be subjected, including line personnel working on them.

Note: Double crossarms are generally used at crossings, unbalanced corners, and dead-ends, in order to permit conductor fastenings at two insulators to prevent slipping, although single crossarms might provide sufficient strength. To secure extra strength, double crossarms are frequently used, and crossarm guys are sometimes used.

(4) Supply-line conductors.

Size. Supply-line conductors shall be not smaller than the sizes listed in Table 278-13.

RECOMMENDATION: It is recommended that these minimum sizes for copper and steel be not used in spans longer than one hundred fifty feet for the heavy-loading district, and one hundred seventy-five feet for the medium-loading and light-loading districts.

(5) Service drops.

(a) Size of open-wire service drops.

(i) Not over 750 volts. Service drops shall be as required by (1) or (2):

(A) Spans not exceeding one hundred fifty feet. Sizes shall not be smaller than those specified in Table 278-14.

Table 278-13. Grade N Minimum Sizes for Supply Line Conductors
(AWG for Copper and Aluminum; WG Stl. for Steel)

	Urban	Rural
Soft copper	6	8
Medium or hard-drawn copper	8	8
Steel	9	9
	Spans 150 feet or less	Spans exceeding 150 feet
Stranded aluminum:		
EC	4	2
ACSR	6	4
ALLOY	4	4
ACAR	4	2

(B) Spans exceeding one hundred fifty feet. Sizes shall not be smaller than required for Grade C (WAC 296-44-27821 (8)(a)).

(ii) Exceeding 750 volts. Sizes of service drops of more than 750 volts shall not be less than required for supply-line conductors of the same voltage.

(b) Tension of open-wire service drops. The tension of the service drop conductors shall not exceed the strength of the conductor attachment or its support under the expected loadings.

(c) Cabled service drops. Service conductors may be grouped together in a cable, provided the following requirements are met:

(i) Size. The size of each conductor shall not be less than required for drops of separate conductors. (WAC 296-44-27847 (5)(a).)

(ii) Tension of cabled service drops. The tension of the service drop conductors shall not exceed the strength of the conductor attachment or its support under the expected loadings.

Table 278–14. Minimum Sizes of Service Drops Carrying 750 V or Less
(Voltages of trolley–contact conductors are voltage to ground. AWG used for aluminum copper wires; Stl. WG used for steel wire)

Situation	Copper wire		Steel wire	EC aluminum wire[2]
	Soft drawn	Medium or hard drawn		
Alone	10	12	12	4
Concerned with communication conductor	10	12	12	4
Over supply conductors				
of 0 to 750 V	10	12	12	4
750 V to 8.7 kV[1]	8	10	12	4
Exceeding 8.7 kV[1]	6	8	9	4
Over trolley–contact conductors 0 to 750 V ac or dc	8	10	12	4
Exceeding 750 V ac or dc	6	8	9	4

[1] Installation of service drops of not more than 750 V above supply lines of more than 750 V should be avoided where practical.

[2] Where ACSR or aluminum alloy is used, the minimum size shall be No. 6 wire.

(6) Trolley–contact conductors. In order to provide for wear, no trolley–contact conductors shall be installed of less size than AWG No. 0, if of copper, or AWG No. 4, if of silicon bronze.

(7) Communication conductors. There are no specific requirements for Grade N communication line conductors or service drops.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–27847, filed 7/25/86.]

WAC 296–44–29501 Line insulation.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–29501, filed 7/25/86.]

WAC 296–44–29509 Application of rule. These requirements apply only to open conductor supply lines.

Note 1: See WAC 296–44–24233 (3)(f).

Note 2: See WAC 296–44–24221(5) for insulation requirements for neutral conductors.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–29509, filed 7/25/86.]

WAC 296–44–29515 Material and marking. Insulators for operation of supply circuits shall be made of wet process porcelain or other material which will provide equivalent or better electrical and mechanical performance. Insulators for use at or above 2.3 kilovolts between conductors shall be marked by the maker with his name or trademark and an identification mark or markings which will permit determination of the electrical and mechanical properties. The marking shall be applied so as not to reduce the electrical or mechanical strength of the insulator.

Note: The identifying marking can be either a catalog number, trade number, or any other means so that properties of the unit can be determined either through catalogs or other literature.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–29515, filed 7/25/86.]

WAC 296–44–29523 Ratio of flashover to puncture voltage. Insulators shall be designed so that the ratio of their rated low frequency dry flashover voltage to low frequency puncture voltage is in conformance with applicable American National Standards. When a standard does not exist, this ratio shall not exceed seventy–five percent.

The applicable American National Standards are:
ANSI C29.1–1982 [9].
ANSI C29.2–1982 [10].
ANSI C29.3–1980 [11].
ANSI C29.4–1977 [12].
ANSI C29.5–1977 [13].
ANSI C29.6–1977 [14] and C29.6a–1974.
ANSI C29.7–1982 [15].

Note: Insulators specifically designed for use in areas of high atmospheric contamination may have a rated low frequency dry flashover voltage not more than eighty percent of their low frequency puncture voltage.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–29523, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296–44–29529 Insulation level. The rated dry flashover voltage of the insulator or insulators, when tested in accordance with ANSI C29.1–1982 [9] shall not be less than that shown in Table 295–1, unless based on a qualified engineering study. Higher insulation levels than those shown in Table 295–1, or other effective means, shall be used where severe lightning, high atmospheric contamination, or other unfavorable conditions exist. Insulation levels for system voltages in excess of those shown shall be based on a qualified engineering study.

Table 295–1. Insulation Level Requirements

Nominal voltage (between phases) (kV)	Minimum rated dry flashover voltage of insulators[1] (kV)	Nominal voltage (between phases) (kV)	Minimum rated dry flashover voltage of insulators[1] (kV)
0.75	5	46	125
2.4	20	69	175
6.9	39	115	315
13.2	55	138	390
23.0	75	161	445
34.5	100	230	640

[1] Interpolate for intermediate values.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–29529, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-29539 Factory tests. Each insulator or insulating part thereof for use on circuits operating at or above 2.3 kilovolts between conductors shall be tested by the manufacturer in accordance with applicable American National Standards or, where such standards do not exist, other good engineering practices to assure their performance.

The applicable American National Standards are listed in WAC 296-44-29523.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-29539, filed 7/25/86.]

WAC 296-44-29541 Special insulator applications. (1) Insulators for constant-current circuits. Insulators for use on constant-current circuits shall be selected on the basis of the rated full load voltage of the supply transformer.

(2) Insulators for single-phase circuits directly connected to three-phase circuits. Insulators used on single-phase circuits directly connected to three-phase circuits (without intervening isolating transformers) shall have an insulation level not less than that required for the three-phase circuit.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-29541, filed 7/25/86.]

WAC 296-44-29551 Protection against arcing and other damage. In installing and maintaining insulators and conductors, precautions shall be taken to prevent as far as is practical any damage which might render the conductors or insulators liable to fall. Precautions shall also be taken to prevent, as far as is practical, any arc from forming or prevent any arc which might be formed from injuring or burning any parts of the supporting structures, insulators, or conductors.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-29551, filed 7/25/86.]

WAC 296-44-29563 Mechanical strength of insulators. Insulators shall withstand all the loads specified in WAC 296-44-263 except those of WAC 296-44-26309(3) without exceeding the following percentage of their rated ultimate strength:

Cantilever	40 percent
Compression	50 percent
Tension	50 percent

Note 1: The rated ultimate mechanical strength of suspension type insulators is considered to be the rated "combined mechanical and electrical strength."

Note 2: See ANSI C29.1-1982 [9].

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-29563, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-29572 Aerial cable systems. (1) Electrical requirements.

(a) Covered or insulated conductors not meeting the requirements of WAC 296-44-21209 (3)(a), (b) or (c) shall be considered as bare conductors for all insulation requirements.

(b) The insulators or insulating supports shall meet the requirements of WAC 296-44-29529.

(c) The systems shall be so designed and installed to minimize long term deterioration from electrical stress.

(2) Mechanical requirements.

(a) Insulators other than spacers used to support aerial cable systems shall meet the requirements of WAC 296-44-29563.

(b) Insulating spacers used in spacer cable systems shall withstand the loads specified in WAC 296-44-263 (except those of WAC 296-44-26309(3)) without exceeding fifty percent of their rated ultimate strength.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-29572, filed 7/25/86.]

WAC 296-44-317 Miscellaneous requirements.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-317, filed 7/25/86.]

WAC 296-44-31709 Structures for overhead lines. (1) Supporting structures.

(a) Protection of structures.

(i) Mechanical injury. Appropriate physical protection shall be provided for supporting structures subject to vehicular traffic abrasion which would materially affect their strength.

(ii) Climbing. Readily climbable supporting structures, such as closely latticed poles or towers, including those attached to bridges, carrying open supply conductors energized at more than 300 volts, which are adjacent to roads, regularly travelled pedestrian thoroughfares, or places where persons frequently gather (such as schools or public playgrounds) shall be equipped with barriers to inhibit climbing by unqualified persons or posted with appropriate warning signs.

Note: This rule does not apply where the right-of-way is fenced.

(iii) Fire. Supporting structures shall be placed and maintained so as to be exposed as little as is practical to brush, grass, rubbish, or building fires.

(iv) Attached to bridges. Supporting structures attached to bridges for the purpose of carrying open supply conductors exceeding 600 volts shall be posted with appropriate warning signs.

(b) Steps. Steps permanently installed on supporting structures shall not be closer than eight feet from the ground or other accessible surface.

Note: This rule does not apply where supporting structures are isolated.

(c) Identification. Supporting structures, including those on bridges, on which supply or communication conductors are maintained shall be so constructed, located, marked, or numbered so as to facilitate identification by employees authorized to work thereon. Date of installation of such structures should be recorded where practical by the owner.

(d) Obstructions. Signs, posters, notices, and other attachments shall not be placed on supporting structures without concurrence of the owner. Supporting structures

should be kept free from other climbing hazards such as tacks, nails, vines, and through bolts not properly trimmed.

(e) Decorative lighting. Attachment of decorative lighting on structures shall not be made without the concurrence of the owners and occupants.

(2) Unusual conductor supports. Where conductors are attached to structures other than those used solely or principally for their support, all rules shall be complied with as far as they apply. Such additional precautions as may be deemed necessary by the administrative authority shall be taken to avoid damage to the structures or injury to the persons using them. The supporting of conductors on trees and roofs should be avoided.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31709, filed 7/25/86.]

WAC 296-44-31719 Tree trimming. (1) General.

(a) Trees which may interfere with ungrounded supply conductors should be trimmed or removed.

Note: Normal tree growth, the combined movement of trees and conductors under adverse weather conditions, voltage, and sagging of conductors at elevated temperatures are among the factors to be considered in determining the extent of trimming required.

(b) Where trimming or removal is not practical, the conductor should be separated from the tree with suitable materials or devices to avoid conductor damage by abrasion and grounding of the circuit through the tree.

(2) At line crossings, railroad crossings, and limited access highway crossings. The crossing span and the adjoining span on each side of the crossing should be kept free from overhanging or decayed trees or limbs which otherwise might fall into the line.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31719, filed 7/25/86.]

WAC 296-44-31729 Guying and bracing. (1) Where used. When the loads to be imposed on supporting structures are greater than can be safely supported by the structures alone, additional strength shall be provided by the use of guys, braces, or other suitable construction. Such measures shall also be used where necessary to prevent undue increase of sags in adjacent spans as well as to provide sufficient strength for those supports on which the loads are considerably unbalanced, for example, at corners, angles, dead ends, large differences in span lengths, and changes of grade of construction.

(2) Strength. The strength of the guy or brace shall meet the requirements of WAC 296-44-278 for the applicable grade of construction. For guy wires conforming to ANSI/ASTM Standards, the minimum breaking strength value therein defined shall be the rated breaking strength required in this code.

(3) Point of attachment. The guy or brace should be attached to the structure as near as is practical to the center of the conductor load to be sustained. However, on lines exceeding 8.7 kilovolts the location of the guy or brace may be adjusted to minimize the reduction of the insulation offered by nonmetallic support arms and supporting structures.

(4) Guy fastenings. Guys having an ultimate strength of two thousand pounds or more and subject to small radius bends should be stranded and should be protected by suitable guy thimbles or their equivalent. Cedar and other softwood poles around which any guy having an ultimate strength of ten thousand pounds or more is wrapped should be protected by the use of suitable guy shims.

Where there is a tendency for the guy to slip off the shim, guy hooks or other suitable means of preventing this action should be used. Shims are not necessary in the case of supplementary guys, such as storm guys.

(5) Guy markers (guy guards). The ground end of anchor guys, exposed to pedestrian traffic, shall be provided with a substantial and conspicuous marker not less than eight feet long.

Note: Visibility of markers can be improved by the use of color or color patterns which provide contrast with the surroundings.

(6) Electrolysis. Where anchors and rods are subject to electrolysis, suitable measures should be taken to minimize corrosion from this source.

(7) Anchor rods.

(a) Anchor rods should be installed so as to be in line with the pull of the attached guy when under load.

Note: This is not required for anchor rods installed in rock or concrete.

(b) The anchor rod assembly shall have an ultimate strength not less than that required of the guy.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31729, filed 7/25/86.]

WAC 296-44-31738 Insulators in guys attached to supporting structures. (1) Properties of guy insulators.

(a) Material. Insulators shall be made of wet process porcelain, wood, glass fiber, reinforced plastic or other material of suitable mechanical and electrical properties.

(b) Electrical strength. The guy insulator shall have a rated dry flashover voltage at least double the nominal line voltage and a rated wet flashover voltage at least as high as the nominal line voltage between conductors of the guyed circuit. A guy insulator may consist of one or more units.

(c) Mechanical strength. The rated ultimate strength of the guy insulator shall be at least equal to the rated breaking strength of the guy in which it is installed.

(2) Use of guy insulators.

(a) Ungrounded guys attached to supporting structures carrying open supply conductors of more than 300 volts, or if exposed to such conductors, shall be insulated.

Note: Guys grounded in accordance with WAC 296-44-18261 (3)(b) need not be insulated.

Note: A guy insulator is not required if the guy is attached to a supporting structure on private right-of-way if all the supply circuits exceeding 300 volts meet the requirements of WAC 296-44-19409 (2)(b).

(b) Insulators shall be installed as follows:

(i) All insulators shall be located at least eight feet above the ground.

(ii) Where hazard would exist with one insulator, two or more guy insulators shall be placed so as to include, in so far as is practical, the exposed section of the guy between them.

(iii) Insulators shall be so placed that in case any guy sags down upon another, the insulators will not become ineffective.

(3) Corrosion protection. An insulator in the guy strand used exclusively for the elimination of corrosion of metal in ground rods, anchors, anchor rods, or pipe in an effectively grounded system, shall not be classified as a guy insulator and shall not reduce the mechanical strength of the guy.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31738, filed 7/25/86.]

WAC 296-44-31749 Span-wire insulators. (1) Properties of span-wire insulators.

(a) Material. Insulators shall be made of wet process porcelain, wood, fiberglass, or other material of suitable mechanical and electrical properties.

(b) Insulation level. The insulation level of span-wire insulators shall meet the requirements of WAC 296-44-29539.

A hanger insulator, where used to provide single insulation as permitted by subsection (2) of this section shall meet the requirements of WAC 296-44-29539.

(c) Mechanical strength. The rated ultimate strength of the span-wire insulator shall be at least equal to the rated breaking strength of the span-wire in which it is installed.

(2) Use of span-wire insulators.

(a) All span-wires, including bracket span-wires, shall have a suitable insulator (in addition to an insulated hanger if used) inserted between each point of support of the span-wire and the luminaire or trolley-contact conductor supported.

Note 1: Single insulation, as provided by an insulated hanger, may be permitted when the span-wire or bracket is supported on wood poles supporting only trolley, railway feeder, or communication conductors used in the operation of the railway concerned.

Note 2: Insulators are not required if the span-wire is effectively grounded.

Note 3: This rule does not apply to insulated feeder taps used as span-wires.

(b) In case insulated hangers are not used, the insulator shall be located so that in the event of a broken wire the energized part of the span-wire cannot be reached from the ground.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31749, filed 7/25/86.]

WAC 296-44-31757 Overhead conductors. (1) Identification. All conductors of electric-supply and communication lines should, as far as is practical, be arranged to occupy uniform positions throughout, or shall be constructed, located, marked, numbered, or attached to distinctive insulators or crossarms, so as to facilitate identification by employees authorized to work thereon. This does not prohibit systematic transposition of conductors.

(2) Branch connections.

(a) Connections to circuits, service loops, and equipment in overhead construction shall be accessible to authorized employees.

(b) Connections shall be supported and placed so that swinging or sagging cannot bring them in contact with other conductors or interfere with the safe use of pole steps, or reduce the climbing or lateral working space.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31757, filed 7/25/86.]

WAC 296-44-31765 Equipment on supporting structures. (1) Identification. All equipment of electric-supply and communication lines should be arranged to occupy uniform positions throughout or shall be constructed, located, marked, or numbered so as to facilitate identification by employees authorized to work thereon.

(2) Location. All supply and communication equipment such as transformers, regulators, capacitors, amplifiers, loading coils, surge arresters, switches, etc., when located below conductors or other attachments, shall be mounted outside of the climbing space required in WAC 296-44-212.

(3) Guarding. Exposed energized parts of equipment such as switches, circuit breakers, surge arresters, etc., shall be enclosed or guarded if all of the following conditions apply:

(a) The equipment is located below the top conductor support.

(b) The equipment is located on the climbing side of the structure.

(4) Clearance above ground. Equipment shall be mounted at not less than the following heights above ground, measured to the lower projection of such equipment:

(a) Equipment cases which are effectively grounded, or ungrounded cases which contain equipment connected to circuits of nor more than 150 volts:

Over traveled portions of roadway	16 feet
Over shoulder of roadway	15 feet
Over walkways	10 feet

Note 1: The bottom of the housing of traffic control signals suspended over the traveled portion of the roadway shall be not less than fifteen feet nor more than nineteen feet above the grade at the center of the roadway.

Note 2: Effectively grounded equipment cases such as fire alarm boxes, traffic control boxes, or meters may be mounted over a walkway at a lower level for accessibility provided such equipment does not unduly obstruct the walkway.

(b) Ungrounded equipment cases which contain equipment connected to circuits of more than 150 volts shall have the same clearances above ground as specified for rigid live parts in WAC 296-44-21230(3).

(5) Clearances from buildings, bridges, or other structures.

(a) Effectively grounded equipment cases may be located on or adjacent to buildings, bridges, or other structures provided that all exposed live parts of such

equipment are located so that the clearances for open supply line conductors as specified in WAC 296-44-21253 (3), (4) and (6) are maintained.

(b) Equipment cases which are not effectively grounded shall be located so that the clearances for open supply line conductors of WAC 296-44-21253 (3), (4) and (6) are maintained.

(c) Equipment cases shall be located so as not to serve as a means of approach to exposed live parts by unqualified persons.

(6) Street and area lighting.

(a) All exposed ungrounded conductive parts of luminaires and their supports which are not insulated from current-carrying parts shall be maintained at not less than twenty inches from the surface of their supporting structure:

Note 1: This may be reduced to five inches if located on the side of the structure opposite the designated climbing space.

Note 2: This does not apply where the equipment is located at the top or other vertical portion of the structure which is not subject to climbing.

(b) The lowering rope or chain for luminaires arranged to be lowered for examination or maintenance shall be of a material and strength designed to withstand climatic conditions and to sustain the luminaire safely. The lowering rope or chain, its supports, and fastenings shall be examined periodically.

(c) Insulators, as specified in WAC 296-44-31738(1), should be inserted at least eight feet from the ground in metallic suspension ropes or chains supporting lighting units of series circuits.

(d) A suitable device shall be provided by which each lamp on series lighting circuits of more than 300 volts may be safely disconnected from the circuit before the lamp is handled.

Note: This rule does not apply where the lamps are always worked on from suitable insulated platforms or aerial lift devices, or handled with suitable insulated tools, and treated as under full voltage of the circuit concerned.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31765, filed 7/25/86.]

WAC 296-44-31772 Communications protective requirements. (1) Where required. Where communications apparatus is handled by other than qualified persons, it shall be protected by one or more of the means listed in subsection (2) of this section if such apparatus is permanently connected to lines subject to any of the following:

(a) Lightning.

(b) Possible contact with supply conductors whose voltage to ground exceeds 300 volts.

(c) Transient rise in ground potential exceeding 300 volts.

(d) Steady state induced voltage of a hazardous level.

Note: When communications cables will be in the vicinity of supply stations where large ground currents may flow, the effect of these currents on communications circuits should be evaluated.

(2) Means of protection. Where communications apparatus is required to be protected under subsection (1) of this section protective means adequate to withstand the voltage expected to be impressed shall be provided by insulation, protected where necessary by arresters used in conjunction with fusible elements. Severe conditions may require the use of additional devices such as auxiliary arresters, drainage coils, neutralizing transformers, or isolating devices.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31772, filed 7/25/86.]

WAC 296-44-31783 Circuits of one class used exclusively in the operation of circuits of another class. (1) Overhead communication circuits used exclusively in the operation of supply circuits.

(a) Communication circuits used exclusively in the operation of supply lines may be run either as ordinary communication circuits or as supply circuits under the conditions specified in (c) and (d) of this subsection, respectively. After the selection of the type of communication circuit construction and protection for a section, such construction and protection shall be consistently adhered to throughout the extent of such section of the communication system.

(b) Communication circuits used in operation of supply lines shall be isolated or guarded at all points so as to be inaccessible to the public.

(c) Communication circuits used in the operation of supply lines may be run as ordinary communication conductors under the following conditions:

(i) Where such circuits are below supply conductors in the operation of which they are used (including high-voltage trolley feeders) at crossings, conflicts, or on commonly used poles, provided:

(A) Such communication circuits occupy a position below all other supply conductors or equipment at crossings, conflicts, or on commonly used poles.

(B) Such communication circuits and their connected equipment are adequately guarded and are accessible only to authorized persons.

(ii) Where such circuits are below supply conductors in the operation of which they are used and are above other supply or communication conductors at wire crossings, conflicts, or on the same poles, provided the communication circuits are protected by fuseless surge arresters, drainage coils, or other suitable devices to prevent the communication circuit voltage from normally exceeding 400 volts to ground.

Note: The grades of construction for communication conductors with inverted levels apply.

(d) Communication circuits used in the operation of supply lines shall comply with all requirements for the supply lines with which they are used, where they do not comply with the provisions of (c)(i) or (ii) of this subsection.

Note 1: If the voltage of the supply conductors concerned exceeds 8.7 kilovolts, the communication conductors need only meet the requirements for supply conductors of 5 to 8.7 kilovolts.

Note 2: Where the supply conductors are required to meet Grade C, the size of the communication conductors may be the same as for Grade D (see WAC 296-44-27833 (9)(b)) for spans up to one hundred fifty feet.

(2) Supply circuits used exclusively in the operation of communication circuits. Circuits used for supplying power solely to apparatus forming part of a communications system shall be installed as follows:

(a) Open wire circuits shall have the grades of construction, clearances, insulation, etc., prescribed elsewhere in these rules for supply or communication circuits of the voltage concerned.

(b) Special circuits operating at voltages in excess of 400 volts to ground and used for supplying power solely to communications equipment may be included in communications cables under the following conditions:

(i) Such cables shall have a conductive sheath or shield which is effectively grounded and each such circuit shall be carried on conductors which are individually enclosed with an effectively grounded shield.

(ii) All circuits in such cables shall be owned or operated by one party and shall be maintained only by qualified personnel.

(iii) Supply circuits included in such cables shall be terminated at points accessible only to qualified personnel.

(iv) Communications circuits brought out of such cables, if they do not terminate in a repeater station or terminal office, shall be protected or arranged so that in the event of failure within the cable, the voltage on the communication circuit will not exceed 400 volts to ground.

(v) Terminal apparatus for the power supply shall be so arranged that the live parts are inaccessible when such supply circuits are energized.

Note: The requirements of this section do not apply to the supply circuits of 600 volts or less where the transmitted power does not exceed 5 kilowatts and the installation complies with WAC 296-44-19409 (2)(b).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31783, filed 7/25/86.]

WAC 296-44-31792 Electric railway construction. (1) Trolley-contact conductor fastenings. All overhead trolley-contact conductors shall be supported and arranged so that the breaking of a single contact conductor fastening will not allow the trolley conductor live span-wire, or current-carrying connection to come within ten feet (measured vertically) from the ground, or from any platform accessible to the general public.

Span-wire insulation for trolley-contact conductors shall comply with WAC 296-44-31749.

(2) High voltage contact conductors. Trolley-contact conductors energized at more than 750 volts shall be suspended so as to minimize the possibility of a break, and in such a way that, if broken at one point, the conductor will not come within twelve feet (measured vertically) of the ground, or any platform accessible to the public.

(3) Third rails. Third rails shall be protected by adequate guards composed of wood or other suitable insulating material.

Note: This rule does not apply where third rails are on fenced right-of-way.

(4) Prevention of loss of contact at railroad crossings at grade. At crossings at grade with other railroads or other electrified railway systems, contact conductors shall be arranged as set forth in specifications of (a), (b), (c), and (d) of this subsection, whichever apply:

(a) Where the crossing span exceeds one hundred feet catenary construction shall be used for overhead trolley-contact conductors.

(b) When pole trolleys, using either wheels or sliding shoes, are used:

(i) The trolley-contact conductor shall be provided with live trolley guards of suitable construction; or

(ii) The trolley-contact conductor should be at a uniform height above its own track throughout the crossing span and the next adjoining spans. Where it is not practical to maintain a uniform height, the change in height shall be made in a gradual manner.

Note: (b) of this subsection does not apply where the crossing is protected by signals or interlocking.

(c) When pantograph type collectors are used, the contact conductor and track through the crossing should be maintained in a condition where rocking of pantograph-equipped cars or locomotives will not de-wire the pantograph. If this cannot be done, auxiliary contact conductors shall be installed. Wire height shall conform with (b) of this subsection.

(d) Where two electrified tracks cross:

(i) When the trolley-contact conductors are energized from different supply circuits, or from different phases of the same circuit, the trolley-conductor crossover shall be designed to insulate both conductors from each other. The design shall not permit either trolley collector to contact any conductor or part energized at a different voltage than at which it is designed to operate.

(ii) Trolley-contact crossovers used to insulate trolley conductors of the same voltage but of different circuit sections shall be designed to prevent both sections being simultaneously contacted by the trolley collector.

(e) When third rail construction is used, and the length of the third rail gap at the crossings is such that a car or locomotive stopping on the crossing can lose propulsion power, the crossing shall be protected by signals or interlocking.

(5) Guards under bridges. Trolley guards of suitable construction shall be provided where the trolley-contact conductor is so located that a trolley pole leaving the conductor can make simultaneous contact between it and the bridge structure.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-31792, filed 7/25/86.]

PART G--INSTALLATION, MAINTENANCE OF UNDERGROUND ELECTRIC SUPPLY AND COMMUNICATION LINES

WAC 296-44-350 Safety rules for the installation and maintenance of underground electric-supply and communication lines.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-350, filed 7/25/86.]

WAC 296-44-35009 Purpose. The purpose of WAC 296-44-350 through 296-44-49121 is the practical safeguarding of persons during the installation, operation, or maintenance of underground or buried supply and communication cables and associated equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-35009, filed 7/25/86.]

WAC 296-44-35021 Scope. WAC 296-44-350 through 296-44-49121 cover supply and communication cables and equipment in underground or buried systems. The rules cover the associated structural arrangements and the extension of such systems into buildings. It also covers the cables and equipment employed primarily for the utilization of electric power when such cables and equipment are used by the utility in the exercise of its function as a utility. They do not cover installations in electric supply stations.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-35021, filed 7/25/86.]

WAC 296-44-365 General requirements applying to underground lines. The introduction WAC 296-44-005, 296-44-013 and 296-44-016 definitions WAC 296-44-011, list of referenced documents WAC 296-44-017, and grounding methods WAC 296-44-023 shall apply to the requirements of WAC 296-44-350 through 296-44-49121.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-365, filed 7/25/86.]

WAC 296-44-36518 Installation and maintenance. (1) Persons responsible for underground facilities shall be in a position to indicate the location of their facilities.

(2) Reasonable advance notice should be given to owners or operators of other proximate facilities which may be adversely affected by new construction or changes in existing facilities.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-36518, filed 7/25/86.]

WAC 296-44-36527 Accessibility. All parts which must be examined or adjusted during operation shall be arranged so as to be readily accessible to authorized persons by the provision of adequate working spaces, working facilities, and clearances.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-36527, filed 7/25/86.]

WAC 296-44-36539 Inspection and tests of lines and equipment. (1) When in service.

(a) Initial compliance with safety rules. Lines and equipment shall comply with these safety rules upon being placed in service.

(b) Inspection. Accessible lines and equipment shall be inspected by the responsible party at such intervals as experience has shown to be necessary.

(c) Tests. When considered necessary, lines and equipment shall be subjected to practical tests to determine required maintenance.

(d) Record of defects. Any defects affecting compliance with this code revealed by inspection, if not promptly corrected, shall be recorded; such record shall be maintained until the defects are corrected.

(e) Remedying defects. Lines and equipment with recorded defects which would endanger life or property, shall be properly repaired, disconnected, or isolated.

(2) When out of service.

(a) Lines infrequently used. Lines and equipment infrequently used shall be inspected or tested as necessary before being placed into service.

(b) Lines temporarily out of service. Lines and equipment temporarily out of service shall be maintained in a safe condition.

(c) Lines permanently abandoned. Lines and equipment permanently abandoned shall be removed or maintained in a safe condition.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-36539, filed 7/25/86.]

WAC 296-44-36551 Grounding of circuits and equipment. (1) Methods. The methods to be used for grounding of circuits and equipment are given in WAC 296-44-023.

(2) Conductive parts to be grounded. Cable sheaths and shields (except conductor shields), equipment frames and cases (including pad-mounted devices), and conductive lighting poles shall be effectively grounded. Ducts and riser guards of conductive material which enclose electric supply lines shall be effectively grounded.

Note: This rule does not apply to parts which are eight feet or more above readily accessible surfaces or are otherwise isolated or guarded.

(3) Use of earth as part of circuit. Supply circuits shall not be designed to use the earth normally as the sole conductor for any part of the circuit.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-36551, filed 7/25/86.]

WAC 296-44-36563 Communication protective requirements. (1) Where required. Where communications apparatus is handled by other than qualified persons, it shall be protected by one or more of the means listed in subsection (2) of this section if such apparatus is permanently connected to lines subject to any of the following:

(a) Lightning.

(b) Possible contact with supply conductors whose voltage exceeds 300 V.

(c) Transient rise in ground potential exceeding 300 V.

(d) Steady-state induced voltage of a hazardous level.

Note: When communications cables will be in the vicinity of supply stations where large ground currents may flow, the effect of these currents on communications circuits should be evaluated.

(2) Means of protection. Where communications apparatus is required to be protected under subsection (1) of this section, protective means adequate to withstand the voltage expected to be impressed shall be provided by insulation, protected where necessary by arresters.

Severe conditions may require the use of additional devices such as auxiliary arresters, drainage coils, neutralizing transformers, or isolating devices.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-36563, filed 7/25/86.]

WAC 296-44-36575 Induced voltage. Rules covering supply line influence and communication line susceptiveness have not been detailed in this code. Cooperative procedures are recommended to minimize steady state voltages induced from proximate facilities. Therefore, reasonable advance notice should be given to owners or operators of other known proximate facilities which may be adversely affected by new construction or changes in existing facilities.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-36575, filed 7/25/86.]

WAC 296-44-370 Strength requirements--Grade N construction. (1) **Poles and towers.** Poles used for lines for which neither Grade B, C or D is required shall be of such initial size and so guyed or braced, where necessary, as to withstand safely the loads to which they may be subjected, including linemen working on them. Such poles and stubs on state and federal highways shall be located as far as practicable from the traveled portion of such highways. The number of crossings over such highways should be kept to a minimum. Such poles and stubs located within falling distance of the traveled portion of such highways, or so located that their failure would permit wires, cables, guys, or other equipment to fall into the traveled portion of the highway, or would reduce the clearances specified in Table 1 over the traveled portion of such highways, shall be periodically inspected and maintained in safe condition.

(2) **Guys.** The general requirements for guys are covered under "miscellaneous requirements" (WAC 296-44-400 through 296-44-427).

(3) **Crossarm strength.** Crossarms shall be securely supported, by bracing if necessary, so as to support safety loads to which they may be subjected in use, including linemen working on them. Any crossarm, or buckarm, shall be capable of supporting a vertical load of 225 pounds at either extremity, in addition to the weight of the conductors.

Note: Double crossarms are generally used at crossings, unbalanced corners, and dead-ends, in order to permit conductor fastenings at two insulators, and so prevent slipping, although single crossarms might provide sufficient strength. To secure extra strength, double crossarms are frequently used, and crossarm guys are sometimes used.

(4) **Supply-line conductors.**

(a) Material. All supply-line conductors shall be of material or combinations of materials which will not corrode excessively under the prevailing conditions.

(b) Size. Supply-line conductors shall be not smaller than the following:

Table 27.—Grade N minimum sizes for supply-line conductors

(AWG for copper and aluminum; Stl. WG for steel)

	Urban	Rural
Soft copper	6	8
Medium or hard-drawn copper	8	8
Steel	9	9

	Urban and rural	
	Spans 150 feet or less	Spans exceeding 150 feet
Stranded aluminum:		
Not reinforced	1	0
Steel-reinforced	6	4

RECOMMENDATION: It is recommended that, except as modified in WAC 296-44-364 (6)(b), these minimum sizes for copper and steel not to be used in spans longer than 150 feet for the heavy-loading district, and 175 feet for the medium and light-loading districts.

(5) **Supply services.**

(a) Material. All supply service conductors shall be of material or combinations of materials which will not corrode excessively under the prevailing conditions.

(b) Size of open-wire services.

(i) Not over 750 volts between conductors. Supply-service leads of not over 750 volts between conductors shall be not smaller than required by (A) or (B) below:

(A) Spans not exceeding 150 feet. Sizes shall be not smaller than specified in Table 28.

Table 28.—Minimum sizes of service leads carrying 750 volts or less

(All voltages are between conductors except trolley-contact conductors where voltages are to ground)

(AWG for copper; Stl. WG for steel)

Situation	Copper wire		Steel wire
	Soft-drawn	Medium or hard-drawn	
Alone	10	12	12
Concerned with communication conductors	10	12	12
Over supply conductors of—			
0 to 750 volts	10	12	12
750 to 8,700 volts[1]	8	10	12
Exceeding 8,700 volts[1]	6	8	9
Over trolley-contact conductors—			
0 to 750 volts ac or dc	8	10	12
Exceeding 750 volts ac or dc	6	8	9

[1]Installation of service leads of not more than 750 volts above supply lines of more than 750 volts should be avoided where practicable.

(B) Spans exceeding 150 feet. Sizes shall be not smaller than required for Grade C. (WAC 296-44-364 (6)(b).)

(ii) Exceeding 750 volts between conductors. Sizes of supply-service leads of more than 750 volts between

conductors shall be not less than required for supply-line conductors of the same voltage.

(c) Sag, open-wire services.

(i) Not over 750 volts between conductors. Supply service leads of not over 750 volts between conductors shall have sags not less than shown in Table 29.

Table 29.—Sags for open-wire services

Span lengths	Sag
Feet	Inches
100 or less	12.
100 to 125	18.
125 to 150	27.
Exceeding 150	Grade C sags.

(ii) Exceeding 750 volts between conductors. Supply service leads of more than 750 volts between conductors shall comply as to sags with the requirements for supply line conductors of the same voltage.

(d) Cabled services. Supply service leads may be grouped together in a cable, provided the following requirements are met:

(i) Size. The size of each conductor shall be not less than required for leads of separate conductors (subsection (5)(b)).

(ii) Sag. The sag of the cable should be not less than required for leads of separate conductors (subsection (5)(c)).

(iii) Insulation. The insulation should be sufficient to withstand twice the normal operating voltage.

(6) **Lightning-protection wires.** Lightning-protection wires paralleling the line conductors shall be regarded, in respect to size and material requirements, as supply conductors.

(7) **Trolley-contact conductors.** In order to provide for wear, no trolley-contact conductors shall be installed of less size than No. 0, if of copper, or No. 4, if of silicon bronze.

(8) **Cradles at supply-line crossing.** Cradles should not be used.

Note: It is less expensive and better to build the supply line strong enough to withstand extreme conditions than to build a cradle of sufficient strength to catch and hold the supply line if it falls.

(9) **Communication conductors.** There are no specific requirements for Grade N communication line conductors or service drops.

[§ 26 (part), filed 3/23/60, effective 12/1/58.]

WAC 296-44-386 Underground conduit systems.

Note: While it is often the practice to use duct and conduit interchangeably, duct, as used herein, is a single enclosed raceway for conductors or cable; conduit is a structure containing one or more ducts; and conduit system is the combination of conduit, conduits, manholes, handholes, and/or vaults joined to form an integrated whole.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-386, filed 7/25/86.]

WAC 296-44-38609 Location.

(1) Routing.

(a) General.

(i) Conduit systems should be subject to the least disturbance practical. Conduit systems extending parallel to other subsurface structures should not be located directly over or under other subsurface structures. If this is not practical, the rule on clearances, as stated in subsection (2) of this section, should be followed.

(ii) Conduit alignment should be such that there are no protrusions which would be harmful to the cable.

(iii) When bends are required, the minimum radius shall be sufficiently large to prevent damage to cable being installed in the conduit.

RECOMMENDATION: The maximum change of direction in any plane between lengths of straight rigid conduit without the use of bends should be limited to 5°.

(b) Natural hazards. Routes through unstable soils such as mud, shifting soil, etc., or through highly corrosive soils, should be avoided. If construction is required in these soils, the conduit should be constructed in such a manner as to minimize movement and/or corrosion or both.

(c) Highways and streets. When conduit must be installed longitudinally under the roadway, it should be installed in the shoulder or, to the extent practical, within the limits of one lane of traffic.

(d) Bridges and tunnels. The conduit system shall be located so as to minimize the possibility of damage by traffic. It should be located to provide safe access for inspection or maintenance of both the structure and the conduit system.

(e) Crossing railroad tracks.

(i) The top of the conduit system should be located not less than thirty-six inches below the top of the rails of a street railway or fifty inches below the top of the rails of a railroad. Where unusual conditions exist or where proposed construction would interfere with existing installations, a greater depth then specified above may be required.

Note: Where this is impractical, or for other reasons, this clearance may be reduced by agreement between the parties concerned. In no case, however, shall the top of the conduit or any conduit protection extend higher than the bottom of the ballast section which is subject to working or cleaning.

(ii) At crossings under railroads, manholes, handholes, and vaults should not, where practical, be located in the roadbed.

(f) Submarine crossing. Submarine crossings should be routed, installed, or both so they will be protected from erosion by tidal action or currents. They should not be located where ships normally anchor.

(2) Clearances from other underground installations.

(a) General. The clearance between a conduit system and other underground structures paralleling it should be as large as necessary to permit maintenance of the system without damage to the paralleling structures. A conduit which crosses over another subsurface structure shall have a minimum clearance sufficient to prevent damage to either structure. These clearances should be determined by the parties involved.

Note: When conduit crosses a manhole, vault, or subway tunnel roof, it may be supported directly on the roof with the concurrence of all parties involved.

(b) Separations between supply and communications conduit systems. Conduit systems to be occupied by communications conductors shall be separated from conduit systems to be used for supply systems by:

(i) Three inches of concrete.

(ii) Four inches of masonry.

(iii) Twelve inches of well tamped earth.

Note: Lesser separations may be used where the parties concur.

(c) Sewers, sanitary and storm.

(i) If conditions require a conduit to be installed parallel to and directly over a sanitary or storm sewer, it may be done provided both parties are in agreement as to the method.

(ii) Where a conduit run crosses a sewer it shall be designed to have suitable support on each side of the sewer to prevent transferring any direct load onto the sewer.

(d) Water lines. Conduit should be installed as far as is practical from a water main in order to protect it from being undermined if the main breaks. Conduit which crosses over a water main shall be designed to have suitable support on each side as required to prevent transferring any direct loads onto the main.

(e) Fuel lines. Conduit should have sufficient clearance from fuel lines to permit the use of pipe maintenance equipment. Conduit and fuel lines shall not enter the same manhole.

(f) Steam lines. Conduit should be so installed as to prevent detrimental heat transfer between the steam and conduit systems.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-38609, filed 7/25/86.]

WAC 296-44-38628 Excavation and backfill. (1) Trench. The bottom of the trench should be undisturbed, tamped, or relatively smooth earth. Where the excavation is in rock, the conduit should be laid on a protective layer of clean tamped backfill.

(2) Quality of backfill. All backfill should be free of materials that may damage the conduit system.

RECOMMENDATION: Backfill within six inches of the conduit should be free of solid material greater than four inches in maximum dimension or with sharp edges likely to damage it. The balance of backfill should be free of solid material greater than eight inches in maximum dimension. Backfill material should be adequately compacted.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-38628, filed 7/25/86.]

WAC 296-44-38641 Ducts and joints. (1) General.

(a) Duct material shall be corrosion resistant and suitable for the intended environment.

(b) Duct materials, the construction of the conduit, or both shall be designed so that a cable fault in one duct would not damage the conduit to such an extent that it would cause damage to cables in adjacent ducts.

(c) The conduit system shall be designed to withstand external forces to which it may be subjected by the surface loadings set forth in WAC 296-44-38653(1) except that impact loading may be reduced one-third for each foot of cover so no impact loading need be considered when cover is three feet or more.

(d) The internal finish of the duct shall be free of sharp edges or burrs which could damage supply cable.

(2) Installation.

(a) Restraint. Conduit, including terminations and bends, should be suitably restrained by backfill, concrete envelope, anchors, or other means to maintain its design position under stress of installation procedures, cable pulling operations, and other conditions such as settling and hydraulic or frost uplift.

(b) Joints. Ducts shall be joined in a manner sufficient to prevent solid matter from entering the conduit line. Joints shall form a sufficiently continuous smooth interior surface between joining duct sections so that supply cable will not be damaged when pulled past the joint.

(c) Externally coated pipe. When conditions are such that externally coated pipe is required, the coating shall be corrosion resistant and should be inspected, tested, or both, to see that the coating is continuous and intact prior to backfill. Precautions shall be taken to prevent damage to the coating when backfilling.

(d) Building walls. Conduit installed through a building wall shall have internal and external seals intended to prevent the entrance of gas into the building insofar as practical. The use of seals may be supplemented by gas venting devices in order to minimize building up of positive gas pressures in the conduit.

(e) Bridges.

(i) Conduit installed in bridges shall include the capability to allow for expansion and contraction of the bridge.

(ii) Conduits passing through a bridge abutment should be installed so as to avoid or resist any shear due to soil settlement.

(iii) Conduit of conductive material installed on bridges shall be effectively grounded.

(f) In vicinity of manholes. Conduit should be installed on compacted soil or otherwise supported when entering a manhole to prevent shear stress on the conduit at the point of manhole entrance.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-38641, filed 7/25/86.]

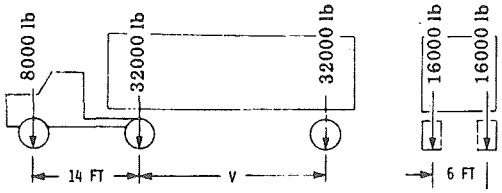
WAC 296-44-38653 Manholes, handholes and vaults. (1) Strength. Manholes, handholes, and vaults shall be designed to sustain all expected loads which may be imposed upon the structure. The horizontal design loads, vertical design loads, or both shall consist of dead load, live load, equipment load, impact, load due to water table, frost, and any other load expected to be imposed upon the structure, to occur adjacent to the structure, or both. The structure shall sustain the combination of vertical and lateral loading that produces the maximum shear and bending moments in the structure.

(a) In roadway areas, the live load shall consist of the weight of a moving tractor–semitrailer truck illustrated in Figure 386–1. The vehicle wheel load shall be considered applied to an area as indicated in Figure 386–2. In the case of multilane pavements, the structure shall sustain the combination of loadings which result in vertical and lateral structure loadings which produce the maximum shear and bending moments in the structure.

Note: Loads imposed by equipment used in road construction may exceed loads to which the completed road may be subjected.

(b) In designing structures not subject to vehicular loading, the minimum live load shall be three hundred pounds per square foot.

(c) Live loads shall be increased by thirty percent for impact.



V = Variable spacing, 14 ft to 30 ft (4.3 m to 9.0 m) inclusive. Spacing to be used is that which results in vertical and lateral structure loading which produces the maximum shear and bending moments in the structure.

Fig. 386-1

Roadway Vehicle Load

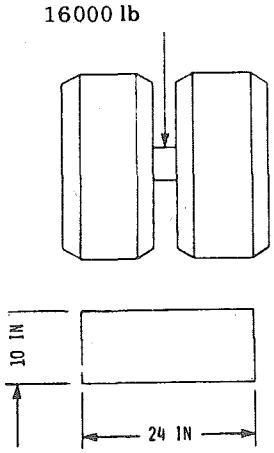


Fig. 386-2

Wheel Load Area

(d) When hydraulic, frost, or other uplift will be encountered, the structure shall either be of sufficient weight or so restrained as to withstand this force. The weight of equipment installed in the structure is not to be considered as part of the structure weight.

(e) Where pulling iron facilities are furnished, they should be installed with a factor of safety of 2 based on the expected load to be applied to the pulling iron.

(2) Dimensions. Manholes shall meet the following requirements: A clear working space sufficient for performing the necessary work shall be maintained. The horizontal dimensions of the clear working space shall be not less than three feet. The vertical dimensions shall be not less than six feet except in manholes where the opening is within one foot horizontally, of the adjacent interior side wall of the manhole.

Note 1: Where one boundary of the working space is an unoccupied wall and the opposite boundary consists of cables only, the horizontal working space between these boundaries may be reduced to thirty inches.

Note 2: In manholes containing only communications cables, equipment, or both, one horizontal dimension of the working space may be reduced to not less than two feet provided the other horizontal dimension is increased so that the sum of the two dimensions is at least six feet.

(3) Manhole access openings.

(a) Round access openings in a manhole containing supply cables shall be not less than twenty–six inches in diameter. Round access openings in any manhole containing communication cables only, or manholes containing supply cables and having a fixed ladder which does not obstruct the opening, shall be not less than twenty–four inches in diameter. Rectangular access openings should have dimensions not less than twenty–six inches by twenty–two inches.

(b) Openings shall be free of protrusions which will injure personnel or prevent quick egress.

(4) Covers.

(a) Manholes and handholes, when not being worked in, shall be securely closed by covers of sufficient weight or proper design so they cannot be easily removed without tools.

(b) Covers should be suitable designed or restrained so that they cannot fall into manholes or protrude into manholes sufficiently far to contact cable or equipment.

(c) Strength of covers and their supporting structure shall be at least sufficient to sustain the applicable loads of subsection (1) of this section.

(5) Access.

(a) Vault or manhole openings shall be located so that safe access can be provided. When in the highway, they should be located outside of the paved roadway when practical. They should be located outside the area of street intersections and crosswalks whenever practical to reduce the traffic hazards to the men working at these locations.

(b)(i) Personnel access openings in vaults or manholes should be located so that they are not directly over the cable or equipment. Where these openings interfere with curbs, etc., they can be located over the cable if one of the following is provided:

(A) A conspicuous warning sign.

(B) A protective barrier over the cable.

(C) A fixed ladder.

(ii) In vaults, other types of openings may be located over equipment to facilitate work on this equipment.

(6) Access doors.

(a) Where accessible to the public, access doors to utility tunnels and vaults shall be locked unless qualified persons are in attendance to prevent entry by unqualified persons.

(b) Such doors shall be designed so that a person on the inside may exit when the door is locked from the outside.

Note: This rule does not apply where the only means of locking is by padlock and the latching system is so arranged that the padlock can be closed on the latching system to prevent locking from the outside.

(7) Ladder requirements. Fixed ladders shall be corrosion resistant.

RECOMMENDATION: Ladders should conform to ANSI A14.1–1982 [2], ANSI A14.2–1982 [3], ANSI A14.3–1982 [4] or ANSI A14.5–1982 [5].

(8) Drainage. Where drainage is into sewers, suitable traps or other means should be provided to prevent entrance of sewer gas into manholes, vaults, or tunnels.

(9) Ventilation. Adequate ventilation to open air shall be provided for manholes, vaults, and tunnels, having an opening into enclosed areas used by the public. Where such enclosures house transformers, switches, regulators, etc., the ventilating system shall be cleaned at necessary intervals.

Note: This does not apply to enclosed areas under water or in other locations where it is impractical to comply.

(10) Mechanical protection. Supply cables and equipment should be installed or guarded in such a manner as to avoid damage by objects falling or being pushed through the grating.

(11) Identification. Manhole and handhole covers should have an identifying mark which will indicate ownership or type of utility.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–38653, filed 7/25/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency and appear herein pursuant to the requirements of RCW 34.08.040.

WAC 296-44-398 Supply cable.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–398, filed 7/25/86.]

WAC 296-44-39809 General.

RECOMMENDATION: Cable should be capable of withstanding tests applied in accordance with an applicable standard issued by a recognized organization such as the American National Standard Institute, Association of Edison Illuminating Companies, the Insulated Cable Engineers Association, the National Electrical Manufacturers Association, or the American Society for Testing and Materials.

(1) The design and construction of conductors, insulation, sheath, jacket, and shielding shall include consideration of mechanical, thermal, environmental, and electrical stresses which are expected during installation and operation.

(2) Cable shall be designed and manufactured to retain specified dimensions and structural integrity during manufacture, reeling, storage, handling, and installation.

(3) Cable shall be designed and constructed in such a manner that each component is protected from harmful effects of other components.

(4) The conductor, insulation, and shielding shall be designed to withstand the effects of the expected magnitude and duration of fault current, except in the immediate vicinity of the fault.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–39809, filed 7/25/86.]

WAC 296-44-39823 Sheaths and jackets.

Sheaths, jackets, or both shall be provided when necessary to protect the insulation or shielding from moisture or other adverse environmental conditions.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–39823, filed 7/25/86.]

WAC 296-44-39842 Shielding.

(1) General.

(a) Conductor shielding should, and insulation shielding shall, be provided as specified by an applicable document issued by a nationally recognized cable standardization organization.

Note: Typical cable standardization organizations include: The Association of Edison Illuminating Companies, the Insulated Cable Engineers Association and the National Electrical Manufacturers Association.

Note: Shielding is not required for short jumpers which do not contact a grounded surface within enclosures or vaults, provided the jumpers are guarded or isolated.

(b) Insulation shielding may be sectionalized provided that each section is effectively grounded.

(2) Material.

(a) The shielding system may consist of semiconducting materials, nonmagnetic metal, or both. The shielding adjacent to the insulation shall be designed to remain in intimate contact with the insulation under all operating conditions.

(b) Shielding material shall either be designed to resist excessive corrosion under the expected operating conditions or shall be protected.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–39842, filed 7/25/86.]

WAC 296-44-39855 Cable accessories and joints.

(1) Cable accessories and joints shall be designed to withstand the mechanical, thermal, environmental, and electrical stresses expected during operation.

(2) Cable accessories and joints shall be designed and constructed in such a manner that each component of the cable and joint is protected from harmful effects of the other components.

(3) Cable accessories and joints shall be designed and constructed to maintain the structural integrity of the cables to which they are applied and to withstand the magnitude and duration of the fault current expected during operation, except in the immediate vicinity of the fault.

(4) For insulating joints, see WAC 296-44-39842 (1)(b).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-39855, filed 7/25/86.]

WAC 296-44-413 Cable in underground structures.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-413, filed 7/25/86.]

WAC 296-44-41309 General. (1) WAC 296-44-398 shall apply to supply cable in underground structures.

(2) On systems operating above 2 kV to ground, the design of the conductors or cables installed in nonmetallic conduit should consider the need for an effectively grounded shield, a sheath, or both.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-41309, filed 7/25/86.]

WAC 296-44-41321 Installation. (1) General.

(a) Bending of the supply cable during handling, installation, and operation shall be controlled to avoid damage.

(b) Pulling tensions and sidewall pressures on the supply cable should be limited to avoid damage.

Note: Manufacturers' recommendations may be used as a guide.

(c) Ducts should be cleaned of foreign material which could damage the supply cable during pulling operations.

(d) Cable lubricants shall not be detrimental to cable or conduit systems.

(e) On slopes or vertical runs, consideration should be given to restraining cables to prevent downhill movement.

(f) Supply, control, and communication cables shall not be installed in the same duct unless the cables are maintained or operated by the same utility.

(2) Cable in manholes and vaults.

(a) Supports.

(i) Cable supports shall be designed to withstand both live and static loading and should be compatible with the environment.

(ii) Supports shall be provided to maintain specified separation between cables.

(iii) Horizontal runs of supply cables shall be supported at least three inches above the floor, or be suitably protected.

Note: This rule does not apply to grounding or bonding conductors.

(iv) The installation should allow cable movement without destructive concentration of stresses. The cable should remain on supports during operation.

Note: Special protection may be necessary at the duct entrance.

(b) Separation.

(i) Adequate working space shall be provided in accordance with WAC 296-44-38653(2).

(ii) Between supply and communication facilities (cable, equipment, or both).

(A) Where cable, equipment, or both are to be installed in a joint-use manhole or vault, it shall be done only with the concurrence of all parties concerned.

(B) Supply and communication cables should be racked from separate walls. Crossings should be avoided.

(C) Where supply and communication cables must be racked from the same wall, the supply cables should be racked below the communication cables.

(D) Supply and communication facilities shall be installed to permit access to either without moving the other.

(E) Clearances shall be maintained as specified in Table 413-1.

(c) Identification.

(i) General.

(A) Cables shall be permanently identified by tags or otherwise at each manhole or other access opening of the conduit system.

Table 413-1
Minimum Separation Between Supply and Communications Facilities in Joint-Use Manholes and Vaults

Phase-to-Phase Supply Voltage	Surface to Surface (in)
0 to 15,000	6
15,001 to 50,000	9
50,001 to 120,000	12
120,001 and above	24

Note 1: These separations do not apply to grounding conductors.

Note 2: These separations may be reduced by mutual agreement between the parties concerned when suitable barriers or guards are installed.

Note: This requirement does not apply where the position of a cable, in conjunction with diagrams or maps supplied to workers, gives sufficient identification.

(B) All identification shall be of a corrosion-resistant material suitable for the environment.

(C) All identification shall be of such quality and located so as to be readable with auxiliary lighting.

(ii) Joint-use manholes. Where cables in a manhole are maintained or operated by different utilities or are of supply and communication usage, they shall be permanently marked as to company, type of use, or both.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-41321, filed 7/25/86.]

WAC 296-44-41333 Grounding and bonding. (1) Insulation shielding of cable and joints shall be effectively grounded.

(2) Cable sheaths or shields which are connected to ground at a manhole shall be bonded or connected to a common ground.

(3) Bonding and grounding leads shall be of a corrosion resistant material suitable for the environment or suitably protected.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-41333, filed 7/25/86.]

WAC 296-44-41341 Fireproofing. Although fireproofing is not a requirement, it may be provided in accordance with each utility's normal service reliability practice to provide protection from external fire.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-41341, filed 7/25/86.]

WAC 296-44-41359 Communication cables containing special supply circuits. Special circuits operating at voltages in excess of 400 V to ground and used for supplying power solely to communications equipment may be included in communications cables under the following conditions:

(1) Such cables shall have a conductive sheath or shield which shall be effectively grounded and each such circuit shall be carried on conductors which are individually enclosed with an effectively grounded shield.

(2) All circuits in such cables shall be owned or operated by one party and shall be maintained only by qualified personnel.

(3) Supply circuits included in such cables shall be terminated at points accessible only to qualified employees.

(4) Communications circuits brought out of such cables, if they do not terminate in a repeater station or terminal office, shall be protected or arranged so that in event of a failure within the cable, the voltage on the communications circuit will not exceed 400 V to ground.

(5) Terminal apparatus for the power supply shall be so arranged that live parts are inaccessible when such supply circuits are energized.

(6) Such cables shall be identified, and the identification shall meet the pertinent requirements of WAC 296-44-41321 (2)(c).

Note: The requirements of WAC 296-44-41359(1) do not apply to supply circuits of 550 V or less which carry power not in excess of 3200 W.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-41359, filed 7/25/86.]

WAC 296-44-425 Direct buried cable.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-425, filed 7/25/86.]

WAC 296-44-42509 General. (1) WAC 296-44-398 through 296-44-39855 shall apply to direct buried supply cable.

(2) Cables operating above 600 V to ground shall have a continuous shield, sheath, or concentric neutral which is effectively grounded.

(3) Cables of the same circuit operating below 600 V to ground and without an effectively grounded shield or sheath shall be placed in close proximity (no intentional separation) to each other.

(4) Communications cables containing special circuits supplying power solely to communications equipment shall comply with the requirements of WAC 296-44-41359 (1)(a) through (e).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-42509, filed 7/25/86.]

WAC 296-44-42521 Location and routing. (1) General.

(a) Cables should be located so as to be subject to the least disturbance practical. Cables to be installed parallel to other subsurface structures should not be located directly over or under other subsurface structure, but if this is not practical, the rules on clearances in WAC 296-44-42533 should be followed.

(b) Cables should be installed in as straight and direct a line as practical. Where bends are required, the minimum radius shall be sufficiently large to prevent damage to the cable being installed.

(c) Cable systems should be routed so as to allow safe access for construction, inspection, and maintenance.

(d) The location of structures in the path of the projected cable route shall, as far as practical, be determined prior to trenching, plowing, or boring operation.

(2) Natural hazards. Routes through unstable soil such as mud, shifting soils, corrosive soils, or other natural hazards, should be avoided. If burying is required through areas with natural hazards, the cables shall be constructed and installed in such a manner as to protect them from damage. Such protective measures should be compatible with other installations in the area.

(3) Other conditions.

(a) Swimming pools. Supply cable should not be installed within five feet of a swimming pool or its auxiliary equipment. If five feet is not attainable, supplemental mechanical protection shall be provided.

(b) Buildings and other structures. Cable should not be installed directly under building or storage tank foundations. Where a cable must be installed under such a structure, the structure shall be suitably supported to prevent transfer of a harmful load onto the cable.

(c) Railroad tracks.

(i) The installation of cable longitudinally under the ballast section for railroad tracks should be avoided. Where cable must be installed longitudinally under the ballast section of a railroad, it should be located at a depth of not less than fifty inches below the top of the rail.

Note: Where this is impractical, or for other reasons, this clearance may be reduced by agreement between the parties concerned.

Note: Where unusual conditions exist or where proposed construction would interfere with existing installations, a greater depth than specified above would be required.

(ii) Where a cable crosses under railroad tracks, the same clearances indicated in WAC 296-44-38609 (1)(e) shall apply.

(d) Highways and streets. The installation of cable longitudinally under traveled surfaces of highways and streets should be avoided. When cable must be installed longitudinally under the roadway, it should be installed in the shoulder or, if this is not practical, within the limits of one lane of traffic to the extent practical.

(e) Submarine crossings. Submarine crossings should be routed, installed, or both, so they will be protected from erosion by tidal action or currents. They should not be located where ships normally anchor.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-42521, filed 7/25/86.]

WAC 296-44-42533 Clearances from other underground structures (sewers, water lines, fuel lines, building foundations, steam lines, other supply or communication conductors not in random separation, etc.). (1) Horizontal clearance. The horizontal clearance between direct buried cable and other underground structures shall be controlled at a minimum of twelve inches or larger as necessary to permit access to and maintenance of either facility without damage to the other. Installations with less than twelve inch horizontal separation shall conform with requirements of subsection (3) of this section, WAC 296-44-42559, or both.

(2) Crossings.

(a) Where a cable crosses under another underground structure, the structure shall be suitably supported to prevent transfer of a harmful load onto the cable system.

(b) Where a cable crosses over another underground structure, the cable shall be suitably supported to prevent transfer of a harmful load onto the structure.

(c) Adequate support may be provided by installing the facilities with sufficient vertical separation.

(d) Adequate vertical clearance shall be maintained to permit access to and maintenance of either facility without damage to the other. A vertical clearance of twelve inches is, in general, considered adequate but the parties involved may agree to a lesser separation.

(3) Parallel facilities. If conditions require a cable system to be installed with less than twelve inches horizontal separation or directly over and parallel to another underground structure (or another underground structure installed directly over and parallel to a cable), it may be done providing all parties are in agreement as to the method. Adequate vertical clearance shall be maintained to permit access to and maintenance of either facility without damage to the other.

(4) Thermal protection. Cable should be installed with sufficient clearance from other underground structures, such as steam or cryogenic lines, to avoid thermal damage to the cable. Where it is not practical to provide adequate clearance, a suitable thermal barrier shall be placed between the two facilities.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-42533, filed 7/25/86.]

WAC 296-44-42541 Installation. (1) Trenching. The bottom of the trench receiving direct buried cable should be relatively smooth undisturbed earth, well tamped earth, or sand. When excavation is in rock or rocky soils, the cable should be laid on a protective layer of well tamped backfill. Backfill within four inches of the cable should be free of materials that may damage the cable. Backfill should be adequately compacted. Machine compaction should not be used within six inches of the cable.

(2) Plowing.

(a) Plowing in of cable in soil containing rock or other solid material should be done in such a manner that the solid material will not damage the cable, either during the plowing operation or afterward.

(b) The design of cable plowing equipment and the plowing-in operation should be such that the cable will not be damaged by bending, side-wall pressure, or excessive cable tension.

(3) Boring. Where a cable system is to be installed by boring and the soil and surface loading conditions are such that solid material in the region may damage the cable, the cable shall be adequately protected.

(4) Depth of burial.

(a) The distance between the top of a cable and the surface under which it is installed (depth of burial) shall be sufficient to protect the cable from injury or damage imposed by expected surface usage.

(b) Burial depths as indicated in this section are considered adequate, except as noted in (ii), (iii) and (iv) following.

(i) Supply cables or conductors

Voltage phase-to-phase	Depth of Burial (in)
0 to 600	24
601 to 50,000	30
50,001 and above	42

Note: Street light cables operating at not more than 150 V to ground may be buried at a depth not less than eighteen inches.

(ii) In areas where frost conditions could damage cables, greater burial depths than indicated above may be desirable.

(iii) Lesser depths than indicated above may be used where supplemental protection is provided.

(iv) Where the surface is not to final grade, under which a cable is to be installed, the cable should be placed so as to meet or exceed the requirements indicated above, both at the time of installation and subsequent thereto.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-42541, filed 7/25/86.]

WAC 296-44-42559 Random separation--Additional requirements. These rules apply to cables or conductors when the radial separation between them will be less than twelve inches.

(1) Supply cables or conductors. The cables or conductors of a supply circuit and those of another supply circuit may be buried together at the same depth with no deliberate separation between facilities, provided all parties involved are in agreement.

(2) Communication cables or conductors. The cables or conductors of a communication circuit and those of another communication circuit may be buried together and at the same depth with no deliberate separation between facilities, provided all parties involved are in agreement.

(3) Supply and communication cables or conductors. Supply cables or conductors and communication cables or conductors may be buried together at the same depth with no deliberate separation between facilities, provided all parties involved are in agreement and the following requirements are met:

(a) Voltage.

(i) Grounded supply systems shall not be operated in excess of 22,000 V to ground.

(ii) Ungrounded supply systems shall not be operated in excess of 5,300 V phase–to–phase.

(b) Bare or semiconducting jacketed grounded conductor.

(i) A supply facility operating above 300 V to ground shall include a bare or semiconducting jacketed grounded conductor in continuous contact with the earth. This conductor, adequate for the expected magnitude and duration of the fault current which may be imposed, shall be one of the following:

(A) A sheath, an insulation shield, or both;

(B) Multiple concentric conductors closely spaced circumferentially;

(C) A separate conductor in contact with the earth and in close proximity to the cable, where such cable or cables also have a grounded sheath or shield not necessarily in contact with the earth. The sheath, shield, or both, as well as the separate conductor, shall be adequate for the expected magnitude and duration of the fault currents which may be imposed.

Note: This is applicable when a cable in nonmetallic duct is considered as a direct buried cable installation and random separation is desired.

Note: Where buried cable passes through a short section of conduit such as under a roadway, the contact with earth of the grounded conductor can be omitted, provided the grounded conductor is continuous through the conduit.

(ii) The bare conductor or conductors in contact with the earth shall be of suitable corrosion resistant material. The conductor covered by a semiconducting jacket shall be compatible with the jacketing compound.

(iii) The radial resistivity of the semiconducting jacket shall not be more than one hundred meter ohms and shall remain essentially stable in service. The radial resistivity of the jacket material is that value calculated from measurements on a unit length of cable, of the resistance between the concentric neutral and a surrounding conducting medium. Radial resistivity is equal to the resistance of a unit length times the surface area of jacket divided by the average thickness of the jacket over the neutral conductors. All dimensions are to be expressed in meters.

(c) Ungrounded supply systems. Cables of an ungrounded supply system operating above 300 V shall be of effectively grounded concentric shield construction in continuous contact with the earth. Such cables shall be maintained in close proximity to each other.

(4) Multiple cable systems. More than one cable system buried in random separation may be treated as one system when considering clearance from other underground structures or facilities.

(5) Protection.

(a) Supply circuits operating above 300 V to ground or 600 V between conductors shall be so constructed, operated, and maintained that when faulted, they shall be promptly deenergized initially or following subsequent protective device operation (phase–to–ground faults for grounded circuits, phase–to–phase faults for ungrounded circuits).

(b) Ungrounded supply circuits operating above 300 V shall be equipped with a ground fault indication system.

(c) Communication protective devices shall be adequate for the voltage and currents expected to be impressed on them in the event of contact with the supply conductors.

(d) Adequate bonding shall be provided between the effectively grounded supply conductor or conductors and the communication cable shield or sheath at intervals which should not exceed one thousand feet.

(e) In the vicinity of supply stations where large ground currents may flow, the effect of these currents on communication circuits should be evaluated before communication cables are placed in random separation with supply cables.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–42559, filed 7/25/86.]

WAC 296–44–440 Risers.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–440, filed 7/25/86.]

WAC 296–44–44009 General. (1) Mechanical protection for supply conductors or cables shall be provided as required by WAC 296–44–170 through 296–44–31792. This protection should extend at least one foot below ground level.

(2) Supply conductors or cable should rise vertically from the cable trench with only such deviation as necessary to permit a reasonable cable bending radius.

(3) Exposed conductive pipes or guards containing supply conductors or cables shall be grounded in accordance with WAC 296–44–36551.

(4) All supply conductors or cables from underground systems which connect to overhead systems shall be protected by a metal pipe or conduit which gives mechanical protection up to a point not less than eight feet above the ground and forty inches above communications circuits for public use. Schedule 80 PVC (polyvinyl chloride) piping shall be acceptable as a substitute for metal on both high and low voltage conductors. The conductor on the pole above eight feet will be covered with wood molding or other suitable protective material.

[Statutory Authority: Chapter 49.17 RCW. 89–11–035 (Order 89–03), § 296–44–44009, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–44009, filed 7/25/86.]

WAC 296–44–44021 Installation. (1) The installation should be designed so that water does not stand in riser pipes above the frost line.

(2) Conductors or cables shall be supported in a manner designed to prevent damage to conductors, cables, or terminals.

(3) Where conductors or cables enter the riser pipe or elbow, they shall be installed in such a manner that shall minimize the possibility of damage due to relative movement of the cable and pipe.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–16–007 (Order 86–26), § 296–44–44021, filed 7/25/86.]

WAC 296-44-44033 Pole risers--Additional requirements. (1) Risers shall be located on the pole so as to provide climbing space (see WAC 296-44-21273).

(2) The number, size, and location of riser ducts or guards shall be limited to allow adequate access for climbing.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-44033, filed 7/25/86.]

WAC 296-44-44047 Pad-mounted installations. (1) Supply conductors or cables rising from the trench to transformers, switchgear, or other equipment mounted on pads shall be so placed and arranged that they will not bear on the edges of holes through the pad nor the edges of bends or other duct work below the pad.

(2) Cable entering pad-mounted equipment shall be maintained substantially at adequate depth for the voltage class until it becomes protected by being directly under the pad, unless other suitable mechanical protection is provided.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-44047, filed 7/25/86.]

WAC 296-44-452 Supply cable terminations.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-452, filed 7/25/86.]

WAC 296-44-45209 General. (1) Cable terminations shall be designed and constructed to meet the requirements of WAC 296-44-39855.

(2) Riser terminations not located within a vault, pad-mounted equipment, or similar enclosure shall be installed in a manner designed to assure that clearance specified in Parts 1 and 2 of this code are maintained.

(3) A cable termination shall be designed to prevent moisture penetration into the cable where such penetration is detrimental to the cable.

(4) Where clearances between parts at different potentials are reduced below those adequate for the voltage and BIL (basic impulse insulation level), suitable insulating barriers or fully insulated terminals shall be provided to meet the required equivalent clearances.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-45209, filed 7/25/86.]

WAC 296-44-45219 Support at terminations. (1) Cable terminations shall be installed in a manner designed to maintain their installed position.

(2) Where necessary, cable shall be supported or secured in a manner designed to prevent the transfer of damaging mechanical stresses to the termination, equipment, or structure.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-45219, filed 7/25/86.]

WAC 296-44-45231 Identification. Suitable circuit identification shall be provided for all terminations.

Note: This requirement does not apply where the position of the termination, in conjunction with diagrams or maps supplied to workmen, gives sufficient identification.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-45231, filed 7/25/86.]

WAC 296-44-45243 Separations and clearances in enclosures or vaults. (1) Adequate electrical clearances and separations of supply terminations shall be maintained, both between conductors and between conductors and ground, consistent with the type of terminator used.

(2) Where exposed live parts are in an enclosure, clearances and separations or insulating barriers adequate for the voltages and the design BIL shall be provided.

(3) Where a termination is in a vault, uninsulated live parts are permissible provided they are guarded or isolated.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-45243, filed 7/25/86.]

WAC 296-44-45257 Grounding. (1) All exposed conducting surfaces of the termination device, other than live parts and equipment to which it is attached, shall be effectively grounded, bonded, or both.

(2) Conductive structures supporting cable terminations shall be effectively grounded.

Note: Grounding, bonding, or both is not required where the above parts are isolated or guarded.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-45257, filed 7/25/86.]

PART H--INSTALLATION AND MAINTENANCE OF ELECTRIC UTILIZATION EQUIPMENT

WAC 296-44-467 Equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-467, filed 7/25/86.]

WAC 296-44-46709 General. (1) Equipment includes:

(a) Buses, transformers, switches, etc., installed for the operation of the electric-supply system.

(b) Repeaters, loading coils, etc., installed for the operation of the communication system.

(c) Auxiliary equipment such as sump pumps, convenience outlets, etc., installed incidental to the presence of the supply or communication systems.

(2) Where equipment is to be installed in a joint-use manhole, it shall be done with the concurrence of all parties concerned.

(3) Supporting structures, including racks, hangers, or pads and their foundations shall be designed to sustain all loads and stresses expected to be imposed by the supported equipment including those stresses caused by its operation.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-46709, filed 7/25/86.]

WAC 296-44-46733 Design. (1) The expected thermal, chemical, mechanical, and environmental conditions at the location shall be considered in the design of all equipment and mountings.

(2) All equipment, including auxiliary devices, shall be designed to withstand the effects of normal, emergency, and fault conditions expected during operation.

(3) Switches shall be provided with clear indication of contact position, and the handles or activating devices clearly marked to indicate operating directions.

RECOMMENDATION: The handles or control mechanism of all switches throughout the system should operate in a like direction to open and in a uniformly different direction to close in order to minimize errors.

(4) Remotely controlled or automatic devices shall have provisions for local blocking to prevent operation if such operation may result in a hazard to the worker.

(5) Enclosures containing fuses and interrupter contacts shall be designed to withstand the effects of normal, emergency, and fault conditions expected during operation.

(6) When tools are to be used to connect or disconnect energized devices, space or barriers shall be designed to provide adequate clearance from ground or between phases.

(7) Where pad-mounted equipment is not within a fenced or otherwise protected area, access to exposed live parts in excess of 600 V shall require two separate conscious acts. One shall be the opening of a door or barrier which is locked or otherwise secured against unauthorized entry. The other shall be either the opening or the removal of a second secured door or barrier.

RECOMMENDATION: A prominent warning sign should be placed on the second door or barrier and be visible when the first is opened or removed.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-46733, filed 7/25/86.]

WAC 296-44-46739 Location in underground structures. (1) Equipment shall not obstruct personnel access openings in manholes or vaults nor shall it prevent easy egress by men working in the structures containing the equipment.

(2) Equipment shall not be installed closer than eight inches to the back of fixed ladders and shall not interfere with the proper use of such ladders.

(3) Equipment should be arranged in a manhole or vault to permit installation, operation, and maintenance of all items in such structures.

(4) Switching devices which have provision for manual or electrical operation shall be operable from a safe position. This may be accomplished by use of portable auxiliary devices, temporarily attached.

(5) Equipment should not interfere with drainage of the structure.

(6) Equipment shall not interfere with the ability to ventilate any structure or enclosure.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-46739, filed 7/25/86.]

WAC 296-44-46747 Installation. (1) Provisions for lifting, rolling to final position, and mounting shall be adequate for the weight of the device.

(2) Live parts shall be guarded or isolated to prevent contact by persons in a normal position adjacent to the equipment.

(3) Operating levers, inspection facilities, and test facilities shall be visible and readily accessible when equipment is in final location without moving permanent connections.

(4) Live parts shall be isolated or protected from exposure to conducting liquids or other material expected to be present in the structure containing the equipment.

(5) Operating controls of supply equipment, readily accessible to unauthorized personnel, shall be secured by bolts, locks, or seals.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-46747, filed 7/25/86.]

WAC 296-44-46755 Grounding. (1) Cases and enclosures made of conductive material shall be effectively grounded or guarded.

(2) Guards constructed of conductive material shall be effectively grounded.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-46755, filed 7/25/86.]

WAC 296-44-46761 Identification. Where transformers, regulators, or other similar equipment operate in multiple, tags, diagrams, or other suitable means shall be used to indicate that fact.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-46761, filed 7/25/86.]

WAC 296-44-491 Installation in tunnels.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-491, filed 7/25/86.]

WAC 296-44-49109 General. (1) The installation of supply and communication facilities in tunnels shall meet the applicable requirements contained elsewhere in WAC 296-44-350 through 296-44-49121 as supplemented or modified by this section.

(2) Where the space occupied by supply or communications facilities in a tunnel is accessible to other than qualified persons, or where supply conductors do not meet the requirements of WAC 296-44-350 through 296-44-49121 for cable systems, the installation shall be in accordance with the applicable requirements of WAC 296-44-170 through 296-44-31792.

(3) All parties concerned must be in agreement with the design of the structure and designs proposed for installations within it.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-49109, filed 7/25/86.]

WAC 296-44-49121 Environment. (1) When the tunnel is accessible to the public or when workers must enter the structure to install, operate, or maintain the facilities in it, the design shall provide a controlled safe environment including where necessary, barriers, detectors, alarms, ventilation, pumps, and adequate safety devices for all facilities. Controlled safe environment shall include:

(a) Design to avoid poisonous or suffocation atmosphere.

(b) Design to protect persons from pressurized lines, fire, explosion, and high temperatures.

(c) Design to avoid unsafe conditions due to induced voltages.

(d) Design to prevent hazards due to flooding.

(e) Design to assure egress; two directions for egress shall be provided for all points in tunnels.

(f) Working space, in accordance with WAC 296-44-38653(2), the boundary of which shall be a minimum of two feet away from vehicular operating space or from exposed moving parts of machinery.

(g) Safeguards designed to protect workers from hazards due to the operation of vehicles or other machinery in tunnels.

(h) Unobstructed walkways for workers in tunnels.

(2) A condition of occupancy in multiple-use tunnels by supply and communications facilities shall be that the design and installation of all facilities is coordinated to provide a safe environment for the operation of supply facilities, communications facilities, or both. Safe environment for facilities shall include:

(a) Means to protect equipment from harmful effects of humidity or temperature.

(b) Means to protect equipment from harmful effects of liquids or gases.

(c) Coordinated design and operation of corrosion control systems.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-007 (Order 86-26), § 296-44-49121, filed 7/25/86.]

WAC 296-44-850 Pole lines that overbuild or underbuild existing pole lines. No company shall construct a pole line which will overbuild or underbuild the existing pole lines of any company without first giving such company fifteen days' notice in writing or receiving the permission of the company affected: *Provided*, That this rule shall not apply to wires crossing over or under existing wires at an angle in excess of fifteen degrees: *Provided further*, That this rule shall only apply when either the existing or the proposed line is to be operated at a potential in excess of 5,000 volts.

[Rule 34, filed 8/3/61.]

WAC 296-44-855 High potential lines overbuilding telephone, telegraph, or signal wires. Wires or cables carrying electricity at a potential of 750 volts or more, overbuilding telephone, telegraph, or signal wires shall have a minimum size of wire No. 6 B & S gauge annealed copper or its equivalent in strength: *Provided further*, That this rule shall only apply when either the existing or the proposed line is to be operated at a potential in excess of 5,000 volts.

[Rule 35, filed 8/3/61.]

WAC 296-44-860 Crossings over railroads, street railroads, telephone, telegraph, signal or other power lines--General requirements. All wires or cables carrying electric current shall be run, placed, erected and maintained on crossings over railroads, street railroads, telephone, telegraph, signal or other power lines, in accordance with the following specifications: (1) Location: The poles, or towers, shall be located as far as practicable from inflammable material or structures.

(2) The poles, or towers, supporting the crossing span, and the adjoining span on each side preferable shall be in a straight line.

(3) Power wires or cables shall cross above the telegraph, telephone, and similar wires wherever practicable.

(4) Cradles or overhead bridges shall not be used.

(5) Crossing spans shall have a maximum length of 150 feet, except by permission of the commission,* and the difference in length of the crossing and adjoining spans generally shall not be more than fifty percent of the length of the crossing span.

(6) Clearance: Poles shall not be located less than twelve feet from the nearest rail of mainline track, nor less than six feet from the nearest rail of sidings, except by permission of the commission.* At loading sidings sufficient space shall be left for a driveway.

(7) The separation of conductors supported by pin insulators shall not be less than:

Line voltage	Separation
Not exceeding 750 volts	10 inches
Exceeding 750 volts but not exceeding 7,500	12 inches
Exceeding 7,500 volts but not exceeding 15,000	22 inches
Exceeding 15,000 volts but not exceeding 27,000	30 inches
Exceeding 27,000 volts but not exceeding 35,000	36 inches
Exceeding 35,000 volts but not exceeding 47,000	45 inches
Exceeding 47,000 volts but not exceeding 70,000	60 inches

Note 1.—This requirement does not apply to wires of the same phase or polarity between which there is no difference of potential.

Note 2.—The separation of conductors in series arc or incandescent circuits where the potential is not in excess of 10,000 volts need not exceed 12 inches.

(8) When supported by insulators of the disc or suspension type, the wire in the crossing span and the next adjoining spans shall be so attached to the insulators that a break in the span next adjoining the crossing span will not reduce the clearance specified more than twenty-five percent.

*Public service commission abolished. Duties devolve upon director of labor and industries, RCW 43.22.050.

(9) Conductors: The normal mechanical tension in the conductors generally shall be the same in the crossing span and in the adjoining span on each side.

(10) The conductors shall not be spliced in the crossing span, nor in the adjoining span on either side when there are more than two spans between crossings.

(11) The method of supporting the conductors at the poles, or towers, shall be such as to hold the wires, under

maximum loading, to the supporting structures, in case of broken insulators, or wires broken or burned at the insulator, without allowing an amount of slip which would materially reduce the clearance specified.

(12) Crossarms: Double crossarms shall be used on the poles or towers supporting crossing spans having a potential in excess of 15,000 volts where the strength of the conductor is less than that of No. 2 B. & S. gauge annealed copper.

(13) Guys: Wooden poles supporting crossing spans having a length of one hundred and twenty–five feet or more, and the next adjoining poles shall be headguyed away from the crossing span in all cases where the potential is in excess of 15,000 volts.

(14) Strain insulators shall not be used in guying steel structures, and are not required on wooden poles if the guy is effectually grounded, except within the incorporated limits of any city or town as provided in RCW 19.29.010(11).

(15) Clearing: The space around the poles, or towers, shall be kept free from inflammable material, underbrush and grass.

(16) Temperature: In the computation of stresses and clearances, and in erection, provision shall be made for a variation in temperature from minus 20 degrees Fahrenheit to plus 120 degrees Fahrenheit. A suitable modification in the temperature requirements shall be made for regions in which the above limits would not fairly represent the extreme range of temperature.

[Rule 36, subsections 1–16, filed 8/3/61.]

WAC 296-44-865 Crossings over railroads, street railroads, telephone, telegraph, signal or other power lines--Loads. (1) The conductors shall be considered as uniformly loaded throughout their length, with a load equal to the resultant of the dead load plus the weight of a layer of ice one–half inch in thickness, and a wind pressure of 8.0 pounds per square foot on the ice–covered diameter, at a temperature of 0 degrees Fahrenheit.

(2) The weight of ice shall be assumed as 57 pounds per cubic foot (0.033 pounds per cubic inch).

(3) Insulators, pins, and conductor attachments shall be designed to withstand, with the designated factor of safety, the tension in the conductors under the maximum loading.

(4) The poles, or towers, shall be designed to withstand, with the designated factor of safety, the combined stress from their own weight, the wind pressure on the pole, or tower, and the above wire loading on the crossing span and the next adjoining span on each side. The wind pressure on the poles, or towers, shall be assumed at 13 pounds per square foot on the projected area of solid or close structures, and on one and one–half times the projected area of latticed structures.

(5) The poles, or towers, shall also be designed to withstand the loads specified in subsection (4) above combined with the unbalanced tension of:

2 broken wires for poles, or towers, carrying 5 wires or less.

3 broken wires for poles, or towers, carrying 6 to 10 wires.

4 broken wires for poles, or towers, carrying 11 or more wires.

(6) Crossarms shall be designed to withstand the loading specified in subsection (4) above combined with the unbalanced tension of one wire broken at the pin farthest from the pole.

(7) The poles, or towers, may be permitted a reasonable deflection under the specified loading, provided that such deflection does not reduce the clearances specified more than 25 percent, or produce stresses in excess of those specified in WAC 296–44–875.

[Rule 36, subsections 17–23, filed 8/3/61.]

WAC 296-44-870 Crossings over railroads, street railroads, telephone, telegraph, signal or other power lines--Factors of safety. (1) The ultimate unit stresses divided by the allowable unit stress shall be not less than the following:

Wires and cables	2
Pins	2
Insulators, conductor attachments and guys	3
Wooden poles and crossarms	3
Structural steel	3
Reinforced concrete poles and crossarms	4
Foundations	2

(2) Insulators: Each insulator shall be subjected to a dry flash over test for five consecutive minutes at the following test voltages:

Line voltage	Test voltage
Less than 30,000	3 times line voltage
Exceeding 30,000 but not exceeding 50,000	2 1/2 times line voltage
Exceeding 50,000	2 1/4 times line voltage

Each insulator shall further be so designed that, with excessive potential, at rated frequency, failure will first occur by flash over and not by puncture.

(3) Each separate part of a built–up insulator shall be subjected to its dry flash over test for five consecutive minutes. The minimum test voltage for each given part of a built–up insulator shall be the potential difference across such part when the assembled insulator is subjected to test as specified in subsection (2) above.

(4) Each insulator shall be subjected to a wet flash over test, under a precipitation of water of one–fifth of an inch per minute, at an inclination of forty–five degrees to the axis of the insulator at the following test voltages:

Line voltage	Test voltage
Less than 30,000	2 times line voltage
Exceeding 30,000	1 3/4 times line voltage

(5) Test voltage above 35,000 volts shall be determined by the A.I.E.E. Standard Spark–Gap Method.

(6) Test voltages below 35,000 volts shall be determined by transformer ratio.

(7) Conductors: The conductors shall be of copper, aluminum or other noncorrodible material or of steel covered with such noncorrodible material.

(8) Conductors shall be of such mechanical strength that when subjected to the most severe loading conditions specified in WAC 296-44-865(1), the tension will not exceed fifty percent of the ultimate strength of the conductor and that under the maximum deflection from such loading the clearances specified will not be reduced.

(9) Insulators for use on lines operated at a potential in excess of 5,000 volts shall be of porcelain or such other material and design that the insulator will have a mechanical strength equivalent to a porcelain insulator, conforming in dielectric strength to subsections 2-6 above.

(10) Strain insulators for guys shall have an ultimate strength of not less than twice that of the guy in which placed. Strain insulators for guys shall not flash over at the line voltage under a precipitation of one-fifth of an inch per minute, at an inclination of forty-five degrees to the axis of the insulator.

Note: This only applies in the case of guys placed in observance of WAC 296-44-860(13).

(11) Pins: For voltage of 15,000 and over, insulator pins shall be of steel, wrought iron, malleable iron, or other approved metal or alloy, and shall be galvanized or otherwise protected from corrosion: *Provided*, That cast iron pins having a minimum diameter of 1/2 inch need not be galvanized or otherwise specially protected from corrosion.

(12) Guys: Guys shall be galvanized or copper-covered stranded steel cable, not less than 1/4 inch in diameter, or galvanized rolled rods of equivalent tensile strength.

Note: This only applies in the case of guys placed in observance of WAC 296-44-860(13).

(13) Guys to the ground shall connect to a galvanized anchor rod, extending at least one foot above the ground level.

Note: This only applies in the case of guys placed in observance of WAC 296-44-860(13).

(14) Wooden poles: Wooden poles supporting conductors operated at a potential in excess of 7,500 volts shall be of selected timber, peeled, free from defects which would decrease their strength or durability, not less than seven inches minimum diameter at the top, and meeting the requirements as specified in WAC 296-44-865 (4) and (5) and subsection (1) of this section.

[Rule 36, subsections 24-37, filed 8/3/61.]

WAC 296-44-875 Crossings over railroads, street railroads, telephone, telegraph, signal or other power lines--Working unit stresses. Obtained by dividing the ultimate breaking strength by the factors of safety given in WAC 296-44-870(1).

(1) Structural steel: Lbs. Per Sq. In.

Tension (net section)	18,000
Shear	14,000
Compression ($\frac{L}{R}$ equals radius of gyration.)	$18{,}000 - 60\frac{L}{R}$

(2) Rivets, pins:

Shear	10,000
Bearing	20,000
Bending	20,000

(3) Bolts:

Shear	8,500
Bearing	17,000
Bending	17,000

(4) Wires and cables:

Copper hard drawn, sold B. & S. G. 4-0, 3-0, 2-0	25,000
Copper hard drawn, solid B. & S. G. 1-0	27,500
Copper hard drawn, solid B. & S. G. No. 1	28,500
Copper hard drawn, solid B. & S. G. Nos. 2, 4, 6,	30,000
Copper soft drawn, solid B. & S. G.	17,000
Copper hard drawn, stranded B. & S. G.	30,000
Copper soft drawn, stranded B. & S. G.	17,000
Aluminum, hard drawn, stranded, B. & S. G. under 4-0	12,000
Aluminum, hard drawn, stranded, B. & S. G. 4-0 and over	11,500

(5) Untreated timber:

	Bending Lbs. Per Sq. In.	Compression $(\frac{L}{60D})$
Eastern white cedar	600	600
Chestnut	850	850
Washington cedar	850	850
Idaho cedar	850	850
Port Oxford cedar	1,150	1,150
Long-leaf yellow pine	1,000	1,000
Short-leaf yellow pine	800	800
Douglas fir	900	900
White oak	950	950
Red cedar	700	700
Bald cypress (heartwood)	800	800
Redwood	650	650
Catalpa	500	500
Juniper	550	550

L equals length in inches.
D equals least side, or diameter, in inches.

Note 1: In lieu of the above construction, power lines may be carried on poles of such length and spaced at such distances that a wire breaking at any point in the crossing span will swing clear of wire leads below and not come within ten feet of the ground at the highest point.

Note 2: Drop wires from a pole to the patrons' premises or wires crossing over same need not conform to the foregoing specifications except as covered by the following note.

Note 3: Telephone and telegraph lines, and telephone and power drops or service wires must be placed below power wires carrying 750 volts or more, or otherwise must maintain the same standard of strength as the wires they cross or are above.

Note 4: Only the construction last in point of time so run, placed, erected or maintained shall be held to be in violation of the provisions of this rule.

[Rule 36, subsections 38-41, filed 8/3/61.]

WAC 296-44-880 Crossings over railroads, street railroads, telephone, telegraph, signal or other power lines--Clearance.

CLEARANCE The following clearances shall be maintained in all crossing spans	Rails of Rail-roads	Buildings	Telephone, Telegraph and Signal wires	Power Lines 750 Volts and less, Except Trolley wires
Telephone, telegraph and signal wires	25'	.....	2' above or below*	
Power lines 750 volts and less, except trolley wires	25'	4'	Less 300V 2' above More 300V 3' above	2' above or below
Power lines more than 750 volts and less than 7,500 volts	28'	6'	3' above	3' above or below
Power lines more than 7,500 volts and less than 15,000 volts	28'	6'	7' above	7' above
Power lines 15,000 volts or more	34'	8'	7' above	7' above
Trolley wires	22'	.....	4' below+	4' below
Drops and service wires	25'	.....	2' above or below	Less 300V 2' below More 300V 3' below

* Unless suitably supported to prevent contact.

+ Except for properly protected cables when two feet will be permitted

CLEARANCE The following clearances shall be maintained in all crossing spans	Power Lines more than 750 an less than 7,500 volts	Power Lines more than 7,500 and less than 15,000 volts	Power Lines 15,000 volts or more	Trolley Wires
Telephone, telegraph and signal wires				
Power lines 750 volts and less, except trolley wires				
Power lines more than 750 volts and less than 7,500 volts	3' above or below			
Power lines more than 7,500 volts and less than 15,000 volts	7' above or below	7' above or below		
Power lines 15,000 volts or more	7' above or below	7' above or below	7' above or below	
Trolley wires	4' below	7' below	7' below	None
Drops and service wires above+	3' below	7' below	7' below	3'

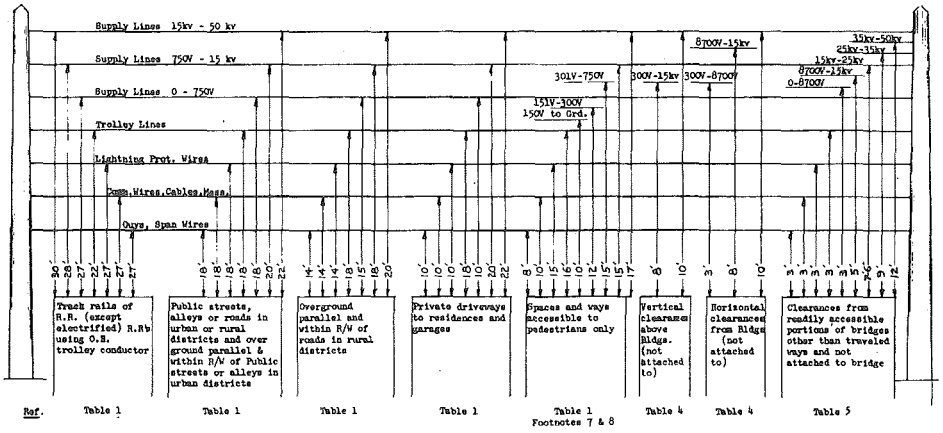
+ Except for properly protected cables when two feet will be permitted.

[Rule (part), (codified as WAC 296-44-880), filed 8/3/61.]

WAC 296-44-88001 Figure 1--Ground wire clearance.

GROUND AND WIRE CLEARANCES

Fig. 1



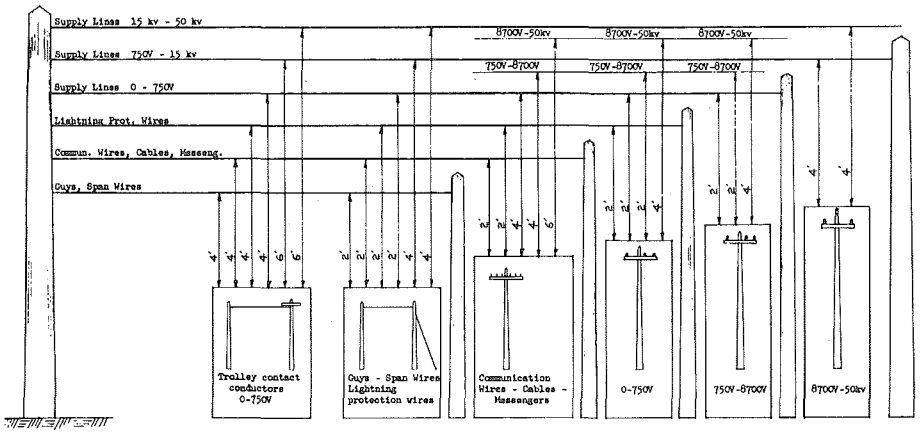
Note: Above clearances are subject to local ordinances and laws.
State highways are governed by franchise.
For voltages above 50 kv – Basic clearance at 50 kv plus 0.5 ins. per kv in excess of 50 kv.

Ref: WAC 296-44-316(1) Table 1, WAC 296-44-322 (3) and (4) Tables 4 and 5.

[Figure 1, (codified as WAC 296-44-88001), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88002 Figure 2--Basic wire crossing clearance.

BASIC WIRE CROSSING CLEARANCES

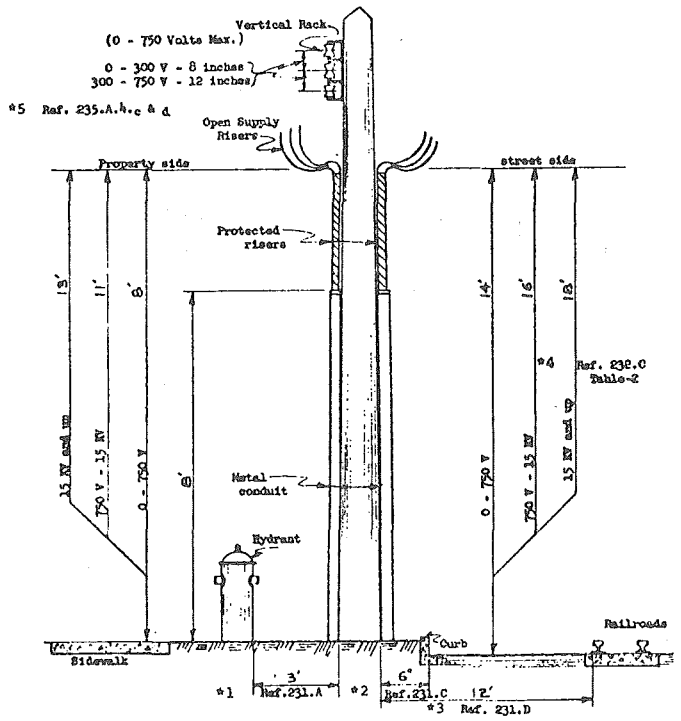


Ref: WAC 296-44-319(1) – Table 3

[Figure 2, (codified as WAC 296-44-88002), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88003 Figure 5--Clearances above ground for underground risers and horizontal clearance of poles from hydrants, curbs and railroads.

Fig. 5



Clearances above ground for underground risers and horizontal clearance of poles from hydrants, curbs and railroads.

*1 WAC 296-44-313(1).
*2 WAC 296-44-313(3).
*3 WAC 296-44-313(4).
*4 WAC 296-44-316(3).
*5 WAC 296-44-325 (1)(d)(iii) and (iv).

[Figure 5, (codified as WAC 296-44-88003), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88004 Illustration--Working space.

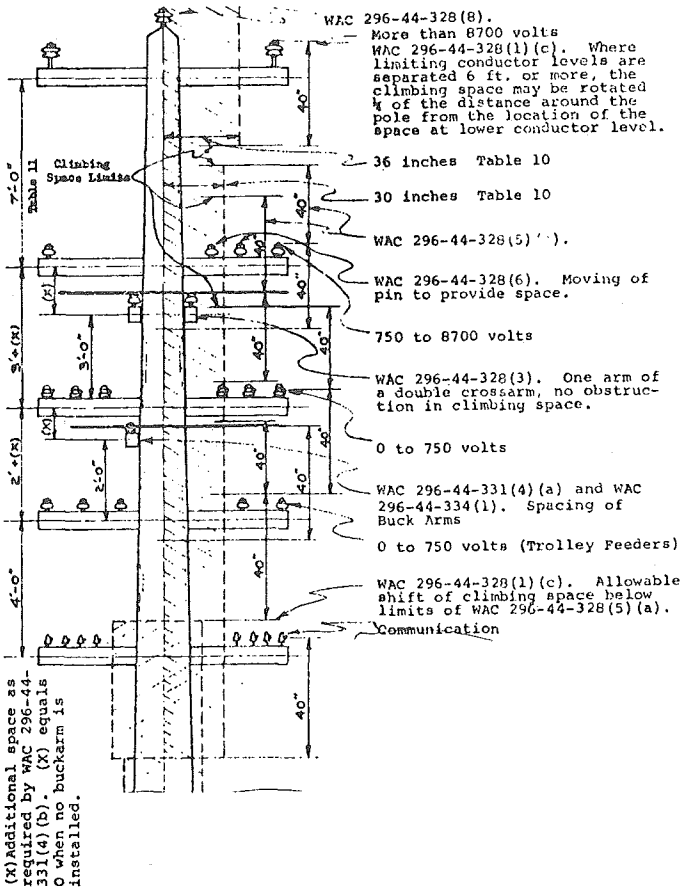


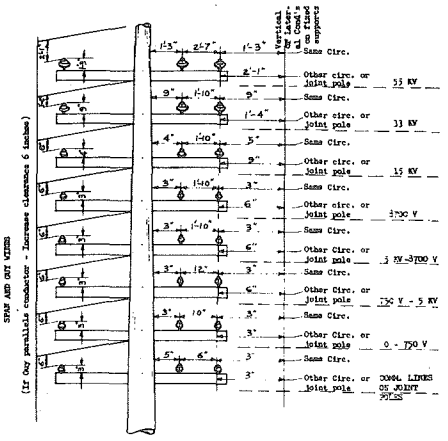
Illustration of Minimum Crossarm Spacing and Minimum Climbing and Working Spaces

Note: The climbing space at communication conductors shall be the same as required for supply conductors immediately above, with a maximum of 30". (Footnote 2 – Table 10)
The climbing space of supply conductors shall be that required by Table 10 for the highest voltage conductor bounding the climbing space and where this voltage level is 40" or less above or below the next lower voltage level than the larger space shall be required. (The vertical separation of conductors on standard pin supports are the regular points for reference.)

[Illustration, (codified as WAC 296-44-88004), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88005 Figures 6.A – 9.A--Clearances.

Fig 6.A – 9.A



MINIMUM CLEARANCES BETWEEN CONDUCTORS AND FROM CONDUCTORS TO GUYS, SURFACES OF POLES, CROSSARMS, VERTICAL OR LATERAL CONDUCTORS ATTACHED TO FIXED SUPPORTS.

These clearances graphically represented are basic minimums and are not intended to represent absolute allowable clearances under these rules.

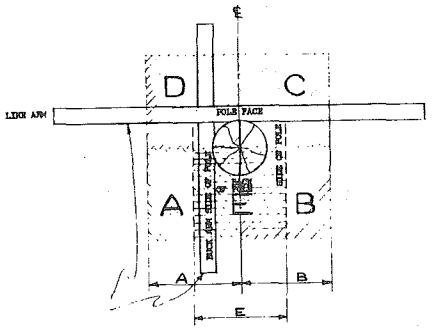
Note: If suspension insulators are not restrained from movement, these clearances are to be maintained with insulator swing of 45° on steel supports or 30° on wooden supports.

INTERPOLATION: For vertical and lateral conductors of over 8700 volts OF THE SAME CIRCUIT – 3 ins. plus 0.25 in. for each 1000 volts. OF OTHER CIRCUITS – 6 ins. plus 0.4 in. for each 1000 volts.

REF. WAC 296-44-325 – Tables 6 and 9
WAC 296-44-334 (5)(c)

[Figures 6.A – 9.A, (codified as WAC 296-44-88005), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88006 Figure--Climbing space.



WAC 296-44-328(3) A single cross arm at any conductor level is considered as an obstruction in the climbing space. WAC 296-44-328(4).

WAC 296-44-328 (1)(c) "A"-"B"-"C"-& "D" Pole quadrants of the dimensions specified in Table #10 for the voltage of the conductor

concerned.

If climbing space is located in quadrant "B," then it may be rotated to quadrant "A" or "C" in any 6 ft. conductor separation.

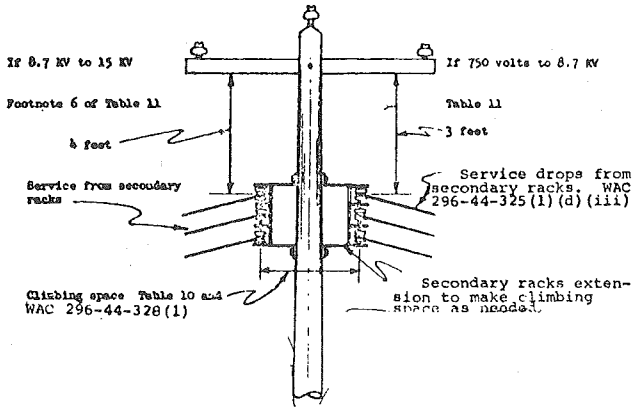
"E" Climbing space on back of pole and may be shifted to quadrants "A" or "B" at 40 inches below limiting conductor levels, or to "C" or "D" in any 6 ft. conductor spacing by the shortest path.

WAC 296-44-331(4) Location of buckarms in relation to linearms.

Note: Conductors supported in standard 29 1/2 in. pin spaces which conflict with the climbing space requirements shall be considered in compliance with the 30 in. climbing space as specified in WAC 296-44-328.

[Figure, (codified as WAC 296-44-88006), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88007 Illustration--Climbing space.



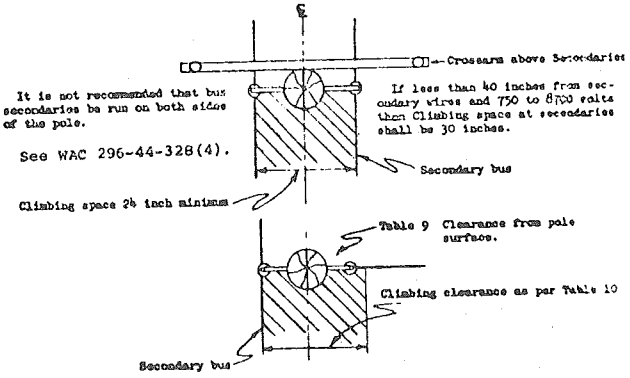
Note: The following application of these rules will be made when secondary racks installed according to WAC 296-44-325 (1)(d) are involved.

(1) Secondary racks will be considered the same as crossarms for the application of Table 11 and dimensions as per WAC 296-44-334(1) will apply.

(2) The top and bottom conductors will be the limiting conductors as per WAC 296-44-328 (5)(a).

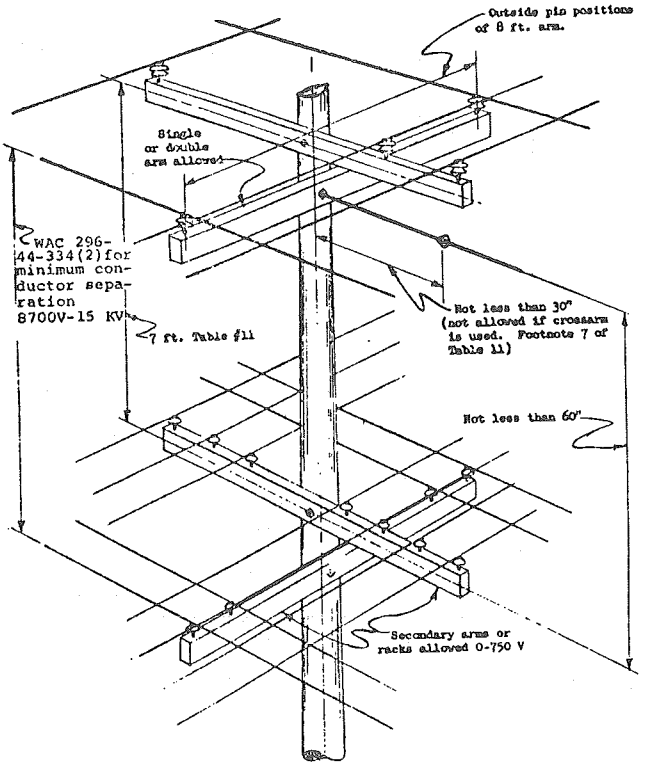
[Illustration, (codified as WAC 296-44-88007), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88008 Illustration--Climbing space.



[Illustration, (codified as WAC 296-44-88008), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88009 Illustration--Footnote 7 of Table 11--Climbing space.



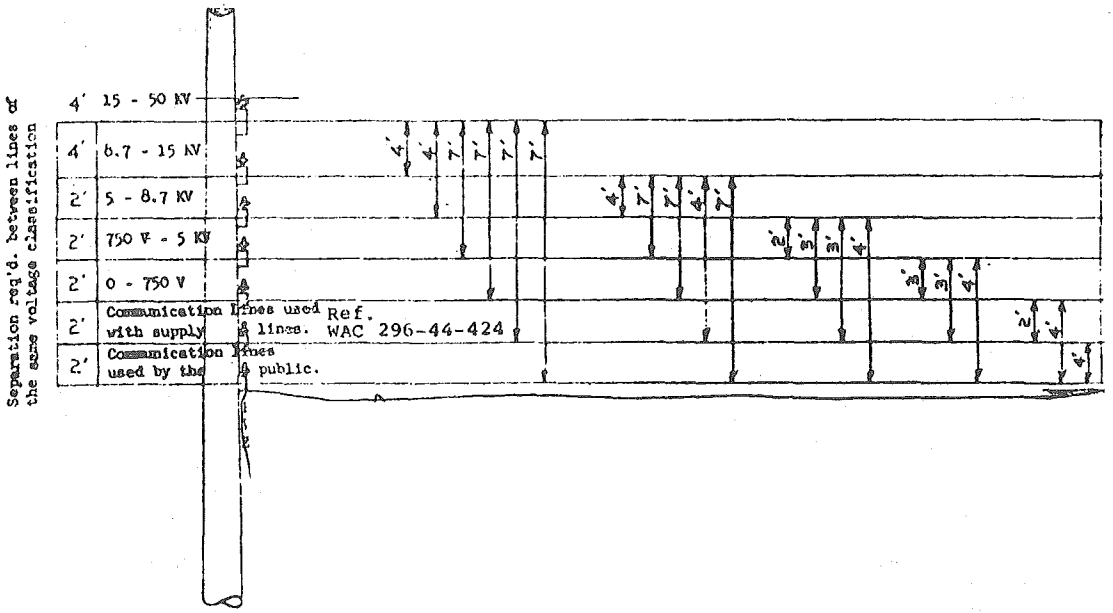
Ref. – WAC 296-44-334 (1)(a).
FOOTNOTE 7 OF TABLE #11.

[Illustration, (codified as WAC 296-44-88009), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88010 Figure 11.A--Minimum vertical separation between horizontal crossarms.

Fig. 11.A

Minimum vertical separation between horizontal crossarms of the same utility and communication circuits.



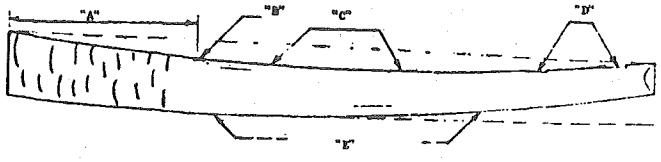
REF. WAC 296-44-334 – Table 11
EXCEPTION: See WAC 296-44-334 (1)(a), Table 11–Footnote 6.

WHERE CONDUCTORS ARE OF THE SAME VOLTAGE CLASSIFICATION

Where crossarm separation is:	Separation between conductors may be reduced to:
2 Ft.	16 ins.
3 Ft.	28 ins.
4 Ft.	40 ins.
6 Ft.	60 ins.
7 Ft.	70 ins.

[Figure 11.A, (codified as WAC 296-44-88010), filed 3/23/60, effective 12/1/58.]

WAC 296-44-88011 Illustration--Climbing space--Location and spacing of crossarms.



WAC 296-44-400 (1)(f)	Length or distance from butt of pole to butt gain or other marking that will indicate depth of pole setting.
WAC 296-44-400 (1)(f)	Butt gain or other permanent marking.
WAC 296-44-328(3)	Face of pole, preferred for the location of line arms.

"D" Cut gains for the location and spacing of crossarms.
"E" Back of pole. Preferred location of climbing space.

[Illustration, (codified as WAC 296-44-88011), filed 3/23/60, effective 12/1/58.]

Chapter 296-45 WAC
SAFETY STANDARDS--ELECTRICAL WORKERS

WAC

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.

296-45-120 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.

296-45-130 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.

296-45-140 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.

296-45-150 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.

296-45-160 Tools—Scaffolds. [§ IV, Rule 4.28, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.

296-45-170 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.

296-45-180 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.

296-45-190 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.

296-45-200 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.

296-45-210 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.

296-45-220 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.

296-45-230 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.

296-45-240 Equipment—Fire extinguishers. [§ IV, Rule 4.56, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.

296-45-250 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.

296-45-260 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.

296-45-270 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.

296-45-280 Employee qualifications. [§ V, Rule 5.1, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.

296-45-290 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.

296-45-300 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.

296-45-310 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.

296-45-320 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.

296-45-330 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.

296-45-340 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.

296-45-350 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.

296-45-360 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.

296-45-370 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.

296-45-380 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.

296-45-390 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.

296-45-65025 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.

WAC 296-45-650 Electrical workers safety rules--Foreword. The purpose of this chapter is to make the workplace of electrical employees as free from recognized hazard as is reasonably possible. The observance of these rules may in some instances require that speed and work performance be subordinated to the safety of employees. Since the purpose of these rules is the safety of employees, it is expected that those employees engaged in the work for which these rules are intended will, in good faith, adhere to the provisions of this chapter. This chapter is not intended to be a complete description of the work to be done nor is it complete in the sense that additional or unusual hazards may not exist for which there is no regulation or rule. In the event a hazard exists which is not contemplated by this chapter, it is expected that the foreman and employees will in good faith mutually discuss the particular hazard and arrive at a method of performing 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.

[Order 76-38, § 296-45-650, filed 12/30/76.]

WAC 296-45-65003 Scope and application. (1) The work for which this chapter is enacted is a specialized type of construction work and, insofar as it is specialized, such operations, procedures and work require a particular type of rule or regulation which is generally embodied within this chapter. The purpose of this chapter shall be to avoid those hazards peculiar to the industry, the purpose for which this chapter is designed, and this chapter shall include employees and employers whose business and work include power distribution and

transmission lines. The standards apply to all such construction work of an electrical nature regardless of the general nature of the business. The criterion for application of this chapter shall be the nature of the particular work to be or which is being performed. That work which is intended to be encompassed within the provisions of the mandatory and recommended provisions of this chapter shall include that work, conditions, practices, means, operations and processes performed at or on power distribution and transmission line installations, regardless of location, whether such installation for power distribution is (are) above ground or below ground, and shall include such adjacent and supporting structures as are fairly encompassed by these regulations.

Generally, the nature of the work will be such that industrial insurance premiums could reasonably be said to be reportable; (as of the effective date of this chapter) under WAC 296-17-521 (Class 5-8); WAC 296-17-522 (Class 6-1); and WAC 296-17-539 (Class 13-1). This guideline applies insofar as said class either directly or indirectly is related to the construction, erection, maintenance, repair, alteration, or other operation involving power distribution and transmission lines.

(2) Communication lines and work directed communication lines as defined in chapter 296-32 WAC (safety rules for tele-communications) are subject to the provisions of chapter 296-32 WAC and are not encompassed within the scope of this chapter.

(3) These standards shall apply 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.

(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) Under certain circumstances, an employer may obtain a variance from the director of the department of labor and industries or his 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 WAC 296-350-200 through 296-350-280.

(6) 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.

(7) 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.

(8) Should a rule or standard contained within this chapter conflict, in any manner, with a standard or rule contained within a general (horizontal) chapter, the standard or rule contained herein shall apply so long as the work being done is electrical work involving power distribution and transmission lines. Should a standard or rule contained within this chapter conflict, in any manner, with a standard or rule contained within a specialized (vertical) chapter (one which applies to a particular type of work), the standard or rule contained herein shall apply as long as the work being performed involves power distribution and transmission lines as hereinbefore defined. Should there be a conflict between two or more standards or rules contained within this chapter, the standard or rule which affords the worker greater safety shall apply.

(9) 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, foreman, 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.

(10) "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.

(11) 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.

(12) When the language used in this chapter indicates that it is the responsibility, duty, or obligation of the foreman 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.

[Order 76-38, § 296-45-65003, filed 12/30/76.]

WAC 296-45-65005 Definitions. These definitions are applicable to chapter 296-45 WAC.

(1) "Aerial manlift equipment." All types of equipment such as extended towers, boom-mounted cages or baskets, and truck-mounted ladders. This equipment is primarily designed to place personnel and equipment aloft to work on elevated structures and equipment.

(2) "Apprentice." An employee who is being trained to be a journeyman.

(3) "Approved." Meets or exceeds the recognized standards of safety within the industry.

(4) "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.

(5) "Automatic circuit recloser." A self-controlled device for automatically interrupting and reclosing an alternating current circuit with a predetermined sequence of opening and reclosing followed by resetting, hold closed, or lockout operation.

(6) "Barrier." A physical obstruction which is intended to prevent contact with energized lines or equipment.

(7) "Barricade." A physical obstruction such as tapes, screens, or cones intended to warn and limit access to a hazardous area.

(8) "Belts."

(a) "Lineman's body belt." A waist belt of approved material with a front buckle, two "D" rings for attaching safety straps and multiple loop strap for holding tools.

(b) "Strap." An adjustable leather, web, nylon, or other approved material in various lengths which permit free use of both hands in circling of post, pole, girder, etc. The safety strap permits the employee to assume a safe working position.

(c) "Construction belt." A strong leather, web, or other approved material belt at least 1 3/4 inches wide that may be equipped with fixed or adjustable "D" rings for attaching safety straps or lanyards.

(d) "Lanyard." A flexible line or strap of high tensile strength with snap hooks at one or both ends. They serve as safety straps or tail lines for use with belts or harness.

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

(10) "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 purpose of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

(11) "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).

(12) "Cable sheath." A protective covering applied to cables. A cable sheath may consist of multiple layers of which one or more is conductive.

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

(14) "Clearance (operating power lines and equipment)." The certification by the proper authority that a specified line or piece of equipment is deenergized, that the proper precautionary measures have been taken and the line or equipment is being turned over to the employee.

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

(16) "Communication lines." The conductors and their supporting or containing structures which are used for public or private signal or communication service: *Provided*, That such lines operate at potentials not exceeding 400 volts to ground or 750 volts between any two points of the circuit: *Provided further*, That the transmitted power does not exceed 150 watts. When operating at less than 150 volts, no limit is placed on the capacity of the system.

Communication lines generally include telephone, telegraph, cable antenna TV, railroad signal, data, clock, fire, police alarm, community television antenna, or other similar systems conforming with the above. Lines used for signaling purposes, but not included under the above definition, are considered as supply lines of the same voltage and are to be so run.

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

(18) "Conductor shielding." An envelope which encloses the conductor of a cable and provides an equipotential surface in contact with the cable insulation.

(19) "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.

(20) "De-energized (or dead)." Free from any electrical connection to a source of potential difference and from electrical charges. "Dead" is used only with reference to current-carrying parts which are sometimes alive or energized.

(21) "Designated or authorized employee." A qualified person delegated to perform specific duties under the conditions existing.

(22) "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 buildup of voltages which may result in undue hazard to connected equipment or to persons.

(23) "Electric line truck." Any vehicle used to transport men, 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.

(24) "Electric supply lines." Those conductors used to transmit electric energy together with necessary supporting and containing structures. Signal lines of more than 400 volts to ground are always electric supply lines if they are installed and used as electric supply lines.

(25) "Emergency." An unforeseen occurrence endangering life, limb, or property.

(26) "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.

(27) "Energized, alive, or live." 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. Electrical connections of less than 100 volts are not considered energized. Communication or signal lines as defined in this chapter are not considered energized.

(28) "Equipment." A general term which includes fittings, devices, appliances, fixtures, apparatus, and comparable equipment used as part of, or in connection with, an electrical power transmission and distribution system, or utility communication systems over 400 volts.

(29) "Exposed." Not isolated or guarded.

(30) "Fault current." As used in this chapter means the current that flows in an electrical system because of a defect in the circuit induced accidentally or otherwise.

(31) "Fixed ladder." A ladder which is permanently secured to a structure.

(32) "Foreman or man-in-charge." The person directly in charge of workers doing the work, regardless of title.

(33) "Foreign operation." Any business or work being performed which does not come within the mandatory scope and application of this chapter; an operation which would otherwise be subject to the provisions of this chapter may be subject to the provisions of another chapter in the event the employees performing the particular work were not competent as defined within the provisions of this chapter.

(34) "Guarded." Protected by personnel, covered, fenced, or enclosed by means of approved casings, barrier rails, screens, mats, platforms, or other approved devices in accordance with standard barricading techniques designed to prevent dangerous approach or contact by persons or conductive objects.

(35) "Ground" (reference)." That conductive body, usually earth or a system ground, to which an electric potential is referenced.

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

(37) "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.

(38) "Grounding." For the purpose of these rules, means the act of placing shorts and grounds on de-energized conductors and equipment.

(39) "Grounding electrode (ground electrode)." A conductor embedded in the earth, used for maintaining ground potential on conductors connected to it, and for dissipating into the earth current conducted to it.

(40) "Grounding electrode resistance." The resistance of the grounding electrode to earth.

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

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

(43) "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).

(44) "Groundman." A member of crew working on ground under direction of foreman.

(45) "Hotline tools and ropes." Those tools and ropes which are specifically designed for work on energized high voltage lines and equipment.

(46) "Insulated." Separated from other conducting surfaces by a dielectric substance including air space offering a high resistance to the passage of current. When any object is said to be insulated, it is understood to be insulated in an approved manner for the conditions to which it is subjected. Insulated covering of conductors is one means of making the conductor insulated.

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

(48) "Insulation shielding." An envelope which encloses the insulation of a cable and provides an equipotential surface in contact with cable insulation.

(49) "Isolated." An object that is not readily accessible to persons unless special means of access are used.

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

(51) "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.

(52) "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.

(53) "Portable ladder." As used in this chapter means a ladder capable of being moved by hand or manually and one which is usually moved into position by hand.

(54) "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.

(55) "Protective devices." Those devices such as rubber gloves, rubber blankets, line hose, rubber boots, or other insulating devices, which are specifically designed for the protection of employees.

(56) "Public highway." For the purpose of these rules shall include 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.

(57) "Pulling tension." The longitudinal force exerted on a cable during installation.

(58) "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 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 electrical trades with which he may be connected.

(59) "Secured ladder." A ladder which is not capable of being dislodged from the top by lateral, or jerking motion(s).

(60) "Sheath." As applied to tools carried in lineman's tool belt shall mean a sheath that effectively covers the tool and prevents such tool from falling from the belt.

(61) "Switch." A device for opening and closing or changing the connection of a circuit. In these rules, a switch is understood to be manually operable, unless otherwise stated.

(62) "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.

(63) "Rubber." Any goods, equipment, or tool made out of either natural or synthetic rubber.

(64) "Unstable material." Earth material, other than running, that because of its nature or the influence of other conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

(65) "Vault." An enclosure into which personnel may enter and used for the purpose of installing, operating, or maintaining equipment and cable.

(66) "Voltage." The effective (rms) potential difference between any two conductors or between a conductor and ground. Voltages are expressed in nominal values. 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.

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

(68) "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 auto-transformer), 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. Low voltage includes voltages from 100 to 750 volts. High voltage shall mean those voltages of 751 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.

[Order 76-38, § 296-45-65005, filed 12/30/76.]

WAC 296-45-65009 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 WAC 296-62-054 through 296-62-05427 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 foremen 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.

(6) 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.

(7) The employer or a representative(s) designated by him 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.

(8) 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.

(9) The employer shall provide and make available to all employees accident report and safety suggestion forms.

(10) In the case of fatal accident, immediate notice shall be given by the employer or his authorized representative either by telephone or telegraph (collect) to the department of labor and industries, division of industrial safety and health, Olympia, Washington, or any of its branch offices. All such notices shall include time, place, and date of the accident and the employer's name.

(11) Nothing contained within this chapter shall prohibit an employer or his authorized representative from disciplining employees for failure to comply with the provisions of this or any other safety code.

[Statutory Authority: Chapter 49.17 RCW. 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.]

WAC 296-45-65011 Foreman's responsibility. (1) Every foreman shall understand these and any other applicable safety rules and comply therewith. Foremen 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) Foremen 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) Foremen 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.

[Order 76-38, § 296-45-65011, filed 12/30/76.]

WAC 296-45-65013 Foreman-employee responsibility. (1) An employee shall protect his climbing and working space at all times if the conductors are so spaced that in climbing or working he will be, or where it is possible to come within, the minimum required distances specified in these rules.

(2) Foremen 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, foremen 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) Foremen 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, foremen 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.

[Order 76-38, § 296-45-65013, filed 12/30/76.]

WAC 296-45-65015 Work required of foremen. (1) A foreman cannot properly supervise the work and look out for the safety of employees under his direction if required to work as a foreman and a lineman at the same time.

(2) Foremen should be constantly alert and shall not be required to serve in such dual capacity, except in crews of not more than two linemen, in which case they may work as one of the linemen.

(3) In crews of two linemen or less, each lineman may have a groundman but, if additional linemen or groundmen are added to the crew, the foreman shall confine his activities to supervising the work, as exhibited below:

Type of Crew	Minimum Requirements
2 linemen	One lineman as man-in-charge.
2 linemen plus 1 groundman	One lineman as man-in-charge or climbing foreman.
2 linemen plus 2 groundmen	One lineman as man-in-charge or climbing foreman.
2 linemen plus any combination of 3 linemen or groundmen	One nonclimbing foreman.

[Order 76-38, § 296-45-65015, filed 12/30/76.]

WAC 296-45-65017 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 750 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.

(5) Employees shall report all injuries, regardless of severity, to the employer or designated representative. Report forms furnished by the employer should be used.

[Order 76-38, § 296-45-65017, filed 12/30/76.]

WAC 296-45-65019 First aid. In addition to complying with the first aid provisions as found in WAC 296-24-060 through 296-24-073, all employees whose duties require them to work on energized wires, equipment, or to climb poles or related structures, shall take an approved course in controlling bleeding and cardiopulmonary resuscitation, and

(1) All linemen shall be instructed in pole-top rescue and become and remain proficient in its application.

(2) It is recommended that all employees receive basic first aid training.

(3) Safety suggestion forms should, where possible, be used for suggesting the elimination of hazardous conditions and such reported suggestions shall be retained by the employer or his authorized representative.

[Order 76-38, § 296-45-65019, filed 12/30/76.]

WAC 296-45-65021 Tools and protective equipment. (1) Protective equipment.

(a) Rubber protective equipment shall be in accordance with the provisions of the American National Standards Institute (ANSI), ANSI J6 series as revised in 1971, as follows:

Item	Standard
Rubber Insulating Gloves	J6.6-1971 Edition
Rubber Matting for Use Around Electrical Apparatus	J6.7-1971 Edition
Rubber Insulating Blankets	J6.4-1971 Edition
Rubber Insulating Hoods	J6.2-1971 Edition
Rubber Insulating Line Hose	J6.1-1971 Edition
Rubber Insulating Sleeves	J6.5-1971 Edition

(b) 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.

(c) 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.

(d) 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.

(e) High voltage rubber gloves shall have and pass a minimum dielectric test of at least 10,000 volts.

(f) 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.

(g) Before being placed in service, all rubber protective equipment shall be numbered and records kept for test purposes and assignment.

(h) 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 dielectric test: *Provided*, That all rubber gloves and rubber sleeves which are in service must be dielectrically tested every three months and shall not be used unless they have been tested within three months and bear marking or identification of the date of the last dielectric test.

(i) Whenever any rubber protective equipment is dielectrically tested, such testing shall be performed by a person or persons familiar with the testing procedure and in a facility which meets the recognized standards in the industry for such testing. All rubber gloves that are in service shall be tested at a voltage twice the amount for which such rubber equipment is used. Whenever a dielectric test is conducted, the rubber protective equipment shall also be visually inspected in detail for defects.

(j) Approved protectors shall be worn at all times over rubber gloves. Inner liners may be worn if desired.

(k) 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.

(l) Approved rubber gloves and carrying bag shall be assigned to each employee who works with, or is exposed to energized parts.

(m) Rubber protective equipment shall not be vulcanized or patched.

(n) 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.

(o) 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.

(p) Protective line equipment of material other than rubber shall be kept clean and visually inspected before each use.

(q) 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.

(r) Line hose or similar type of equipment shall not be used on voltages in excess of 15,000 volts as measured from phase to phase unless the manufacturer specifies otherwise.

(s) 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.

(2) Personal climbing equipment. All lineman body belts, safety straps, lanyards, hooks, and other similar equipment shall comply to this chapter. This rule shall not apply to personal climbing equipment in use at the effective date of this chapter during its lifetime provided such equipment is maintained in good condition and in accordance with the applicable safety rule and requirement in effect at the time such equipment was obtained.

(a) Safety lines shall not be used for shock loading and shall be used only for emergency rescue. All safety lines shall be a minimum one–half inch diameter and three– or four–strand first grade manila or its equivalent in strength (2,650 pounds) and durability.

(b) Defective ropes shall not be used and shall be replaced.

(c) 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.

(d) Body belts with straps or lanyards shall be worn by employees working at an elevated position such as on poles, towers, or similar structures: *Provided*, That body belts and lanyards need not be used by employees while erecting transmission towers. Body belts and straps shall be inspected each day for defects before use. Defective body belts and straps shall not be used.

(e) 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.

(f) 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.

(g) 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.

(h) Climbing gaffs shall be kept properly sharpened and shall be at least 1–1/8 inches in length.

(3) Ladders.

(a) Portable metal or other portable conductive ladders shall not be used on or near energized line or equipment except where nonconductive ladders present a greater electrical hazard than conductive ladders. A greater electrical hazard would be static electricity such as might be found in extra high voltage substations. 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.

(b) All ladders including hook type ladders used in structures shall be secured to prevent the ladder from being accidentally displaced.

(c) All ladders shall be handled and stored in such a manner as to prevent damage to the ladder.

(d) When ascending or descending a ladder, the employee shall face the ladder and have free use of both hands.

(e) All defective ladders shall be taken out of service and labeled as defective.

(f) 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.

(g) 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.

(h) Portable ladders shall not be moved with employees on the ladder.

(i) No employee shall ascend or descend a rolling ladder while it is moving.

(j) No employee shall stand on the top two steps of a step ladder.

(k) No employee shall use a step ladder as a straight ladder.

(l) All ladders shall be of sufficient strength for the use to which they are placed.

(m) Ladders shall always be placed on a secure footing with both legs resting firmly on the lower surface.

(n) Ladders made by fastening cleats or similar devices across a single rail shall not be used.

(4) Hot line tools.

(a) Only hot line tools having manufacturer's certification of withstanding the following minimum tests shall be used:

(i) 100,000 volts per foot of length for 5 minutes when the tool is made of fiberglass; or

(ii) 75,000 volts per foot of length for 3 minutes when the tool is made of wood; or

(iii) Other tests which equal or exceed (i) and (ii) of this subsection.

(b) All hot line tools shall be visually inspected each day before use. All hot line tools shall be wiped clean before being used.

(c) Defective hot line tools shall not be used and shall be marked as defective and turned in for repair or replacement.

(d) Hot line tools and ropes shall be inspected each day before use. They shall be stored and maintained and used in such a manner as to prevent damage. Hot line tools and ropes shall not be used for purposes other than line work. Wood hot sticks shall be maintained with a surface coating of varnish or other approved treatment to prevent the absorption of moisture into the stick. The maintenance, inspection, storage, and use of such equipment shall be in conformance with the methods and standards recognized by manufacturers and the industry.

(5) Measuring ropes and tapes.

(a) Measuring ropes or measuring tapes which are metal or certain conductive strands shall not be used when working on or near energized lines or parts.

(6) Hand tools.

(a) All power hand tool switches shall comply with the provisions of WAC 296-24-650 through 296-24-67005.

(i) Be equipped with three-wire cord having the ground wire permanently connected to the tool frame and having a means for grounding the other end of the cord except when such three-wire cord increases the hazard to the employees or where the hand held tool is double insulated and permanently labeled "double insulated."

(ii) Be connected to the power supply by means of an isolating transformer, or other isolated power supply.

(b) All hydraulic tools which are used on or around energized lines or equipment shall use nonconductive hoses having approved strength for the normal operating pressures. The provisions of WAC 296-155-360 (4)(a) and (b) are mandatory.

(c) All pneumatic tools which are used on or around energized lines or equipment shall:

(i) Have nonconducting hoses having approved strength for the normal operating pressures, and

(ii) Have an accumulator on the compressor to collect moisture.

(7) Hand axes shall not be used when working overhead.

(8) Small tools carried in body belts shall be placed so as to present the least danger of coming into accidental contact with live parts.

(9) All tools carried in workers' body belts shall be sheathed: *Provided*, That tower erectors need not comply with this rule except when working on or above electric power equipment or lines.

(10) Tools other than those which are carried in workers' body belts shall not be carried up or lowered down poles or similar structures in belts but shall be raised and lowered by means of an approved container or hand line.

(11) All tools shall be kept in good working condition and shall be properly stored. Defective tools shall be taken out of service.

(12) Tools and loose material shall not be left at the top of poles or structures.

(13) Tools shall be placed where they will not be the cause of injury due to stepping or tripping on them.

(14) The surface and surface preservation of wood tools such as ladders, pike poles, switch sticks, insulating platforms used in electrical work shall be maintained. Only transparent preservatives shall be used. Where ladders and pike poles are not used on or near energized lines and are inspected monthly by qualified inspectors, they may be painted.

(15) Scaffolds shall be constructed and used in conformance with the general safety and health standards (WAC 296-24-82503) and the safety standards for construction work (WAC 296-155-485) of the state of Washington.

(16) Wearing apparel.

(a) Goggles, rubber gloves, respirators, and other such personal protective devices shall not be interchanged among employees unless they have been sanitized.

(b) Workers shall wear clothing appropriate to the season and the kind of work being performed: *Provided*, That shirts or jumpers with full length sleeves rolled down and protective hats shall be worn when working on or near live parts or while climbing poles.

(c) When working on or near energized parts, employees shall not wear loose dangling watch chains, key chains, or unnecessary metal of any type, and should not wear coats with metal zippers.

(17) When working at night, spotlights or portable lights for emergency lighting shall be provided and used as is necessary to perform work safely.

(18) Sanitary facilities. The requirements of WAC 296-24-120 through 296-24-130(13) shall be complied with.

(19) Industrial hygiene. The requirements of chapter 296-62 WAC are mandatory unless they are inconsistent with this chapter.

(20) Fire extinguishers. Employees should know the location and how to operate fire extinguishers in the worksite vicinity.

(21) 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.

(22) Working near or over water. When employees are engaged in work over or near water and when the danger of drowning exists, suitable flotation protection shall be provided and worn as required by WAC 296-24-086.

[Order 76-38, § 296-45-65021, filed 12/30/76.]

WAC 296-45-65023 Clearances, operating power lines and equipment. Clearances, directly under the control of the power dispatcher or person acting in that capacity, shall be requested and executed by observing the following rules:

(1) Employers shall designate a qualified person or persons to act in the capacity of power dispatcher, also known as load dispatcher or system operator.

(2) No switch shall be operated and no clearance tag placed or removed without an order from the power dispatcher having jurisdiction, except where standing orders or regulations have been given covering such operations.

(3) In all cases, switching orders must be given directly to the employees in charge of operating the switches by the power dispatcher 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 power dispatcher, a person requesting the clearance shall obtain the name of the dispatcher to whom the request was made and the dispatcher shall obtain the name of the person requesting the clearance; and assure himself that the person is qualified to receive such a clearance.

(4) Should it become necessary for a person holding a clearance to leave the job, he shall relinquish his clearance to the dispatcher and a new clearance shall be taken by another qualified person.

(a) In the event of an occurrence which renders it impossible to contact the individual who had a clearance on a given circuit or piece of equipment, that clearance may be released only by the next higher available official who is familiar with the work and has jurisdiction over the circuit or equipment.

(5) The dispatcher 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.

(6) 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.

(7) Clearance tags attached to airbreak switches opened within a substation shall indicate clearly that the line or equipment is cleared for employees to work thereon.

(8) In cases where more than one person will require clearance on the lines or parts of equipment, the power dispatcher must order complete sets of clearance tags for each person requesting clearance.

(9) When two or more crews are engaged in work at any one location on account of emergency or for other reasons, the proper authority may designate one of the foremen to act as foreman of the combined crews for the purpose of obtaining clearances only.

(10) To meet unforeseen conditions, it will be permissible to tag isolated switches for the dispatcher 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 dispatcher requesting the outage who will issue clearances to individuals of his organization against this tag.

(11) No work shall be performed on lines or equipment until the power dispatcher in control of such lines or equipment has clearly granted the clearance. The power dispatcher shall never grant a clearance on lines or equipment before all necessary protective tags are applied, and his own records of such clearance are clear and complete. Before considering any line or equipment to be de-energized, the power dispatcher shall assure himself that all switches which could possibly energize the line or equipment in question have been opened, all phases checked open, the switches tagged and, if possible, locked in the open position.

(12) Metal-clad, draw-out switchgear of over 750 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.

(13) In all other cases, only a visible break of all phases shall be regarded as clearing a line or equipment.

(14) Where two or more 5000-volt (or higher) lines are on the same pole or bus structure, arrangements must be made for simultaneous clearances on all such lines unless the person who requested the clearance specifically states that less will be sufficient.

(15) In giving a clearance, the power dispatcher shall make certain that the man to whom the clearance is given is fully aware of the extent or the limits of his clearance.

(16) The person or persons to whom a clearance has been given shall make certain that all protective grounding or short-circuiting devices installed by him or persons under his direction are removed before clearing the line or equipment to the dispatcher for service.

(17) After receiving notification from the dispatcher that the necessary switching has been done, the person making the request shall take the following precautionary steps before any employee comes in direct contact with the circuit or equipment:

(a) The circuit or equipment shall be tested by generally accepted methods to make certain that it is de-energized.

(b) The circuit or equipment shall be grounded and shorted as prescribed in this section.

(18) No person shall make contact with a circuit or equipment that has not been taken out of service to be worked on until he has the circuit or equipment cleared and tagged by himself or is working directly under the supervision of one who has the circuit or equipment cleared and tagged for himself.

(19) No tag shall be removed and no lines or equipment energized until the clearance has been released to the dispatcher.

(20) There shall be a tag used on any switch, regardless of the voltage or type of construction, where workers are likely to be endangered by the closing of such switch and/or where the switch is not directly visible to the employee protected by the open switch.

[Order 76-38, § 296-45-65023, filed 12/30/76.]

WAC 296-45-65026 Personal protective grounding. (1) Purpose.

(a) Reduce the potential voltage differences across the worker: The primary function of personal protective grounds is to provide maximum safety for personnel while they are working on de-energized lines or equipment. This will be accomplished by making provisions which will reduce the potential voltage differences at the worksite (voltage across the worker) to a safe value in case the equipment or line being worked on is accidentally energized from any possible source.

(b) Protect from induced voltage: The secondary function is also to protect against induced voltage from adjacent parallel energized lines.

(c) Insure adequate operation of protective devices: The third function is to make the protective devices (relays and circuit breakers or fuses) disconnect the energizing source within a given time/current relationship.

(2) Application.

(a) Deenergized line: When an energized line over seven hundred fifty volts is removed from service to be worked on, the line shall be treated as though it is energized until the line is cleared, tagged, tested, and grounded.

(b) Communication conductors: Bare wire communication conductors on power poles and structures are subject to these rules as energized lines and voltages in excess of seven hundred fifty volts unless protected by insulating materials.

(c) New construction: The grounding rule is advisory, rather than compulsory, when work is being done on new construction that is known to be deenergized and it is not possible to energize the line.

(d) Minimum distance from ungrounded conductors: The minimum distance shown in Table 1 of WAC 296-45-65027(14) shall be maintained from ungrounded conductors at the work location. The ground may be omitted if the making of a ground is impractical, or the conditions resulting therefrom are more hazardous than working on the lines or equipment without grounding. However, all work must be done in accordance with this chapter as if the line or equipment is energized.

(3) Grounding equipment.

(a) Availability: Grounding equipment shall be available for use when work is being done on deenergized lines or equipment.

(b) Approved capacity: Grounding equipment shall be of approved current carrying capacity capable of accommodating the maximum fault current to which the line or equipment could be subjected.

(c) Approved connector: Grounding shall be made with an approved connector capable of conducting the available fault current.

(d) Approved ferrules and grounding clamps: Grounding jumpers shall have approved ferrules and grounding clamps that provide mechanical support for jumper cables independent of the electrical connection.

(e) Minimum conductance: A ground lead shall have a minimum conductance of #2 AWG copper.

(4) Testing prior to installation of ground. Before grounds are installed, the deenergized line or equipment shall be tested for voltage by the following approved methods:

(a) Tester testing: Approved testers (audio and/or visual) may be used; however, they shall be tested immediately before and after use to verify that the tester is in good working condition.

(b) Hot line tool testing: A deenergized line may be buzzed or tested, to insure that it is deenergized, using an approved hot line tool with a substantial piece of metal on the end.

(5) Attaching and removing ground(s).

(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.

(c) Ground attachment procedure: When attaching ground(s), the ground end shall be firmly attached first to a reliable ground and then the other end shall be attached to the line or equipment by means of approved hot line tools.

(d) Ground removal procedure: No ground shall be removed until all employees are clear of the temporary grounded lines or equipment. In those instances where the specific line or equipment that has been previously energized at 750 volts or more is being taken out of service or moved to another location, and it has been identified, isolated, tested and grounded, and the safe distances provided in Table 1 are maintained or barriers are installed to protect against contact with energized sources, and it is no longer possible to energize the line or equipment from any source, the grounds may be removed and the line or equipment may be removed from service or moved to another location. When removing the grounding set, it shall be disconnected from the line or equipment first with an approved hot line tool and lowered to a point below all energized conductors before the ground end is disconnected.

(6) Selection of ground location. Attached grounds: Ground(s) attached to each conductor being worked on are adequate when connected in a manner that will reduce the potential voltage difference across the worksite to a safe level. See examples: Figures A, B, and C.

(7) Testing without ground(s): Ground(s) may be temporarily removed when necessary for testing purposes. During a test procedure, with ground(s) removed, care shall be exercised.

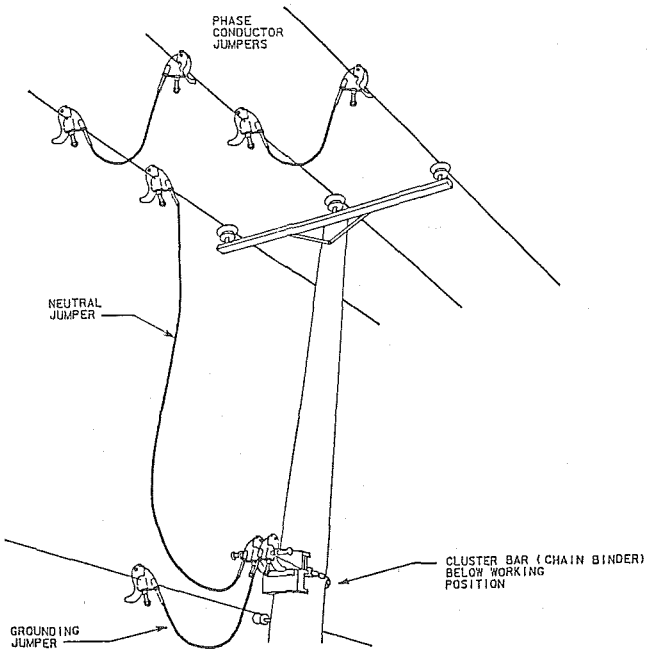
(8) Conductor separation: In cases where the conductor separation at any pole or structure is so great as to make it impractical to apply shorts on all conductors, and where only one conductor is to be worked on, only that conductor which is to be worked on needs to be grounded.

(9) 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: Touch potential hazards refers to the difference in voltage measured between the grounding equipment and a worker in contact with the grounding equipment at the time it is accidently energized. Step potential hazards refers to the difference in voltage measured between the feet of the worker standing or walking in an electrical field created by high voltage being brought to earth.

EXAMPLE OF
INSTALLATION OF PERSONAL PROTECTIVE GROUNDS
ON OVERHEAD LINES

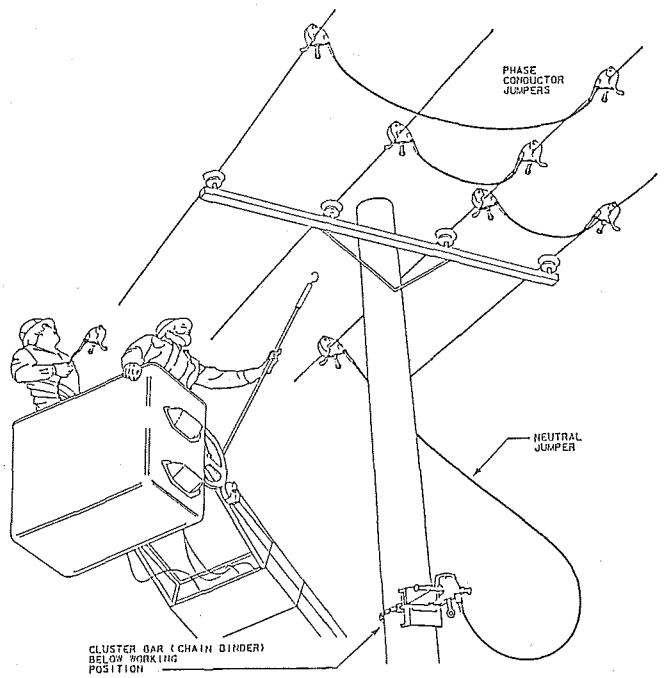
FIGURE A



DISTRIBUTION LINE WITH COMMON NEUTRAL

EXAMPLE OF
INSTALLATION OF PERSONAL PROTECTIVE GROUNDS
ON OVERHEAD LINES

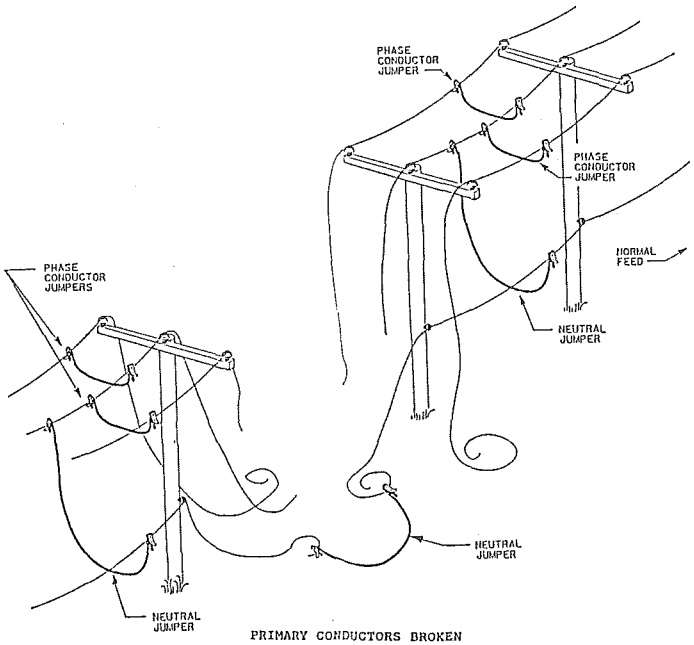
FIGURE B



DISTRIBUTION LINE WITH PRIMARY NEUTRAL

EXAMPLE OF
INSTALLATION OF PERSONAL PROTECTIVE GROUNDS
ON OVERHEAD LINES

FIGURE C



PRIMARY CONDUCTORS BROKEN

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-45-65026, filed 5/11/88.]

WAC 296-45-65027 General requirements. (1) The live-line bare-handed technique is prohibited on voltages of 750 volts or more.

(2) Number of men required to do work safely.

(a) Two competent electrical workers shall be required when performing work on energized high voltage lines or equipment or within the distances in Table 1. One of them shall serve principally as a standby man who shall be so located that he may physically reach the other employee in the event of an accident either with his hand or with a hot stick. The stand-by shall be so positioned as to be able to observe the other employee, his 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.

(b) In cases of necessity the stand-by man 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 man does not increase the hazard.

(c) 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 journeyman lineman or otherwise a competent or qualified employee. If repair to line or equipment is found to be of such nature as to require two linemen, 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.

(3) When only one qualified employee is available and he is required to work on high voltage, these circuits shall be de-energized while the work is performed except for emergencies.

(4) The provisions of subsection (2) of this section 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.

(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) Employees shall not stand on or otherwise come in contact with transformer cases or similar equipment while working on energized lines or equipment.

(7) Employees and conducting objects shall not come within the minimum distances as set forth in Table 1 of energized lines or conductors, except:

(a) When working on voltages of 5 Kv between phases or less employees may come within the distances as set forth in Table 1 if and so long as the employees are wearing approved rubber gloves, or use approved line hoses, rubber blankets, guards or barriers or similar approved protective equipment in such a manner as to protect against accidental contact, if the rubber gloves and other protective equipment is used in an approved manner.

(b) Nothing contained herein shall prevent the use of approved hot sticks on any voltage.

(8) Rubber gloves shall be worn or hot sticks used when placing protective equipment on or around energized conductors of voltages of 750 to 5,000 volts.

(9) Rubber gloves shall be worn or hot sticks used when removing tree branches, limbs, or similar objects from contact with high voltages or when such branch, branches, limbs or other conducting object is within the prohibited distance of Table 1. Rubber gloves shall be worn whenever the employee can touch or come within the prohibited distances as provided in Table 1.

(10) Employees should not wear rubber gloves while ascending or descending a pole until such time as the employee becomes so positioned that he is likely or capable of touching voltages of 750 or more.

(11) Rubber gloves, line hoses, rubber blankets, and other recognized protective equipment are barriers when used. Such barriers can be used on voltages of 5,000 or less between phases.

(12) 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.

(13) 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.

(14) TABLE 1:

Voltage Range (phase to phase) Kilovolt	Minimum Working and Clear Hot Stick Distance
.75 up to 15	2 ft. 0 in.
15 up to 35	2 ft. 4 in.
35 up to 46	2 ft. 6 in.
46 up to 72.5	3 ft. 0 in.
72.5 up to 121	3 ft. 4 in.
121 up to 145	3 ft. 6 in.
145 up to 169	3 ft. 8 in.
169 up to 242	5 ft. 0 in.
242 up to 362	7 ft. 0 in.[1]
362 up to 552	11 ft. 0 in.[1]
552 up to 765	15 ft. 0 in.[1]

[1]Note: For these voltages of 242 and up, the minimum working distances and the minimum clear hot stick distance at the work location may be reduced when and so long as such distances are not less than the shortest distance between the energized part and grounded surface.

(15) Foreign operations. All foreign operations as defined within this chapter conducted on or near power lines or energized equipment shall maintain clearance according to the provisions of WAC 296-24-24019.

[Order 76-38, § 296-45-65027, filed 12/30/76.]

WAC 296-45-65029 Overhead lines. (1) General.

(a) When working on or with overhead lines, this section shall be complied with as well as the applicable divisions of any other section.

(2) Strength of span and its support.

(a) Precautions shall be taken to determine that the span and the supports thereof are of a strength so as to safely bear the weight of the employee(s) and the equipment used thereon.

(b) Before an employee climbs a pole, it shall be inspected or tested to determine that such pole is safe, both above and below the ground level. If the pole is found to be unsafe for climbing, it must be guyed or braced or otherwise supported in such a manner as to allow the employees to safely perform their work.

(c) Before moving conductors there shall be a thorough inspection for strength and good condition of the adjacent supporting poles, structures, and conductor supporting hardware. Approved safeguards shall be installed on such adjacent poles or structures as may be necessary to prevent unexpected or uncontrolled movement of these adjacent poles, structures or conductors supporting equipment or conductors.

(3) When setting, moving or removing poles using cranes, derricks, gin poles, A-frames, or similar equipment near energized lines or equipment, minimum clearances shall be maintained, as provided by Table 1 except when approved barriers or other line protecting devices have been installed.

(4) Temporary guard poles or structures. Guard poles, towers, or other guard structures installed for the purpose of protecting employees, lines, conductors or equipment during the course of construction shall be installed at the same clearance requirements as for permanent construction and with strength and safety factors as required to safely support the loads that may normally be imposed on them during their use.

(5) The safest possible working position shall be assumed before starting work in the vicinity of energized wires, lines, transformers or similar energized equipment.

(6) No work should be performed in inclement weather on high voltage equipment when conditions are such as to materially increase the hazards to the employees excepting emergency work necessary to restore service.

(7) While work is being performed overhead, tools and materials shall be placed in proper receptacles when not being used. Tools and materials shall not be thrown to or from the employees on the pole or other elevated position(s) but shall be raised and lowered by means of a handline and/or tool bag. Tools and loose materials shall not be left on poles, crossarms, ladders or other elevated structures or positions.

(8) Employees shall not work in elevated positions unless secured so as to prevent accidental falling. They shall be secured by a safety belt or other approved means except when ascending, descending or moving from one location to another while in an elevated position. Before an employee throws his weight on a belt, the employee shall determine that the snap or fasteners are properly engaged.

(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) Foremen 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 wear climbers on 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.

(13) After a capacitor has been disconnected from its source of supply, workers shall wait five minutes before short-circuiting and grounding them, unless the capacitor is equipped with an adequate grounding and/or short-circuiting device. Employees shall take care not to contact the terminals, jumpers, or line wires connected directly to capacitors until they have been properly short-circuited and/or grounded.

(14) After removal from service, short circuits shall remain on capacitors in storage until returned to service.

(15) Pulling or slacking shall be done only as directed by the lineman overhead while hoisting or lowering materials by means of a block.

(16) Steel cables shall not be used to raise transformers, poles or any other material except when the cable is rigged below all energized parts at a sufficient distance to prevent any possibility of the cable or conductive material being raised from contacting unguarded energized parts, unless adequately spread, guarded or clearance is maintained as provided in Table 1. The term "energized parts" in this section means wires or equipment carrying more than 300 volts.

(17) 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.

(18) When employees are working overhead, employees shall not dig or do any other work that exposes them to danger due to inattention of the work being performed overhead. Employees shall wear approved hard hats when it is necessary to be beneath overhead employees.

(19) Splicers platforms of the type commonly used for splicing or approved ladders securely hooked over or lashed to the strands may be used.

(20) When employees are required to climb through energized circuits of 2.1 KV or more, preventive measures shall be taken so as to minimize the possibility of contact with energized lines. This may include approved spreading and guarding of the energized conductors.

(21) Methods shall be used that will effectively prevent ropes, (excepting hot line ropes) including hand lines, equipment or materials passing through the conductor level from making contact with the energized conductor or equipment of voltages of 2.1 KV or more. This may include approved spreading or guarding.

(22) All lifting equipment shall be bonded to an effective ground or it shall be considered and worked as energized and barricaded when utilized within the prohibited distance of Table 1 or if during the use of such equipment it is possible that it could come within the prohibited distance of Table 1 it shall be considered energized and barricaded.

[Order 76-38, § 296-45-65029, filed 12/30/76.]

WAC 296-45-65031 Poles and pole settings. (1) All poles, the methods of use and installation of poles, insofar as they affect the employee safety, are subject to the relevant provisions of the electrical construction code, chapter 296-44 WAC.

(2) Pole holes shall not be left unattended or unguarded.

(3) Tag lines shall be of a nonconductive type when used in an area that will come within the prohibited distance of Table 1 or where it is possible that during use such line could come within the provisions of Table 1.

(4) Framing. During framing operations, employees shall not work under a pole or structure suspended by a crane, A-frame or similar equipment unless it is adequately supported.

[Order 76-38, § 296-45-65031, filed 12/30/76.]

WAC 296-45-65033 Transmission line construction. (1) Metal tower construction.

(a) When working with unstable material, the excavation for pad or pile-type footings in excess of four feet deep shall be either sloped to the angle of repose, or shored as provided in WAC 296-155-660 and 296-155-665. Ladders shall be used for ingress and egress to a pad or pile-type footing excavation, if such excavation is in excess of four feet in depth. Employees shall not enter excavation to clear, clean or free the auger unless shoring is first installed.

(b) A designated employee shall be used in directing mobile equipment when such equipment either is or could come within the area of the fault line of the footing excavation.

(c) No employee shall be permitted to remain in the footing when equipment is being spotted for placement or being moved within an area that is likely to disturb the soil of or in the area of the excavation. This rule applies to excavation regardless of whether the excavation is shored or not.

(d) When necessary to assure the stability of mobile equipment, the location of use for such equipment shall be graded and leveled.

(e) Tower assembly shall be carried out with a minimum exposure to employees for falling objects. Employees shall not work under overhead work unless it is required by the very process and there is no other feasible method of performing the work.

(f) During construction or assembly, guy lines shall be used to maintain and secure parts of sections in position in towers or equivalent means shall be used.

(g) Tower members and sections being assembled shall be supported by an approved method.

(2) No employees shall be permitted under a tower when it is in the process of erection or assembly, except as may be required to guide and secure the section being set.

(a) When erecting towers using hoisting equipment adjacent to energized lines or equipment, such lines or equipment shall be deenergized if practical. If the lines are not deenergized, additional caution shall be used, such as a competent qualified employee to watch in order to maintain the minimum clearance provided in Table 1.

(b) Erection cranes or similar equipment shall be set on firm, level foundations and when the equipment has outriggers, the outriggers shall be properly used.

(c) Tag lines shall be utilized to maintain control of tower sections until the section is positively secure.

(d) The load lines shall not be detached from the tower sections until the section is positively secure.

(e) Except during emergency restoration procedure, erection shall be discontinued in the event of high wind or other adverse weather conditions when such weather conditions materially increase the hazard of the work being performed.

(f) All equipment and rigging shall be regularly inspected and maintained in safe operating condition.

(g) Traffic controls shall be maintained and used when crossing highways and railways with equipment as required by the provisions of WAC 296-155-300 (7)(a) and (b).

(h) A designated employee shall be used and shall observe in order to assure that equipment being moved under or near energized lines or equipment maintains the minimum distance as required in Table 1.

(3) Stringing or removing deenergized conductors.

(a) When stringing or removing deenergized conductors, the provisions of this subdivision shall be complied with.

(b) Prior to stringing operations, there shall be a briefing with all affected employees, setting forth the plan of operation and specifying the type of equipment

to be used, grounding devices and procedures to be followed, crossover methods to be employed, and the clearance authorization required, together with any other matters which the particular situation requires. Where conducting objects might contact, or come within the prohibited distance as set forth in Table 1, energized circuits, lines or where there might be a voltage build-up, the conductor being installed or removed shall be grounded first or the employee isolated or insulated.

(c) If the existing line is to be deenergized, proper clearance authorization shall be secured, and the line grounded on both sides of the crossing or the line being crossed shall be treated as energized.

(d) When crossing over energized conductors in excess of 750 volts, rope, nets or guard structures shall be installed so as to prevent accidental contact with the energized conductor(s). Where reasonably practical, the automatic reclosing feature of the circuit interrupting device shall be made inoperative.

(e) When conductors are being strung in or removed, they shall be kept under positive control to prevent accidental contact with energized circuit.

(f) Guard structures members shall be of approved dimension, strength and securely supported to meet the purpose for which they are intended.

(g) Catch-off anchors, rigging and hoists shall be of ample capacity to prevent loss of the lines.

(h) Manufacturer's load rating shall not be exceeded for stringing lines, pulling lines, sock connections, and all load-bearing hardware and accessories.

(i) 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. The provisions of WAC 296-155-330 (3)(d)(ii) concerning splices shall not apply to stringing and removing of deenergized conductors.

(j) Conductor grips shall not be used on wire ropes unless designed for that particular purpose.

(k) When the conductor or pulling line is being pulled (in motion) employees shall not be permitted directly under overhead operations, nor shall any employee be permitted on the crossarm.

(l) A transmission clipping crew shall have a minimum of two structures clipped in between the crew and the conductor being sagged. When working on bare deenergized conductors, clipping and tying crews shall work between grounds at all times. The grounds shall remain intact until the conductors are clipped in except on dead end structures.

(m) Except during emergency restoration procedures, work from structures shall be discontinued when there exists adverse weather conditions such as high wind or ice on the structures which would make the work more hazardous than usual.

(n) Removing, stringing and clipping operations shall be discontinued during the process of an electrical storm when such storm reasonably presents an additional hazard.

(o) Reel handling equipment, including pulling and braking machines, shall have ample capacity, operate smoothly and be leveled and aligned in accordance with the manufacturer's operating instructions.

(p) Communication between the reel tender and pulling rig operator shall be provided and maintained.

(q) Each pull shall be snubbed or dead ended at both ends before subsequent pulls.

(4) Stringing near, above, below or otherwise adjacent to energized lines.

(a) Before stringing near, above, below, parallel to an existing line, there shall be a determination as to whether or not there exists a possibility of a dangerously induced voltage buildup, particularly during switching and grounding fault conditions. Where such possibility of danger does exist, employer shall comply with provisions of subdivision (3)(a) through (3)(j) of this subsection in addition to the provisions of subsection (3) of this section unless the line is worked as energized.

(b) When stringing adjacent to or near energized lines, the tension stringing method or other methods which preclude accidental contact between the lines being pulled and any employee shall be used.

(c) All pulling and tensioning equipment shall be isolated, insulated or effectively grounded.

(d) A ground shall be installed at the tensioning reel set-up in order to ground each bare conductor, subconductor and overhead ground conductor during stringing operations.

(e) During stringing operations, each bare conductor, subconductor and overhead ground conductor shall be grounded at the first transmission structure adjacent to both the tensioning and pulling set-up and in increments so that no point is more than two miles from a ground, and

(i) The grounds shall be left in place until the conductor installation is completed.

(ii) Such grounds shall be removed as the last step of aerial cleanup.

(iii) Except for moving type grounds, the grounds shall be placed and removed with a hot stick.

(iv) Conductors, subconductors and overhead ground conductors shall be grounded at all dead-end or catch-off points.

(f) A ground shall be located at each side and within 10 feet of working areas where conductors, subconductors or overhead ground conductors are being spliced at ground level. The two ends to be spliced shall be bonded to each other.

(g) All conductors, subconductors and overhead ground conductors shall be bonded to the tower at any isolated tower where it may be necessary to complete work on the transmission line.

(h) Work on dead-end towers shall require grounding on all deenergized lines.

(i) Removal of temporary guards: Temporary guards shall not be removed until the adjacent structures have been clipped: *Provided*, The guard structures may be removed if safety slings have first been installed on adjacent tower or structure.

(j) When performing work from the structure, clipping crews and all others working on conductors, subconductors, or overhead ground conductors shall be

protected by individual grounds installed at each such work location.

[Order 76-38, § 296-45-65033, filed 12/30/76.]

WAC 296-45-65035 Substations. (1) Before work is performed on any electrically operated circuit breaker, it shall be cleared from the line and the control switch at the breaker opened. Where circuit breakers are operated by springs, solenoids or compressed air, or similar means, proper precautions shall be taken to prevent unauthorized or accidental operation of the device. This provision does not preclude repairs or adjustments that present no hazard to the employee.

(2) Disconnecting switches must be operated with approved sticks provided for that purpose unless said switches are provided with an operating mechanism having an insulated or grounded handle.

(3) Handles for manual operation of oil circuit breakers shall not be left in their sockets.

(4) Approved insulated platforms or mats shall be provided and used by employees while working on any live part of the switchboard on which any wire or appliance carries a potential in excess of 300 volts.

(5) All generators and motors having a potential of more than 300 volts shall have an approved insulated platform or mat, so arranged so as to permit the attendant to stand upon such a platform or mat when working upon live parts of such generator(s) or motor(s).

(6) Work near energized equipment.

(a) When work is performed in an energized substation, authorization shall be obtained from the designated, authorized employee before work is started.

(b) When work is to be done in an energized substation, the following shall be determined prior to the commencement of work:

(i) What facilities are energized, and

(ii) What protective equipment and precautions are necessary for the safety of personnel.

(c) Extraordinary caution shall be exercised in the handling of busbars, tower steel, materials and equipment in the vicinity of energized facilities. The provisions of Table 1 shall be complied with.

(7) Barricades and barriers.

(a) Barricades or barriers shall be installed to prevent accidental contact with energized lines or equipment.

(b) Where appropriate, signs indicating the hazard shall be posted on or near the barricade or barrier. These signs shall comply with the provisions of WAC 296-155-300.

(8) Control panels.

(a) Work on or adjacent to energized control panels shall be performed by designated employees only.

(b) Precautions shall be taken to prevent accidental operation of relays or other devices due to jarring, vibration, or improper wiring.

(9) Mechanized equipment.

(a) Use of vehicles, gin poles, cranes and other equipment in restricted or hazardous areas shall at all times be controlled by a designated employee.

(b) All mobile cranes and derricks shall be effectively grounded when being moved or operated in close proximity to energized lines or equipment, or where there exists a reasonable possibility that said equipment could accidently move within the prohibited distance as specified in Table 1, or the equipment shall be considered energized.

(10) Storage.

(a) The storage requirements of WAC 296-24-21501 through 296-24-21505 are mandatory.

(11) Fences.

(a) When a substation fence must be expanded or removed for construction purposes, a temporary fence affording similar protection shall be provided and installed when the site is unattended, approved interconnection with ground shall be maintained between the temporary fence and permanent fence.

(b) All gates to all unattended substations shall be locked, except when work is in progress.

(12) Footing excavation.

(a) Excavation for auger, pad and piling-type footings for structures and towers shall comply with the provisions set forth for metal tower construction. (See WAC 296-45-65033.)

(b) No employee shall enter an unsupported auger-type excavation if such excavation is in unstable material. Necessary clean-out shall be accomplished without entry.

[Order 76-38, § 296-45-65035, filed 12/30/76.]

WAC 296-45-65037 Underground. (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) When work is to be performed in a manhole or unvented vault:

(i) No entry shall be permitted unless forced ventilation is provided or the atmosphere is found to be safe by testing for oxygen deficiency and the presence of explosive or potentially hazardous gases or fumes.

(ii) When unsafe conditions are detected, by testing or other means, the work area shall be ventilated and otherwise made safe before entry.

(iii) Provisions shall be made for a continuous supply of air as provided for in WAC 296-62-110.

(iv) 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.

(4) When open flames are used or smoking is permitted in manholes, adequate mechanical forced air ventilation shall be used.

(5) 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.

(6) When work is to be performed in manholes containing any wires or appliances carrying electrical current, they shall be in a sanitary condition.

(7) A watchman shall be kept at the surface when there is any hazard to the employees in the manhole and he should not leave the manhole unwatched until such time as all employees are out and the cover has been replaced.

(8) Care shall be taken to prevent the possibility of vehicles or pedestrians coming in contact with the wires and equipment.

(9) Trenching and excavating.

(a) 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.

(10) 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 competent or 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.

(11) Trenching and excavation operations shall comply with the provisions of WAC 296-155-650 and 296-155-660.

(12)(a) Cables in manholes shall be accessible to employees and clear working space shall be maintained at all times.

(b) Where cables are not permanently identified by tags or otherwise, diagrams and information establishing positive identification and position of the cables shall be provided and supplied to the employees.

(c) Where multiple cables exist in an excavation, cables other than the one being worked on shall be physically protected when necessary.

(d) When multiple cables exist in an excavation, the cables to be worked on shall be identified by approved testing unless its identification is obvious by reason of the distinctive appearance.

(e) 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.

(f) When working on buried cables or cables in manholes, the metallic sheath continuity shall be maintained by bonding across the opening or by equivalent means.

(13) Insulated platforms or other protective devices shall be provided when work is to be done on energized wires or equipment in manholes.

(14) 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.

(15) 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.

(16) 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.

(17) 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.

(18) 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.

(19) WAC 296-45-65023 on clearances and WAC 296-45-65026 on grounding shall be complied with.

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-45-65037, filed 5/11/88; Order 76-38, § 296-45-65037, filed 12/30/76.]

WAC 296-45-65038 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.

(Exception: 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 deenergizing 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) Opening and guarding holes. Whenever a cover is to be removed from a manhole or underground vault, or making excavations in places accessible to vehicular or pedestrian traffic, the following precautions shall be taken:

(a) Before removal or excavating, protective barriers or approved guards and warning signs shall be erected.

(b) After dark, approved lights, reflectors, or similar devices shall be used.

(c) Where permissible and practical, the truck shall also be placed to guard the work area.

(d) A blow torch or other open flame shall never be used to melt ice around a manhole or underground vault cover.

(e) Care shall be taken to prevent the possibility of vehicles coming in contact with the wires and equipment.

(3) Entering underground structures. Before entry into any manhole or underground vault, the following precautions shall be taken:

(a) Observe subsection (2), opening and guarding holes.

(b) Prior to entering an unvented underground vault or manhole, an inspection shall be made to determine if any hazardous conditions exist. Appropriate safeguards shall be applied as required prior to the performance of any work.

(c) No entry shall be permitted unless forced ventilation is provided or the atmosphere is found safe by testing for oxygen deficiency and for the presence of explosive gases or fumes.

(d) Where unsafe conditions are detected, by testing or other means, the work area shall be ventilated and/or otherwise made safe before entry.

(e) Provisions shall be made for a continuous supply of air as provided in WAC 296-62-110 through 296-62-11013.

(f) When forced ventilation is not used, a method of monitoring for oxygen deficiency and to detect the presence of any explosive gases or fumes shall be used.

(g) In any emergency when it becomes necessary for an employee to enter an underground vault where oxygen deficiency, toxic or explosive gases are present, the employee shall use approved respiratory equipment, and a safety belt to which there is attached a fire retardant life line, attended by a qualified person stationed at the underground vault opening.

(h) A watchman shall be kept at the surface when there is any hazard to the employees in the manhole and he should not leave the manhole unwatched until such time as all employees are out and the cover has been replaced.

(i) Except in emergency conditions, a ladder shall always be used when entering or leaving an underground vault.

(4) Working in manholes and underground vaults.

(a) 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.

(b) Cable in manholes or underground vaults shall be accessible to employees and a clear working space (see items (1)(b)(i) and (ii) of this section) shall be maintained at all times; and/or approved protective guards, barriers, etc. when installed and maintained in compliance with the rules of the department of labor and industries shall be considered as providing adequate working clearance for cables over 5 k.v.

If a manhole and/or underground vault is determined to be unsafe by the man in charge, no work shall be done in the manhole and/or vault until the unsafe condition is corrected or deenergized.

(c) No work shall be performed on cables or equipment unless they have been properly identified by an approved method.

(d) Tools and materials shall not be thrown into or out of manholes or underground vaults, but shall be placed in proper receptacles and hoisted in and out by means of an approved method.

(5) Working on cables.

(a) Before any work is to be performed on underground cables and apparatus carrying high voltage, they shall be deenergized 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) Where multiple cables exist in an excavation or manhole, cables other than the one being worked on shall be protected.

(c) 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.

(d) Any cables to be worked on shall be identified by approved testing unless its identification is obvious by reason of the distinctive appearance, such as, tags, color, or other approved methods.

(e) Where work is to be performed on deenergized cables or equipment, the employee directly in charge of the work shall be responsible for determining that the conductors or equipment is deenergized.

(f) After conductors or equipment are cleared for work and the proper clearances have been obtained (WAC 296-45-65023) tests shall be made to determine that the conductors or equipment are deenergized.

(g) When working on underground cables, the metallic sheath continuity shall be maintained by bonding across the opening or by equivalent means.

(h) When work is to be performed in manholes containing any wires or appliances carrying electrical current, they shall be in a sanitary condition.

(i) Insulated platforms or other protective devices shall be provided when work is to be done on energized wires or equipment in manholes.

(6) 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.

(a) All high voltage cables and equipment that have been energized or could become energized shall be considered as energized until such cables have been grounded.

(b) Grounding shall be done at a point as near to the work locations as possible, except where their installations or use increases the working hazard.

(c) Grounds may be removed for test purposes.

(d) 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.

(e) After testing the cable dead, approved grounding devices shall be used. They shall be first connected to a ground before being brought into contact with any deenergized conductors to be grounded. When removed they shall be removed from all circuit conductors before being disconnected from ground.

(f) After grounding the cable, if the workman is to work on cable between terminations, he 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.

(7) Trenching and excavating.

(a) During excavation or trenching, in order to prevent exposure of employees to the hazards created by damage to underground facilities, the man in charge shall make every effort to determine the location of such facilities and conduct the work in a manner designed to avoid damage.

(b) Trenching and excavating operations shall comply with the provisions of WAC 296-155-650 through 296-155-665.

(c) All employees engaged in trenching and excavation operations shall have access at the work site to codes, and/or standards, applicable to such work or shall have been trained in the application of trenching and excavation standards.

(8) Pulling cables. When fishing conduits or ducts, it shall first be determined that the fish tape or wires will not contact any energized lines or equipment.

(9) Heating materials. 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 in the manhole and/or underground vault.

(10) Definitions.

(a) Load-break elbow - a connector designed to close and interrupt current on energized circuits within the design current and voltage rating.

(b) Dead-break elbow - a connector designed to be separated and engaged on deenergized circuits only.

(c) Underground network distribution system - an underground electrical installation fed from multiple primary sources directly associated with area-wide secondary network connected into a common grid.

(d) 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.

[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.]

WAC 296-45-65039 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). Linemen shall not reach over trolley wire(s) unless properly protected by line hose or rubber blanket.

(3) Reaching across sectional insulators. Linemen 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 deenergized 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.

[Order 76-38, § 296-45-65039, filed 12/30/76.]

WAC 296-45-65041 **Aerial manlift equipment.** This section applies to aerial manlift equipment as defined in WAC 296-45-65005.

(1) A daily visual inspection and operating tests shall be made in accordance with the manufacturer's recommendation by the assigned operator.

(2) Aerial manlift equipment shall be of the type designed and maintained to meet the following safety factors:

(a) Stability test. All such equipment shall meet or exceed a safety factor of one and one-half to one in all working positions, based upon the posted working load.

(b) Structural and mechanical tests. All such equipment shall meet or exceed a safety factor of 2 to 1 in all working positions, based upon the manufacturer's maximum rated capacity.

The division of industrial safety and health will accept, in lieu of (b) of this subsection, the safety factor test data submitted by the manufacturer by a competent testing laboratory, or by a registered engineering firm. When and if there exists a reasonable doubt as to whether or not the equipment will meet the data required for stability in structural and mechanical testing, the division may require that such testing be performed on such equipment before it can be used. If the division in writing requires that the employer test its equipment or have such equipment tested, the employer will have a reasonable time within which to secure such information as is required by this rule.

(3) Employee shall not move any such equipment in the direction of an obstructed view unless the following requirements have been met. (An obstructed view exists even though the operator is able to see to the rear by reason of a system of mirrors or a mirror.)

(a) Vehicle can be backed up only when observer signals that it is safe to do so or the driver makes a walk-around inspection prior to backing up, or

(b) The vehicle has a reverse signal alarm audible above the surrounding noise level.

(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) No employee shall ride in the basket while traveling to or from jobsites.

(8) When the support vehicle of any aerial manlift equipment is parked for operation at the jobsite, the brakes shall be set and when outriggers are used, they shall be positioned on pads or a solid surface. Use of outriggers is optional when the support vehicle of aerial manlift equipment is constructed in such a manner that makes the use of outriggers unnecessary, such as with torsion bar stabilizers or other devices that increase stability and eliminates the need for outriggers, even though installed on the vehicle. Wheel chocks shall be installed before using an aerial lift on an incline, provided they can be safely installed. All manufacturer's specifications shall be complied with.

(9) Safety check valves shall be installed in the outrigger hydraulic system which will automatically lock the outrigger in position in case of failure of the hydraulic system except when outriggers are equipped with mechanically self-locking device.

(10) The truck shall not be moved until the boom or ladder is cradled and/or fastened down, the outrigger retracted, and the power take-off disengaged, except for a short move when the truck can be moved with care and under the direction of the employee in the elevated position.

(11) 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.

(12) 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.

(13) Neither the basket, supporting boom or ladder on aerial equipment shall come within the prohibited distance of energized high voltage conductors or equipment as set forth in Table 1 unless protective equipment is used. Special approved insulated tools, insulated fittings and insulated masts need not comply with this section.

(14) When the basket is being used in such a manner that it may contact energized high voltage lines or equipment, the vehicle shall be considered energized at line potential and the following safe practices shall be observed unless such equipment is grounded:

(a) Approved protective devices shall be used.

(b) Before physically contacting, entering or leaving the vehicle, all employees shall make sure that the boom and basket is stationary and not in contact with energized high voltage lines or equipment.

(15) While working in aerial equipment, employees shall wear an approved safety belt attached to the boom or basket, in a secure manner.

(16) No component of aerial devices shall be operated from the ground without permission from the employee in the basket except in case of emergency.

(17) 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.

(18) 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.

(19) 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.

(20) 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.

(21) Linemen shall not wear climbers or spurs while working on a tower truck.

(22) Employees operating controls of aerial equipment shall not stand on the ground or on separate grounded surface unless wearing rubber gloves or standing on insulated board or mat, where equipment is exposed to or operated in the near vicinity of high voltage conductors.

(23) Operating levers or controls shall be kept clear of tools, materials or obstructions.

(24) Load limits as recommended by the manufacturer of aerial manlift equipment shall not be exceeded. Shock loading of the equipment is prohibited.

(25) 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.

(26) Employees shall not belt to adjacent poles, structures, or equipment while performing work from aerial devices.

(27) Whenever it is necessary to work beyond the guarded traffic work area, extreme care shall be exercised and all precautions taken to insure the safety of the operation and the employees.

(28) Power tools not in use shall be disconnected from external power sources.

(29) Electrical, hydraulic or air tools shall have safety switches or devices to prevent accidental operation and, in addition, a quick means of disconnecting on electrically operated equipment shall be within easy reach of the operator.

(30) 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.

(31) The basket shall be kept clean and all tools not in use shall be secured or removed.

(32) 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.

(33) A braking system, independent of the drive-line braking system, shall be installed on all aerial manlift equipment where, from the engineering standpoint, it is feasible.

(34) Safety check valves shall be installed in the hydraulic system of aerial manlift equipment to automatically lock the boom or ladder in position in case of failure to any part of the hydraulic pressure system.

(35) 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.

This section shall not be interpreted as an exception to any other rule in this chapter.

(36) 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.

(37) 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.

(38) Side member guys on aerial ladders shall be insulated.

(39) The manufacturer's operator's instructional manual shall be kept on the vehicle.

(40) Operating instructions, proper sequence and maintenance procedures prescribed by the manufacturer for operation of the equipment shall be followed.

[Statutory Authority: Chapter 49.17 RCW. 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.]

WAC 296-45-65043 All motor vehicle and trailer operations. When motor vehicles and trailers are operated on public right-of-way, highways or similar areas, the equipment shall be operated and maintained in conformance with the motor vehicle code of the state of Washington, chapters 46.04 through 46.61 RCW.

(1) Whenever and wherever such motor vehicle is operated, such equipment shall have a safe functioning brake and an emergency brake. In addition, all motor vehicles and trailers shall have such equipment as is necessary for the safe operation of the vehicle(s).

(a) When traveling, employees must ride inside the vehicle and shall not ride on the sides or on the top, nor shall employees ascend or descend a motor vehicle when such vehicle is in motion.

(b) Employees shall not ride on trailers except in cases where the trailer requires an employee to steer or brake the trailer.

(c) A truck shall not be moved from place to place with the ladder erect other than when positioning the

truck at a given location. This rule does not apply to approved tower or fixed ladder trucks.

(d) Warning signs, flares and other protective devices shall be used which shall conform with the requirements for road construction or maintenance as set forth in chapter 46.37 RCW.

(2) Vehicles shall be positioned as far off the driving lanes as possible, while performing emergency operations or repairs. The 4-way flashers and rotation amber lights shall be actuated. The rotating amber lights shall be visible at 360 degrees, in accordance with chapter 204-38 WAC. Safety cones shall be installed in front of and behind the vehicle. If the operation is for more than a short duration, they shall comply with traffic control procedures.

[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.]

WAC 296-45-65045 Material handling. (1) 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.

(a) The hoist rope shall not be wrapped around the load. This provision shall not apply to electric construction crews when setting or removing poles.

(2) 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.

(3) Tag lines. When necessary to control loads, tag lines or other approved devices shall be used.

(4) 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.

(5) 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.

[Order 76-38, § 296-45-65045, filed 12/30/76.]

WAC 296-45-65047 Specification for linemen's belts and similar equipment. (1) All hardware for linemen's body belts, safety straps and lanyards shall be drop forged or pressed steel and have a corrosive resistive finish tested to the American Society for Testing and Materials B117 as published in 1964 (50 hour test). Surfaces shall be smooth and free from sharp edges.

(a) All buckles shall be those guaranteed by the manufacturer as having at least a 2,000-pound tensile strength with a maximum permanent deformation no greater than one sixty-fourth inch.

(b) All "D" rings shall be those guaranteed by the manufacturer as having at least a 5,000-pound tensile strength without cracking or breaking.

(c) All snap hooks shall be those guaranteed by the manufacturer as having at least a 5,000-pound tensile strength without distortion sufficient to release the keeper.

(d) All fabric used for safety straps shall be guaranteed by the manufacturer as being capable of withstanding either AC or DC dielectric test of not less than 25,000 volts per foot "dry" for 3 minutes without visible deterioration.

(e) All fabric and leather used shall be that which has been represented by the manufacturer as having been tested for leakage current of 1 milliampere with a potential 3,000 volts when applied to the electrodes positioned 12 inches apart.

(f) The cushion part of the body belt may be either leather or other material provided that it;

(i) Has no exposed rivets on the inside;

(ii) Is at least 3 inches in width;

(iii) Is at least five thirty-seconds inch thick, if made of leather; or have equivalent strength if made of other material.

(iv) Has pocket tabs that extend at least 1-1/2 inches down and three inches back of the inside of circle of each "D" ring for riveting on plier or tool pockets. On shifting "D" belts, this measurement for pocket tabs shall be taken when the "D" ring section is centered.

(v) A maximum of four tool loops shall be so situated on the body belt that four inches of the body belt in the center of the back, measuring from "D" ring to "D" ring, shall be free of tool loops and any other attachments.

(vi) All stitching shall be of minimum 42-pound weight nylon or equivalent thread and shall be lock stitched. Stitching parallel to an edge shall not be less than three-sixteenths inch from edge of narrowest member caught by the thread. The use of cross-stitching on leather is prohibited. Approved copper, steel or equivalent liners shall be used around the bar of "D" rings to reduce the wear.

(vii) The keeper of snap hooks shall have a spring tension that will not allow the keeper to begin to open with a weight of 2-1/2 pounds or less, but the keeper of snap hooks shall begin to open with a weight of four pounds, when the weight is supported on the keeper against the end of the nose.

(2) Testing linemen's safety straps, body belts and lanyards shall be in accordance with the following procedure:

(a) Attach one end of the safety strap or lanyard to a rigid support, the other end shall be attached to a 250-pound canvas bag of sand;

(b) Allow the 250-pound canvas bag of sand to free fall 4 feet for (safety strap test) and 6 feet for (lanyard test), in each case stopping the fall of the 250-pound bag;

(c) Failure of the strap or lanyard shall be indicated by any breakage, or slippage sufficient to permit the bag to fall free of the strap or lanyard. The entire "body belt

assembly" shall be tested using one "D" ring. A safety strap or lanyard shall be used that is capable of passing the "impact loading test" and attached as required in item (a) of this subdivision. The body belt shall be secured to the 250-pound bag of sand at a point to simulate the waist of a man and allowed to drop as stated in item (b) of this subdivision. Failure of the body belt shall be indicated by any breakage, or slippage sufficient to permit the bag to fall free of the body belt.

(d) Life lines and lanyards shall comply with the provisions of WAC 296-155-225 (2), (3), (5) and (6).

[Order 76-38, § 296-45-65047, filed 12/30/76.]

WAC 296-45-660 Tree trimming. The purpose of this chapter is to make the workplace free from hazard. All sections of this chapter which include WAC 296-45-660 in the section number will apply.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-660, filed 6/17/81.]

WAC 296-45-66001 Electrical hazards. (1) This section applies to tree trimming by contractors under WAC 296-17-506 (Class 1-6), tree trimming near energized power lines on utility property, governmental and privately owned systems.

(2) Definitions applicable to this section.

(a) "Aerial manlift equipment" - all types of equipment such as extended towers, boom-mounted cages or baskets and truck-mounted ladders. This equipment is primarily designed to place personnel and equipment aloft for working.

(b) "Qualified line-clearing 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 clearing.

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

(d) "Tree trimming groundman" - a member of crew working on the ground under the direction of foreman or tree trimmer.

(3) First aid. In addition to complying with the first aid provisions as found in WAC 296-24-060 through 296-24-073, all employees whose duties require them to work near energized wires, or climb trees shall take an approved course in controlling bleeding and cardiopulmonary resuscitation, and be capable of aerial or tree rescue and remain proficient in its application.

[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.]

WAC 296-45-66003 Tools and protective equipment. 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.

(1) Defective ropes shall not be used and shall be replaced.

(2) Body belts with straps, saddles or lanyards shall be worn by employees working at an elevated position. Body belts, saddles and straps shall be inspected each day for defects before use. Defective body belts, saddles and straps shall not be used.

(3) Body belts, safety straps and saddles shall not be stored with any sharp-edged tools or near sharp objects. When a body belt, saddle, 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, saddle or safety strap with the gaffs or climbers.

[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.]

WAC 296-45-66005 Insulated tools used for tree trimming. (1) Only insulated tools having manufacturer's certification of withstanding the following minimum tests shall be used:

(a) 100,000 volts per foot of length for 5 minutes when the tool is made of fiberglass; or

(b) 75,000 volts per foot of length for 3 minutes when the tool is made of wood; or

(c) Other tests which equal or exceed (a) and (b) of this subsection.

(2) All insulated tools shall be visually inspected each day before use. All insulated tools shall be wiped clean before being used.

(3) Defective insulated tools shall not be used and shall be marked as defective and turned in for repair or replacement.

(4) Hand tools.

(a) All hydraulic tools which are used near energized lines or equipment shall use nonconductive hoses having approved strength for the normal operating pressures. The provisions of WAC 296-155-360 (4)(a) and (b) are mandatory.

(b) All pneumatic tools which are used near energized lines or equipment shall:

(i) Have nonconducting hoses having approved strength for the normal operating pressures, and

(ii) Have an accumulator on the compressor to collect moisture.

(5) All tools shall be kept in good working condition and shall be properly stored. Defective tools shall be taken out of service.

(6) Wearing apparel. Goggles, hearing protection, respirators, and other such personal protective devices shall not be interchanged among employees unless they have been sanitized.

[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.]

WAC 296-45-66007 Aerial manlift equipment. This section applies to aerial manlift equipment as defined in WAC 296-45-65005.

(1) A daily visual inspection and operating tests shall be made in accordance with the manufacturer's recommendation by the assigned operator.

(2) Aerial manlift equipment shall be of the type designed and maintained to meet the following safety factors:

(a) Stability test. All such equipment shall meet or exceed a safety factor of one and one–half to one in all working positions, based upon the posted working load.

(b) Structural and mechanical tests. All such equipment shall meet or exceed a safety factor of 2 to 1 in all working positions, based upon the manufacturer's maximum rated capacity.

(c) The division of industrial safety and health will accept, in lieu of subdivision (b) of this section, the safety factor test data submitted by the manufacturer by a competent testing laboratory, or by a registered engineering firm. When and if there exists a reasonable doubt as to whether or not the equipment will meet the data required for stability in structural and mechanical testing, the division may require that such testing be performed on such equipment before it can be used. If the division in writing requires that the employer test its equipment or have such equipment tested, the employer will have a reasonable time within which to secure such information as is required by this rule.

(3) Employee shall not move any such equipment in the direction of an obstructed view unless the following requirements have been met. (An obstructed view exists even though the operator is able to see to the rear by reason of a system of mirrors or a mirror.)

(a) Vehicle can be backed up only when observer signals that it is safe to do so or the driver makes a walk–around inspection prior to backing up, or

(b) The vehicle has a reverse signal alarm audible above the surrounding noise level.

(4) Hydraulic fluids. All hydraulic fluids used for the insulated section of derrick trucks, aerial lifts, and hydraulic tools which are used 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) No employee shall ride in the basket while traveling to or from jobsites.

(8) 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. If the aerial manlift equipment has outriggers, the outriggers shall be used in accordance with manufacturer's specifications.

(9) Safety check valves shall be installed in the outrigger hydraulic system which will automatically lock the outrigger in position in case of failure of the hydraulic system except when outriggers are equipped with mechanically self–locking device.

(10) The truck shall not be moved until the boom or ladder is cradled and/or fastened down, the outrigger retracted, and the power take–off disengaged, except for a short move when the truck can be moved with care and under the direction of the employee in the elevated position.

(11) 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.

(12) 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.

(13) Neither the basket, supporting boom or ladder on aerial equipment shall come within the prohibited distance of energized high voltage conductors or equipment as set forth in Table 1 unless protective equipment is installed by a qualified person.

(14) While working in aerial equipment employees shall wear an approved safety belt attached to the boom or basket, in a secure manner.

(15) No component of aerial devices shall be operated from the ground without permission from the employee in the basket except in case of emergency.

(16) 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.

(17) Operating levers or controls shall be kept clear of tools, materials or obstructions.

(18) Load limits as recommended by the manufacturer of aerial manlift equipment shall not be exceeded. Shock loading of the equipment is prohibited.

(19) 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.

(20) Employees shall not belt to trees, structures, or equipment while performing work from aerial devices.

(21) Whenever it is necessary to work beyond the guarded traffic work area, extreme care shall be exercised and all precautions taken to ensure the safety of the operation and the employees.

(22) Power tools not in use shall be disconnected from external power sources.

(23) Electrical, hydraulic or air tools shall have safety switches or devices to prevent accidental operation and, in addition, a quick means of disconnecting on electrically operated equipment shall be within easy reach of the operator.

(24) The basket shall be kept clean and all tools not in use shall be secured or removed.

(25) 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.

(26) Safety check valves shall be installed in the hydraulic system of aerial manlift equipment to automatically lock the boom or ladder in position in case of failure to any part of the hydraulic pressure system.

(27) 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.

This section shall not be interpreted as an exception to any other rule in this chapter.

(28) 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.

(29) 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.

(30) The manufacturer's operator's instruction manual shall be kept on the vehicle.

[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.]

WAC 296-45-66009 All motor vehicle and trailer operations. When motor vehicles and trailers are operated on public right-of-way, highways or similar areas, the equipment shall be operated and maintained in conformance with the motor vehicle code of the state of Washington, chapters 46.04 through 46.61 RCW.

(1) Whenever and wherever such motor vehicle is operated, such equipment shall have a safe functioning brake and an emergency brake. In addition, all motor vehicles and trailers shall have such equipment as is necessary for the safe operation of the vehicle(s).

(2) When traveling, employees must ride inside the vehicle and shall not ride on the sides or on the top, nor shall employees ascend or descend a motor vehicle when such vehicle is in motion.

(3) Warning signs, flares and other protective devices shall be used which shall conform with the requirements for road construction or maintenance as set forth in chapter 46.37 RCW.

[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.]

WAC 296-45-66011 Working in proximity to electrical hazards. (1) Contractors shall ensure that a close inspection is made by the employee and by the foreman 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.

(2) Employees engaged in trimming, removing, or clearing trees from lines shall be required to consider all overhead electrical power conductors to be energized until such energized lines have been de-energized and grounded in accordance with the system policy.

(3) Only qualified line-clearing tree trimmer or tree trimming trainee familiar with the special techniques and hazards involved in line clearing, shall be permitted to perform the work if it is found that an electrical hazard exists.

(4) 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.

(5) Where tree work is performed by employees qualified in line-clearing tree trimming and trainees qualified in line-clearing tree trimming, the clearances from energized conductors given in Table 1 shall apply.

TABLE I

Minimum Working Distances from Energized Conductors For Line-Clearing Tree Trimmers and Line-Clearing Tree Trimmer 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.

(6) Branches hanging on an energized conductor may only be removed using approved insulated tools by a qualified line-clearing tree trimmer.

[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.]

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 signalman, 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.

(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) "Signalman." 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.

[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, signalman 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.

[Order 76-38, § 296-45-67505, filed 12/30/76.]

WAC 296-45-67507 Signals. (1) The signals between the signalman 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 signalmen, groundmen, 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.

[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.]

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.

(a) 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 his prerogative and judgment as to safe operation of the helicopter itself concerning size, weight and manner by which loads are connected.

(2) No employee shall work on, under, near or in conjunction with a helicopter whose operation does not correspond with the foregoing provisions.

[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. Weight of the external load shall not exceed the manufacturer's load limit.

(1) 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.

[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. 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 signalmen, prior to the hoisting of any load. There shall be constant radio and hand signals used. The signalman shall have the sole and exclusive function during periods of loading and unloading of signaling and maintaining communications with the pilot. The signalman shall be so dressed as to make his 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 foreman and one top man shall also have an operating transmitter and receiver.

(1) 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.

[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.

(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 his 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.

[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 ability, nor shall any employee work under or near such craft if the operator is careless or engages in any negligent or reckless operation of the helicopter.

[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.]

Chapter 296-46 WAC

SAFETY STANDARDS--INSTALLING ELECTRIC WIRES AND EQUIPMENT--ADMINISTRATIVE RULES

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-46-010, 296-46-020, 296-46-030, 296-46-040, 296-46-050, 296-46-060. [Filed 9/22/60, effective 12/1/60.] Repealed by Order 69-2, filed 2/28/69, effective 4/1/69.

296-46-115 Definitions. [Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-115, filed 2/27/81, effective 4/1/81.] Repealed by 83-23-053 (Order 83-32), filed 11/14/83. Statutory Authority: RCW 19.28.120 and 19.28.510.

296-46-120 Workmanship. [Order 72-7, § 296-46-120, filed 6/7/72; Order 69-2, § 296-46-120, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-160 Service requirements. [Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-160, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-160, filed 7/17/84; Order 69-2, § 296-46-160, filed 2/28/69, effective 4/1/69.] Repealed by 90-19-015, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600.

296-46-165 Service ampacity. [Order 72-7, § 296-46-165, filed 6/7/72.] Repealed by Order 74-43, filed 12/19/74.

296-46-170 Clearance of service drop for single family or duplex residences. [Order 69-2, § 296-46-170, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-190 Current transformers. [Order 69-2, § 296-46-190, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-200 Service entrance conductors. [Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-200, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-200, filed 7/17/84. Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-200, filed 1/31/78; Order 74-43, § 296-46-200, filed 12/19/74; Order 73-7, § 296-46-200, filed 5/17/73; Order 69-2, § 296-46-200, filed 2/28/69, effective 4/1/69.] Repealed by 90-19-015, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28-.060, 19.28.010(1) and 19.28.600.

296-46-210 Service entrance cable. [Order 69-2, § 296-46-210, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-230 Service entrance. [Order 74-43, § 296-46-230, filed 12/19/74; Order 72-7, § 296-46-230, filed 6/7/72; Order 69-2, § 296-46-230, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-240 Service mast. [Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-240, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-240, filed 7/17/84; Order 69-2, § 296-46-240, filed 2/28/69, effective 4/1/69.] Repealed by 90-19-015, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28-.060, 19.28.010(1) and 19.28.600.

296-46-242 Transformer neutral grounding. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-242, filed 1/31/78.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-244 Utility conductor limitations. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-244, filed 1/31/78.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-250 Safe wiring label. [Order 69-2, § 296-46-250, filed 2/28/69, effective 4/1/69.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-260 Direct burial cable. [Order 75-25, § 296-46-260, filed 8/4/75; Order 72-7, § 296-46-260, filed 6/7/72; Order 69-2, § 296-46-260, filed 2/28/69, effective 4/1/69.] Repealed by Order 74-43, filed 12/19/74 and later adopted, as amended, by Order 75-25, filed 8/4/75.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-265 Conductors of different systems. [Order 74-43, § 296-265 (codified as WAC 296-46-265), filed 12/19/74.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-270 Metallic plumbing lines. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-270, filed 1/31/78; Order 69-2, § 296-46-270, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-280 Garbage disposal, waste disposal or waste compactor appliances and dishwasher circuits. [Order 72-7, § 296-46-280, filed 6/7/72; Order 69-2, § 296-46-280, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-290 Range circuit. [Order 69-2, § 296-46-290, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-300 Water heaters. [Order 75-25, § 296-46-300, filed 8/4/75; Order 74-43, § 296-46-300, filed 12/19/74; Order 69-2, § 296-46-300, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-310 Clothes dryers. [Order 69-2, § 296-46-310, filed 2/28/69, effective 4/1/69.] Repealed by Order 72-7, filed 6/7/72.

296-46-320 Electric heating. [Order 74-43, § 296-46-320, filed 12/19/74; Order 73-7, § 296-46-320, filed 5/17/73; Order 72-7, § 296-46-320, filed 6/7/72; Order 69-2, § 296-46-320, filed 2/28/69, effective 4/1/69.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-330 Bathroom receptacles. [Order 69-2, § 296-46-330, filed 2/28/69, effective 4/1/69.] Repealed by Order 72-7, filed 6/7/72.

296-46-335 Unfinished areas. [Statutory Authority: RCW 19.28-.060. 81-06-037 (Order 81-5), § 296-46-335, filed 2/27/81, effective 4/1/81; Order 74-43, § 296-46-335, filed 12/19/74; Order 72-7, § 296-46-335, filed 6/7/72.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-340 Recreation room. [Order 69-2, § 296-46-340, filed 2/28/69, effective 4/1/69.] Repealed by Order 74-43, filed 12/19/74.

296-46-350 Emergency systems. [Statutory Authority: RCW 19-.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-350, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-350, filed 7/17/84. Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-350, filed 2/27/81, effective 4/1/81; 78-02-098 (Order 77-31), § 296-46-350, filed 1/31/78; Order 72-7, § 296-46-350, filed 6/7/72; Order 69-2, § 296-46-350, filed 2/28/69, effective 4/1/69.] Repealed by 90-19-015, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600.

296-46-355 Mobile home connections. [Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-355, filed 2/27/81, effective 4/1/81.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-380 Rockcrushers. [Order 69-2, § 296-46-380, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-390 Woodworking plants. [Statutory Authority: RCW 19-.28.060. 78-02-098 (Order 77-31), § 296-46-390, filed 1/31/78; Order 69-2, § 296-46-390, filed 2/28/69, effective 4/1/69.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-400 Mobile homes. [Order 69-2, § 296-46-400, filed 2/28/69, effective 4/1/69.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-401 License fee. [Order 71-17, § 296-46-401, filed 12/7/71.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-40101 Administrator fees. [Order 74-43, § 296-46-401, (codified as WAC 296-46-40101), filed 12/19/74.] Repealed by 81-06-037 (Order 81-5), filed 2/27/81, effective 4/1/81. Statutory Authority: RCW 19.28.060.

296-46-402 Fees. [Order 75-25, § 296-46-402, filed 8/4/75; Order 74-43, § 296-46-402, filed 12/19/74; Order 71-17, § 296-36-402 (codified as WAC 296-46-402), filed 12/7/71.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-410 Conductor termination. [Order 69-2, § 296-46-410, filed 2/28/69, effective 4/1/69.] Repealed by Order 72-7, filed 6/7/72.

296-46-420 Nonmetallic cable systems—Ground-fault circuit interrupter protection—Knob and tube wiring. [Statutory Authority: RCW 19.28.060. 88-15-063 (Order 88-14), § 296-46-420, filed 7/18/88. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-420, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-420, filed 7/17/84; Order 69-2, § 296-46-420, filed 2/28/69, effective 4/1/69.] Repealed by 90-19-015, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600.

296-46-424 Residential occupancies, ground fault circuit interrupters. [Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-424, filed 2/27/81, effective 4/1/81; 78-02-098 (Order 77-31), § 296-46-424, filed 1/31/78; Order 75-25, § 296-46-424, filed 8/4/75.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-425 Construction sites. [Order 74-43, § 296-46-425, filed 12/19/74.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-426 Bonding agricultural structures and equipment. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-426, filed 1/31/78; Order 74-43, § 296-46-426, filed 1/3/75.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-450 Grounded neutral conductor. [Order 69-2, § 296-46-450, filed 2/28/69, effective 4/1/69.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-460 Terminating immediately inside an outside building wall. [Order 75-25, § 296-46-460, filed 8/4/75; Order 72-7, § 296-46-460, filed 6/7/72; Order 69-2, § 296-46-460, filed 2/28/69, effective 4/1/69.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060.

296-46-492 Electrical license and administrator certificate designation. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-492, filed 1/31/78.] Repealed by 83-23-053 (Order 83-32), filed 11/14/83. Statutory Authority: RCW 19.28.120 and 19.28.510.

296-46-493 Electrical contractor license and administrator certificate fees. [Statutory Authority: RCW 19.28.060 and 19.28.210. 82-18-036 (Order 82-29), § 296-46-493, filed 8/26/82. Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-493, filed 1/31/78.] Repealed by 83-23-053 (Order 83-32), filed 11/14/83. Statutory Authority: RCW 19.28.120 and 19.28.510.

296-46-500 Electrical advisory board. [Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-500, filed 2/27/81, effective 4/1/81; 78-02-098 (Order 77-31), § 296-46-500, filed 1/31/78; Order 74-43, § 296-46-500, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-501 Board of electrical examiners. [Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-501, filed 2/27/81, effective 4/1/81.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-506 Responsibilities of electrical contractors administrator certificate holders—Revocation of certificates—Appeals. [Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-506, filed 2/27/81, effective 4/1/81.] Repealed by 83-23-053 (Order 83-32), filed 11/14/83. Statutory Authority: RCW 19.28.120 and 19.28.510.

296-46-510 Definitions. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-510, filed 1/31/78; Order 74-43, § 296-46-510, filed 12/19/74.] Repealed by 81-06-037 (Order 81-5), filed 2/27/81, effective 4/1/81. Statutory Authority: RCW 19.28.060.

296-46-515 Officers. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-515, filed 1/31/78; Order 74-43, § 296-46-515, filed 12/19/74.] Repealed by 81-06-037 (Order 81-5), filed 2/27/81, effective 4/1/81. Statutory Authority: RCW 19.28.060.

296-46-520 Internal management. [Order 74-43, § 296-46-520, filed 12/19/74.] Repealed by 81-06-037 (Order 81-5), filed 2/27/81, effective 4/1/81. Statutory Authority: RCW 19.28.060.

296-46-525 Board duties. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-525, filed 1/31/78; Order 74-43, § 296-46-525, filed 12/19/74.] Repealed by 81-06-037 (Order 81-5), filed 2/27/81, effective 4/1/81. Statutory Authority: RCW 19.28.060.

296-46-530 Hearings. [Order 74-43, § 296-46-530, filed 12/19/74.] Repealed by 83-23-053 (Order 83-32), filed 11/14/83. Statutory Authority: RCW 19.28.120 and 19.28.510.

296-46-535 Appearance and practice before advisory board. [Order 74-43, § 296-46-535, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-540 Solicitation of business unethical. [Order 74-43, § 296-46-540, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-545 Standards of ethical conduct. [Order 74-43, § 296-46-545, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-550 Appearance by former employee. [Order 74-43, § 296-46-550, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-555 Former employee as expert witness. [Order 74-43, § 296-46-555, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-560 Computation of time. [Order 74-43, § 296-46-560, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-565 Administrative Procedure Act. [Order 74-43, § 296-46-565, filed 12/19/74.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-590 Electric heating. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-590, filed 1/31/78.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-59005 Appendix A—Residential heat loss tables. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-59005, filed 1/31/78. Formerly Appendix A.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-59010 Appendix B—Outdoor design temperatures. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-59010, filed 1/31/78. Formerly Appendix B.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-900 Appendix C—Drawing E-103. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-900, filed 1/31/78; Order 75-25, Appendix C—Drawing E-103 (codified as WAC 296-46-900), filed 8/4/75; Order 72-7, Appendix C, filed 6/7/72.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

296-46-905 Appendix D—Drawing E-104. [Order 75-25, Appendix D (codified as WAC 296-46-905), filed 8/4/75; Order 72-7, Appendix D, filed 6/7/72.] Repealed by 84-15-051 (Order 84-10), filed 7/17/84. Statutory Authority: RCW 19.28.010 and 19.28.060.

Appendix A Residential heat loss tables. [Order 72-7, Appendix A—Residential heat loss tables, filed 6/7/72; Order 69-2, Appendix A—Electric heat loss calculation, filed 2/28/69, effective 4/1/69.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060. Later promulgation, see WAC 296-46-59005.

Appendix B Outdoor design temperatures—Charts. [Order 72-7, Appendix B—Outdoor design temperatures—Charts, filed 6/7/72.] Repealed by 78-02-098 (Order 77-31), filed 1/31/78. Statutory Authority: RCW 19.28.060. Later promulgation, see WAC 296-46-59010.

Reviser's note: The 1978 Edition of National Electrical Code (NFPA No. 70-1978) was adopted by the department of labor and industries on January 1, 1978. [Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), filed 1/31/78.]

WAC 296-46-090 Foreword. The 1990 edition of the National Electrical Code (NFPA 70 – 1990) including Appendix B, the 1990 edition of Centrifugal Fire Pumps (NFPA 20 – 1990) and the 1985 edition of Emergency and Standby Power Systems (NFPA 110 – 1985) 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. Where there is any conflict between this chapter and the National Electrical Code (NFPA 70), Centrifugal Fire Pumps (NFPA 20) or Emergency and Standby Power Systems (NFPA 110), the requirements of this chapter shall be observed. Where there is any conflict between Centrifugal Fire Pumps (NFPA 20) or Emergency and Standby Power Systems (NFPA 110) and the National Electrical Code (NFPA 70), the National Electrical Code shall be followed.

Electrical inspectors will give information as to the meaning or application of the National Electrical Code, the standard on Centrifugal Fire Pumps and the standard on Emergency and Standby Power Systems and this chapter, but will not lay out work or act as consultants for contractors, owners, or users.

The department is authorized to enforce city electrical ordinances where those governmental agencies do not make electrical inspections under an established program.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-090, filed 9/10/90, effective 10/11/90.]

WAC 296-46-110 Marking of disconnecting means. Where electrical equipment is installed to obtain a series combination rating, the identification as required by Section 110-22 shall be in the form of an adhesive label or decal or similar approved means that is suitable for the environment and is substantially yellow in color. The words "CAUTION – SERIES RATED SYSTEM" shall be printed or engraved on the label or decal in block letters at least 1/2 inch high and in a contrasting color.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-110, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-110, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-110, filed 7/17/84. Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-110, filed 2/27/81, effective 4/1/81; 78-02-098 (Order 77-31), § 296-46-110, filed 1/31/78; Order 74-43, § 296-46-110, filed 12/19/74; Order 72-7, § 296-46-110, filed 6/7/72; Order 69-2, § 296-46-110, filed 2/28/69, effective 4/1/69.]

WAC 296-46-130 Classification or definition of occupancies. (1) Educational facility refers to a building or portion of a building used primarily for educational purposes and shall include buildings used for the gathering of groups of six or more persons for purposes of instruction. Educational occupancy includes, but is not restricted to: Schools, colleges, academies, and universities.

(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 shall 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 such as a hospital, nursing home, alcoholism hospital, psychiatric hospital, boarding home, alcoholism treatment facility, maternity home, birth center or childbirth center, residential treatment facility for psychiatrically impaired children and youths, and renal hemodialysis clinics that are licensed by the department of social and health services; 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) 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 shall 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.

(b) 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 shall not apply to any facility, agency, or other entity

which shall be both owned and operated by a public or governmental body.

(c) Detoxification means care or treatment of an intoxicated person during a period where the individual recovers from the effects of intoxication.

(d) Private psychiatric hospital means an institution, facility, building, or agency specializing in the diagnosis, care, and treatment of individuals demonstrating signs and/or symptoms of mental disorder as defined in RCW 71.05.020(2), and providing accommodations and other necessary services over a continuous period of twenty-four hours or more for two or more individuals not related to the operator, provided that this chapter shall not apply to any facility, agency, or other entity which shall be both 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) 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 shall not apply to any hospital approved by the American College of Surgeons, American Osteopathic Association or its successor.

(g) 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 service, provided that the birth service is limited to low-risk maternal clients during the intrapartum period.

(h) 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.

(i) Ambulatory surgical center or ASC means any distinct entity that operates exclusively for the purpose of providing surgical services to patients not requiring hospitalization or that has an agreement with HFCA under Medicare to participate as an ASC.

(j) 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).

(k) Adult residential treatment facility 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 204, Laws of 1982.

(l) Private adult treatment home means a dwelling which is the residence or home of two adults providing food, shelter, beds, and care for two or fewer psychiatrically impaired clients, provided these clients are detained under chapter 71.05 RCW and the dwelling is certified as an evaluation and treatment facility under chapter 71.05 RCW.

(m) Group care facility means a facility maintained and operated for the care of a group of children on a twenty-four-hour basis.

(4) Licensed day care centers.

(a) "Day care center" means an agency that provides care for thirteen or more children either within the abode of the licensee or within a building or portion of a building used for such purposes for periods of less than twenty-four hours.

(b) "Mini day care center" means:

(i) Day care center for the care of twelve or fewer children in a facility other than the family abode of the person or persons under whose direct care and supervision the child is placed; or

(ii) The care of from seven through twelve children in the family abode of such person or persons.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-130, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-130, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-130, filed 7/17/84. Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-130, filed 2/27/81, effective 4/1/81; Order 72-7, § 296-46-130, filed 6/7/72; Order 69-2, § 296-46-130, filed 2/28/69, effective 4/1/69.]

WAC 296-46-140 Plan review for educational, institutional or health care facilities and other buildings. (1) All electrical plans for new or altered electrical installations in educational, institutional, and health or personal care occupancies classified or defined in WAC 296-46-130 and as indicated in WAC 296-46-150, Table 1 or 2 shall be reviewed and approved by the department before the electrical installation or alteration is begun. 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, policies and procedures, may be submitted to that city for review rather than to the department. Approved plans shall be available on the job site for use during the electrical installation or alteration and for use by the electrical inspector. Refer plans for department review to the Electrical Inspection Section, Department of Labor and Industries, 805 Plum St. SE, Olympia, Washington 98504. Please refer to WAC 296-46-910 for required fees for plan review.

(2) 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 shall 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, shall 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 shall include documentation that proves adequate capacity and ratings.

(3) Plan review for new or altered electrical installations of other types of construction may be voluntarily requested by the owner or other interested parties.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-140, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-140, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-140, filed 7/17/84. Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-140, filed 2/27/81, effective 4/1/81; 78-02-098 (Order 77-31), § 296-46-140, filed 1/31/78; Order 74-43, § 296-46-140, filed 12/19/74; Order 72-7, § 296-46-140, filed 6/7/72; Order 69-2, § 296-46-140, filed 2/28/69, effective 4/1/69.]

WAC 296-46-150 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 WAC 296-46-130 and for places of assembly for one hundred or more persons shall comply with Table 1 or 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 shall be used.

Table 1
Health or Personal Care Facilities
Electrical System—Wiring Methods

Health or Personal Care Facility	Power, Lighting, or Class 1 Circuits	Patient Care Areas	Emergency Power, Lighting or Signalling	Low Voltage Systems	Special Requirements
Hospital	3	2	2	6,7	4,5,10
Nursing home	3	2	2	6,7	4,10
Boarding home	3		2	6,7	4,10
Alcoholism hospital	3	2	2	6,7	4,10
Detoxification facilities	3	2	2	6,7	4,10
Psychiatric hospital	3	2	2	6,7	4,5,10
Alcoholism treatment facility (other than detoxification facility)	3	3	2	6,7	4,10
Maternity home	3	2	2	7,8	4,10
Birth or childbirth center	3	2	2	7,8	
Residential treatment facility for psychiatrically impaired children & youths	3	2	2	6,7	4,5,10
Medical, dental & chiropractic clinics	3	2	2	7,8	
Ambulatory surgeries & clinics	3	2	2	7,8	10
Freestanding Renal hemodialysis clinics	3	2	2	7,8	10
Adult residential treatment facility more than 16 persons	3	2	2	6,7	5,10
Adult residential treatment facility 16 persons or less	3	2	2	7,8	4,10

Table 1
Health or Personal Care Facilities
Electrical System—Wiring Methods

Health or Personal Care Facility	Power, Lighting, or Class 1 Circuits	Patient Care Areas	Emergency Power, Lighting or Signalling	Low Voltage Systems	Special Requirements
Group care facilities for children more than 16 persons	3		2	6,7	4,5,10
Group care facilities for children 16 persons or less	3		2	7,8	4,5,10

General lighting load for the facilities in Table 1 shall be calculated at two watts per square foot or connected load if greater.

Table 2
Educational Facilities, Institutional Facilities,
Places of Assembly for 100 or more persons
or other facilities
Electrical System—Wiring Methods

Facility	Power, Lighting or Class 1 Circuits	Emergency Power, Lighting	Low Voltage Systems	Special Requirements
Educational	2,9	2	6,7	10
Institutional	2,9	2	6,7	10
Place of assembly for 100 or more persons	3,9	2	6,7	
Day care center for thirty or more children	2,9	2	6,7	4,5,10
Day care center licensed for less than thirty children	3	2	7,8	4,5,10
Licensed mini day care center	3	2	7,8	4,5

Notes for Tables 1 and 2

1. Metallic raceways.
2. Metallic raceways, type MI, MC, or AC cable where the outer metal jacket is an approved grounding means of a listed cable assembly, with an insulated equipment grounding conductor. A manufactured wiring system is permitted to be installed in compliance with Article 604 of the National Electrical Code.
3. Wiring methods in accordance with the National Electrical Code.
4. Ground–fault circuit–interrupter protection of 15 or 20 ampere, 125 volt receptacles within a bathroom or shower room or within five feet of a basin that is located in a patient room.
5. Tamper resistant receptacles in licensed day care facilities and pediatric or psychiatric patient care areas for 15 or 20 ampere, 125 volt receptacles. Tamper resistant receptacles shall, by construction, limit improper access to energized contacts.
6. Fire alarm, nurse call, public address systems used to give directions during an emergency situation or other emergency systems shall be installed in a metallic raceway.
7. Class 2 or 3 limited energy systems and communication systems including telephone, intercom, data processing or similar systems shall be permitted to be installed as open cable systems in compliance with the National Electrical Code.
8. Fire alarm systems shall be permitted to be installed as open cable systems in compliance with the National Electrical Code.

9. Rigid nonmetallic raceways shall be permitted to be installed outside of buildings, in the earth or in concrete on or below grade.
10. Plan review required.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-150, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-150, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-150, filed 7/17/84. Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-150, filed 2/27/81, effective 4/1/81; 78-02-098 (Order 77-31), § 296-46-150, filed 1/31/78; Order 75-25, § 296-46-150, filed 8/4/75; Order 74-43, § 296-46-150, filed 12/19/74; Order 72-7, § 296-46-150, filed 6/7/72; Order 69-2, § 296-46-150, filed 2/28/69, effective 4/1/69.]

WAC 296-46-180 Meter installation. Except as otherwise permitted by the serving utility, the height of the center of the service meter shall not be more than 7 feet or less than 5 feet above finished grade or the floor below the meter. Secondary instrument transformer conductors for metering shall not be permitted in the service raceway.

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-180, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-180, filed 7/17/84; Order 74-43, § 296-46-180, filed 12/19/74; Order 69-2, § 296-46-180, filed 2/28/69, effective 4/1/69.]

WAC 296-46-21008 Branch circuits. (1) An individual branch circuit shall be provided for the receptacle outlet(s) for dwelling unit bathrooms as defined in the National Electrical Code. Whether one or more circuits are used, these circuits shall not supply other loads.

(2) All 125 volt, single phase, 15 and 20 ampere receptacles installed outdoors at a dwelling shall have ground-fault circuit-interrupter protection for personnel.

(3) All 125 volt, single phase, 15 and 20 ampere receptacles installed in kitchens in a dwelling unit on the small appliance branch circuits, except for those receptacle outlets for dedicated use, such as for a dishwasher, disposal, trash compactor, refrigerator or freezer, shall have ground-fault circuit-interrupter protection for personnel.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-21008, filed 9/10/90, effective 10/11/90.]

WAC 296-46-21052 Receptacles and switches. (1) Receptacles and switches shall not be placed face-up on counter tops or at other locations where subject to moisture or debris entering the device.

(2) Where located out of traffic areas in dwelling units, formed or welded metal boxes that are mounted in a substantial manner such as directly to a framing member shall be permitted to be used for floor receptacle outlets. A metal, weatherproof cover plate shall be used for such installations.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-21052, filed 9/10/90, effective 10/11/90.]

WAC 296-46-220 Branch circuit and feeder calculations. Where unfinished spaces adaptable to future dwelling unit living area are not readily accessible to the service or branch circuit panelboard, circuits shall be taken to the area and terminated in a suitable box. The box shall contain an identification of the intended purpose of the circuit(s). Adequate space and capacity shall be provided in the branch circuit panelboard serving the intended load.

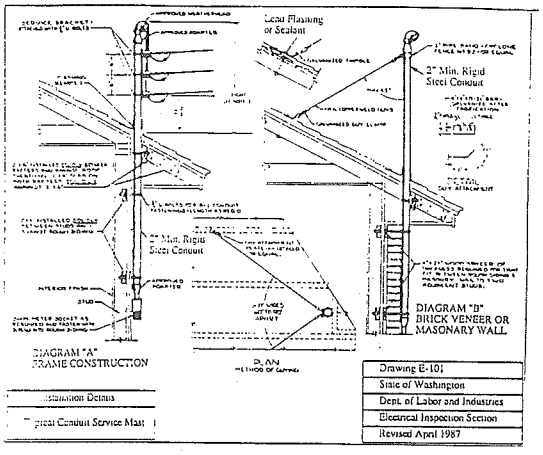
[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-220, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-220, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-220, filed 7/17/84. Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-220, filed 1/31/78; Order 72-7, § 296-46-220, filed 6/7/72; Order 69-2, § 296-46-220, filed 2/28/69, effective 4/1/69.]

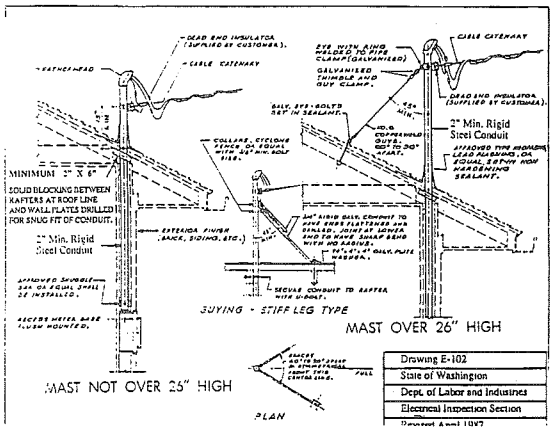
WAC 296-46-23001 Service requirements. (1) The serving utility shall be consulted by the owner, the owner's agent, or the contractor making the installation regarding the service entrance location and meter equipment requirements before installing the service and equipment. Provisions for a meter and related equipment, an attachment of a service drop, or an underground service lateral shall be made at a location acceptable to the serving utility. The point of attachment for a service drop shall permit the clearances required by the National Electrical Code.

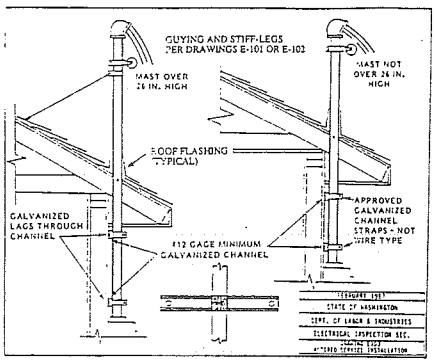
(2) A fire wall shall have a minimum two-hour rating as defined by the Uniform Building Code to be considered a building separation in accordance with Article 100 of the National Electrical Code. Buildings of more than one hour fire rated construction shall have a fire wall separation in compliance with the Uniform Building Code.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-23001, filed 9/10/90, effective 10/11/90.]

WAC 296-46-23028 Service or other masts. Conduit extended through the roof to provide means of attaching the service drop or other conductors shall be no smaller than 2-inch rigid steel galvanized conduit, shall provide a structurally sound attachment for the conductors and shall be equipped with a properly installed flashing at the roof line. The installation shall comply with drawings E-101 and/or E-102, or shall provide equivalent strength by other approved means. Masts for altered or relocated installations shall be permitted to comply with drawing E-103.







Notes to drawings E-101, E-102, and E-103.

1. An approved roof flashing shall be installed on each mast where it passes through a roof. Plastic, nonhardening mastic shall be placed between lead-type flashings and the conduit. Neoprene type flashings shall also be permitted to be used.
2. Masts shall 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 shall 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 shall comply with this requirement as well.
5. Intermediate support masts shall 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 shall 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.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-23028, filed 9/10/90, effective 10/11/90.]

WAC 296-46-23040 Service conductors. (1) Service entrance conductors shall extend at least 18 inches from the service head to permit connection to the service drop.

(2)(a) The installation of service conductors not exceeding 600 volts nominal, within a building or structure shall be 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 shall 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.

(3) Service conductors under the exclusive control of the serving utility, where installed within a building or structure shall be installed in rigid steel galvanized conduit or Schedule 80 nonmetallic conduit. The grounded service conductor shall be permitted to be identified with a yellow jacket or with one or more yellow stripes.

(4) Multiple-occupancy buildings. A second or additional underground service lateral to a building having more than one occupancy shall be permitted to be installed at a location separate from other service laterals to the building provided that all the following conditions are complied with:

(a) Each service lateral is sized in accordance with the National Electrical Code for the calculated load to be served by the conductors;

(b) Each service lateral terminates in service equipment that is located in or on a unit served by the service equipment;

(c) The service 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 directory, suitable for the environment, 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 laterals for two-family dwellings are permitted to terminate in meter enclosures that are permitted to be located less than 15 feet apart.

(5) The service raceway or cable shall extend no more than fifteen feet inside a building or structure.

(6) Except as provided by the National Electrical Code, Section 240-3, Exceptions No. 4, No. 6, No. 7,

and No. 8, and dwelling units, service conductors shall have an ampacity not less than the rating of the service equipment they supply.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-23040, filed 9/10/90, effective 10/11/90.]

WAC 296-46-23062 Service equipment. (1) Service equipment, sub-panels, and similar electrical equipment shall be installed so that they are readily accessible and shall not be installed in bathrooms, clothes closets, shower rooms, cupboards, or attics, or above washers, clothes dryers, or plumbed-in fixtures. All indoor service equipment and sub-panel equipment shall be adequately illuminated.

(2) Service switches and other equipment exposed to elements of the outside weather shall be raintight type factory built for the purpose. Refer to NEMA-3R.

(3) Temporary construction service equipment shall not be used for other than construction purposes and shall be disconnected when the permanent service is connected unless an extension for a definite period of time is granted by the department.

(4) Equipment ground fault protection systems required by the National Electrical Code shall 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. The test shall be performed by a firm that is approved by the department and has qualified personnel and proper equipment to perform the tests required.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-23062, filed 9/10/90, effective 10/11/90.]

WAC 296-46-30001 Support of raceways and cables. Raceways, cables, and boxes shall be permitted to be supported from Number 9 and larger suspended ceiling support wires under the following conditions:

(1) Raceways and cables are not larger than 3/4 inch trade size.

(2) No more than two raceways or cables are supported by a support wire.

(3) Raceways and cables are secured to the support wires by fittings designed and manufactured for the purpose.

(4) The support wires are securely fastened to the structural ceiling and to the ceiling grid system.

(5) The raceways or cables serve equipment that is located within the ceiling cavity or is mounted on or supported by the ceiling grid system.

(6) Where not prohibited by the building code official.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-30001, filed 9/10/90, effective 10/11/90.]

WAC 296-46-316 Conductor ampacities. (1) The ampacity of service laterals exceeding 2000 amperes, where the load factor exceeds seventy percent, shall be determined in accordance with Section 310-15(b) of the National Electrical Code. Load factor is defined as "the ratio of the average load to the peak load occurring during a twenty-four hour period."

(2) It shall be permissible to determine the ampacities of conductors from the tables and accompanying notes in Appendix B of the National Electrical Code for applications covered directly by the tables.

(3) Underground conductors whose ampacity is determined from the National Electrical Code Table 310-16 shall be derated in accordance with Note 8 to Ampacity Tables of 0 to 2000 volts, where stacked or bundled (less than 2-inch spacing) a distance equal to 10 feet or 10 percent of the circuit length, whichever is less.

(4) Unless the equipment is marked by the manufacturer to indicate otherwise, termination provisions are based on the use of 60 C ampacities for wire sizes No.'s 14-1 AWG and 75 C ampacities for wire sizes No.'s 1/0 and larger, as provided in the National Electrical Code Table 310-16 for insulated conductors rated 0-2000 volts, or in Table 400-5 A or B for flexible cords and cables.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-316, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060. 88-15-063 (Order 88-14), § 296-46-316, filed 7/18/88. Statutory Authority: RCW 19.28.060, 19.28-.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-316, filed 5/1/87.]

WAC 296-46-324 Knob-and-tube wiring. The provision of Section 324-4 of the National Electrical Code shall not be construed to 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 shall be surveyed by an appropriately licensed electrical contractor who shall 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. Repairs, alterations, or extensions of or to the electrical system shall be inspected by an electrical inspector as defined in RCW 19.28.070.

(2) The insulation shall 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 shall not be used with knob-and-tube wiring.

(3) All knob-and-tube circuits shall have overcurrent protection in compliance with the 60 degree C column of Table 310-16 of the National Electrical Code. Overcurrent protection shall be either circuit breakers or Type S fuses. The Type S fuse adapters shall not accept a fuse of an ampacity greater than that permitted in this chapter.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-324, filed 9/10/90, effective 10/11/90.]

WAC 296-46-336 Nonmetallic cable systems. All electrical equipment grounding conductors for nonmetallic cable systems shall be completely made up at the time of the inspection.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-336, filed 9/10/90, effective 10/11/90.]

WAC 296-46-348 Electrical metallic tubing. In addition to complying with the provisions of Article 348 of the National Electrical Code, electrical metallic tubing shall not be installed in direct contact with the earth or in concrete on or below grade. See also section 300-6 of the National Electrical Code.

Electrical metallic tubing shall not be installed as the wiring method for service entrance conductors inside a building.

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86-18-041 (Order 86-23), § 296-46-348, filed 8/29/86.]

WAC 296-46-360 Amusement rides or structures, carnivals, circuses, and traveling shows. (1) Electrical installations. Service equipment, separately derived systems, feeders and circuits for each amusement ride, structure or concession and the interconnection of each ride, structure or concession, shall comply with the National Electrical Code and this chapter.

(2) Feeders and circuits for portable rides, structures or concessions shall be listed and labeled, multiconductor cord of a type identified in Table 400-4 of the National Electrical Code for hard usage or extra hard usage or as permitted under the conditions in this chapter, by individual, single conductor power cable. Ampacity shall be determined from the appropriate Table 400-5(A) or 400-5(B) in the National Electrical Code including all notes thereto.

(3) Flexible multiconductor cords shall be connected to equipment by approved connectors designed for the purpose or by listed cord caps. Individual conductors of multiconductor cords in sizes #2 AWG and larger shall be permitted to be connected by listed and labeled connection systems (receptacles and plugs) that ensure by design, first-make, last-break of the equipment grounding conductor. Where conductors are connected individually by such connection systems, the outer jacket of multiconductor cord shall be secured to the electrical equipment independent from the receptacles and plugs by approved cable grips that are installed in a manner to prevent pressure from being applied to the receptacles and plugs.

(4) Individual, single conductor, insulated, portable power cable of a type identified in Table 400-4 of the National Electrical Code for extra hard usage, in sizes 1/0 AWG and larger, shall be permitted to be used in the electrical distribution system provided that:

(a) All conductors of the feeder or circuit including the equipment grounding conductor originate in the same electrical equipment and terminate in the same equipment.

(b) All conductors of the feeder or circuit including the ungrounded, grounded, and equipment grounding conductors are run together and, except for portions installed within approved cable protection systems, and installed to comply with Article 520-53 of the National Electrical Code.

(c) All conductors including the grounded circuit conductor (neutral) if used, the equipment grounding conductor and the ungrounded conductors are listed and labeled cable of the same size, conductor material and insulation.

(d) The cables are secured to the electrical equipment independent from the cable receptacles and plugs by approved cable grips that prevent pressure from being applied to the connectors.

(e) The cables are connected to electrical equipment by approved listed and labeled connection systems that ensure by design, first-make, last-break of the equipment grounding conductor.

(5) Disconnecting means. A separate, enclosed, externally operable fused switch or circuit breaker, shall be installed on each amusement ride, structure or concession to disconnect all electrical equipment. The disconnecting means shall be readily accessible and identified as the disconnecting means. Where more than one power supply is employed, the disconnecting means shall be grouped.

(6) Rotating equipment. Components of amusement rides or structures that rotate more than three hundred sixty degrees and which have electrically operated equipment, shall be supplied by approved collector rings that shall be totally enclosed or located so they are accessible to authorized personnel only. The collector rings shall be factory produced with an equipment grounding segment having a voltage and current rating that equals or exceeds the rating of the current carrying segments. Collector rings shall have an ampacity not less than one hundred twenty-five percent of the full-load current of the largest device served plus the full-load current of all other devices served. Collector rings for control and signal purposes shall have an ampacity not less than one hundred twenty-five percent of the full-load current of the largest device served plus the full-load current of all other devices served.

(7) Equipment grounding. All noncurrent carrying metal parts of amusement rides and structures shall be grounded by an equipment grounding conductor routed with the feeder or circuit conductors in accordance with the National Electrical Code and these rules. The metallic structure shall not be used as a current carrying conductor.

Exception: The metallic structure shall be permitted to be used as the return path for low voltage systems that do not exceed thirty volts, provided that the ungrounded conductors are protected by an overcurrent device in accordance with the National Electrical Code and the system is factory built for such use.

(8) Existing amusement rides, concessions or games electrical systems shall comply with the National Electrical Code and shall be maintained in full compliance. Where new amusement rides, concessions or games are purchased, manufactured or constructed, or where existing rides, concessions or games have major modification, the electrical system shall comply with this chapter and the edition of the National Electrical Code in effect at that time. All rides, concessions, and games shall be identified in or on the disconnecting means as well as by make, model and serial number in records furnished to

the department with the edition of the National Electrical Code the electrical system is intended to comply with.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-360, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86-18-041 (Order 86-23), § 296-46-360, filed 8/29/86. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-360, filed 7/17/84; Order 69-2, § 296-46-360, filed 2/28/69, effective 4/1/69.]

WAC 296-46-370 Boat moorages, floating buildings, and similar installations. Docks, wharves, boat moorages, floating buildings, and similar facilities in addition to complying with the appropriate sections of Article 553 or Article 555 of the National Electrical Code shall have a service disconnect located on the shoreline.

Where shore power is provided, each floating building or boat moorage berth shall have a disconnecting means located within sight of and not more than fifty feet from each floating building or berth. The disconnecting means shall be installed adjacent to but not in or on the floating building. Conductors in excess of 600 volts, nominal shall 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 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-370, filed 5/1/87. Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-370, filed 7/17/84; Order 75-25, § 296-46-370, filed 8/4/75; Order 72-7, § 296-46-370, filed 6/7/72; Order 69-2, § 296-46-370, filed 2/28/69, effective 4/1/69.]

WAC 296-46-422 Water heater circuit. Branch circuit conductors and overcurrent devices shall be rated at least one hundred twenty-five percent of the circuit load. Water heaters which have a rated circuit load in excess of 3,500 watts at 240 volts shall be provided with branch circuit conductors not smaller than No. 10 AWG copper or equal.

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-422, filed 5/1/87.]

WAC 296-46-45001 Transformers. (1) Dry type transformers shall be rated not less than the load served as determined in accordance with Article 220 of the National Electrical Code.

(2) A readily accessible, externally operable, load break rated disconnecting means and overcurrent protection shall be provided on the line side of power transformers. Overcurrent protection shall comply with Article 450 of the National Electrical Code.

(3) See WAC 296-46-480 for location of pad-mounted transformers and WAC 296-46-490 for location of total underground transformers.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-45001, filed 9/10/90, effective 10/11/90.]

WAC 296-46-480 Location of pad-mounted transformers. (1)A pad-mounted transformer installation is an installation of an oil-filled transformer outdoors in which installation of all bushings, handholes, and live and operating parts are guarded by a solid metal enclosure secured so that they are accessible to authorized qualified personnel only. This does not prohibit the use of approved glass monitoring devices or properly baffled ventilators.

(2) If a pad-mounted transformer is to be installed next to a structure of combustible material, it shall not be installed closer than eight feet to the structure. This eight foot separation shall be measured from the nearest metal portion of the pad-mounted transformer installation to the nearest building features required to be safeguarded. If there are overhanging eaves or roof lines of combustible material on a standard single story structure, the eight foot measurement should be made to provide eight feet of clear space between the eaves and the nearest metal portion of the pad-mounted transformer installed outside a vertical line extended from the ends of the eaves to the ground if this distance is at least eight feet horizontally from all combustible walls. In addition, the grade of the ground at the location of the pad-mounted transformer shall be such that any oil leaking from the transformer will flow away from the building and will not form pools. As an exception to subsection (2) of this section, in an urban residential area that has an improved alleyway, and in which a pad-mounted transformer is to be installed next to a noninhabited structure of combustible material the transformer shall not be installed closer than two feet to the structure.

(3) Pad-mounted transformers shall not be installed nearer than two feet, measured horizontally, to a noncombustible building surface having no doors, windows, or other openings closer to the transformer than eight feet.

(4) Pad-mounted transformers should not be located where they are exposed to damage by automobiles, trucks, or other mobile machinery. If transformers are installed in areas subject to traffic other than pedestrian traffic, they shall be provided with additional guarding.

(5) Pad-mounted transformer installations shall be effectively grounded as provided in Section 250-51 of the National Electrical Code.

[Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-480, filed 7/17/84. Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-480, filed 1/31/78; Order 69-2, § 296-46-480, filed 2/28/69, effective 4/1/69.]

WAC 296-46-490 Location of total underground transformers. Enclosures for total underground oil filled transformers shall not be located within eight feet of a doorway or fire escape. Adequate space shall be maintained above the total underground transformer enclosure so that a boom may be used to lift the transformer.

[Statutory Authority: RCW 19.28.010 and 19.28.060. 84-15-051 (Order 84-10), § 296-46-490, filed 7/17/84; Order 69-2, § 296-46-490, filed 2/28/69, effective 4/1/69.]

WAC 296-46-495 Electrical work permits and fees. (1) Where an electrical work permit is required by chapter 19.28 RCW or this chapter, inspections shall not be made, equipment energized, nor services connected

unless an electrical work permit is completely and legibly filled out and readily available. The classification or type of facility to be inspected and the scope of the electrical work to be performed shall be clearly shown on the electrical work permit. The address where the inspection is to be made shall be identifiable from the street, road or highway that serves the premises.

(2) Except for emergency repairs to existing electrical systems, electrical work permits shall be obtained prior to beginning the installation or alteration. An electrical work permit for emergency repairs to existing electrical systems shall be obtained no later than the next business day.

(3) The electrical work permit application shall be posted on the job site at a conspicuous location prior to beginning electrical work and at all times electrical work is performed.

(4) Electrical work permits shall expire one year after the date of purchase unless electrical work is actively and consistently in progress. Electrical work permits for temporary construction activity shall expire ninety days after suspended construction and no later than one year after purchase.

(5) Fees shall be paid in accordance with the inspection fee schedule WAC 296-46-910.

(6) Each person, firm, partnership, corporation, or other entity shall furnish an electrical work permit for the installation, alteration, or other electrical work performed or to be performed by that entity. Each electrical work permit application shall 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 or responsible for the electrical installation or alteration.

(7) An electrical work permit is required for installation, alteration, or maintenance of electrical systems except for replacement of circuit breakers or fuses, for replacement of snap switches, receptacle outlets or heating elements, replacement of contactors, relays, timers, starters, or similar control components or for plug-in appliances or travel trailers.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-495, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-495, filed 5/1/87. Statutory Authority: RCW 19.28.060 and 19.28.210. 85-20-065 (Order 85-16), § 296-46-495, filed 9/27/85. Statutory Authority: RCW 19.28.060. 78-02-098 (Order 77-31), § 296-46-495, filed 1/31/78.]

WAC 296-46-514 Service stations and propane equipment. (1) In addition to complying with Article 514 of the National Electrical Code, each circuit leading to or through a gasoline pump shall be provided with an emergency disconnect switch or other approved means which shall simultaneously disconnect all circuit conductors including the grounded circuit conductor if any.

The disconnecting means or operator shall be substantially red in color and identified with a sign as the emergency disconnecting means. The disconnecting means or operator shall be readily accessible and shall be located outdoors and within sight of the gasoline pump or dispenser the disconnect controls. For multicircuit installations an electrically held contactor shall be permitted to be used.

(2) Propane pumps or dispensers. The wiring of propane pumps, dispensers, and associated electrical equipment shall comply with Article 514 of the National Electrical Code and this chapter.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-514, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-514, filed 5/1/87.]

WAC 296-46-517 Health care facilities. (1) Verification of the integrity of the wiring method ground path as required in Section 517-13(b) of the National Electrical Code shall be performed by low voltage, high current equipment. The ground path shall satisfactorily withstand a test current equal to the ampacity of the largest feeder or branch circuit conductor contained within the raceway or cable for a period of five minutes.

(2) The department shall be notified of when the test is scheduled so a representative may attend to witness the test. A permanent record giving the date, time, circuit, current, results, firm, and person performing the test shall be made and furnished to the owner and department.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-517, filed 9/10/90, effective 10/11/90.]

WAC 296-46-55001 Mobile or manufactured homes. For the purposes of Article 550 of the National Electrical Code, manufactured homes as defined in the Federal Housing and Urban Development (HUD) Mobile Home Construction and Safety Standards Act are considered to be mobile homes as defined in the National Electrical Code.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-55001, filed 9/10/90, effective 10/11/90.]

WAC 296-46-600 Electrical signs. (1) Portable outdoor signs. A weatherproof receptacle outlet that is weatherproof with the supply cord connected shall be installed within six feet of each electrical sign. Extension cords shall not be permitted to supply portable outdoor signs. All new portable outdoor electrical signs shall be listed and labeled by an electrical testing laboratory that is accredited by the department. Existing portable signs that are not listed and labeled or do not have ground-fault circuit-interrupter protection, as required by section 600-11 of the National Electrical Code, shall have ground-fault circuit-interrupter protection provided in the branch circuit that supplies the portable sign.

(2) Awning signs. Lighting fixtures in outdoor awnings shall be listed as suitable for wet locations and be connected by a wiring method suitable for wet locations. Fluorescent lighting fixtures shall be located at least six inches from the awning fabric. Incandescent lamps or fixtures shall be located at least eighteen inches from the awning fabric. A disconnecting means shall be located as per NEC 600-2.

Exception: Listed awning signs shall be installed in compliance with the manufacturer's instructions and the National Electrical Code.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-600, filed 9/10/90, effective 10/11/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86-18-041 (Order 86-23), § 296-46-600, filed 8/29/86.]

WAC 296-46-680 Electrical equipment associated with spas, hot tubs, swimming pools or hydromassage bathtubs. (1) Electrical installations. In addition to complying with the statute, the National Electrical Code, and this chapter, the installation shall comply with electrical testing laboratory standards applicable to the specific equipment or installation.

(2) Package spa or hot tubs. Electrical heating, pumping, filtering, and/or control equipment installed within five feet of a spa or hot tub shall be listed as a package with the spa or hot tub.

(3) Skid packs. A factory assembly of electrical heating, pumping, filtering, and/or control equipment (skid pack) which shall be installed more than five feet from a spa or hot tub and shall be listed as a package unit.

(4) Field assembly of listed electrical equipment for a spa, hot tub, or swim spa. Field installed, listed electrical equipment (as distinguished from recognized components) for a hot tub, spa, or swim spa shall be permitted to 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"; and

(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.

(5) Field assembly of listed electrical equipment for swimming pools. Field installed, listed electrical equipment (as distinguished from recognized components) for a swimming pool shall be permitted to 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"; and

(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.

(6) Hydromassage bathtubs. Hydromassage bathtubs shall be either:

(a) Listed as a unit and bear a listing mark which will read "hydromassage bathtub"; or

(b) Be equipped with a listed "swimming pool pump," "spa pump," or "swimming pool/spa pump" and in addition, show evidence of having received approval from the department for the owners/installation instruction manual, brochures, and/or wiring diagrams.

(7) Manufacturers instructions shall be followed as a part of the listing requirements.

The field assembly or installation of "recognized components" shall not be permitted.

The five foot separation of electrical components 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.

(8) Replacement of electrical equipment. Electrical components which have failed and require replacement shall be replaced with identical products unless the replacement part is no longer available, in which case, a similar product may be substituted provided that the electrical characteristics are identical and that the mechanical and grounding integrity of the equipment is maintained. Recognized components or listed equipment will be permitted to be replaced in kind. Cut-away type display models will not be expected to bear a listing mark and shall not be sold for other than display purposes.

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-680, filed 5/1/87; 86-18-041 (Order 86-23), § 296-46-680, filed 8/29/86.]

WAC 296-46-700 Emergency systems. (1) Exit and emergency lights shall be installed in accordance with the National Electrical Code code, Article 700, and currently adopted edition of the Uniform Building Code in all health or personal care facilities defined in WAC 296-46-130, educational facilities, institutional facilities, hotels, motels, and places of assembly for one hundred or more persons. Installation shall be made in strict accordance with the National Electrical Code, Article 700, and WAC 296-46-150.

(2) Fire alarm systems. Fire alarm systems required by a city, county or state ordinance, statute, or regulation shall be installed in accordance with the National Electrical Code and this chapter. Power-limited fire alarm systems shall be permitted to be installed in metallic raceways using conductors shown in Section 760-16(b) of the National Electrical Code for nonpower-limited circuits or those 600 volt conductors which are rated for 90 degrees C or greater in Table 310-13 of the National Electrical Code.

(3) In new dwelling units or where bedrooms are added to existing dwellings, 120 volt outlets shall be provided for smoke detectors in the locations required by the Uniform Building Code as adopted by the state building code council. Where 120 volt smoke detectors are installed and the sleeping areas within a dwelling unit are remote from one another, means shall be provided to simultaneously sound each alarm from the other detector.

(4) Junction boxes for fire alarm systems other than the surface raceway type, shall be substantially red in color. Power-limited fire protective signalling circuit conductors shall be durably and plainly marked in or on junction boxes or other enclosures to indicate that it is a power-limited fire protective signalling circuit. Conductors for light, heat, or power shall not be installed in any enclosure, raceway, cable, compartment, outlet box, or similar fitting containing fire alarm conductors.

(5) All boxes and enclosures, including transfer switches, generators, and power panels for emergency systems and circuits shall be permanently marked with an adhesive label or decal or similar approved means

that is suitable for the environment and is substantially red in color. The words "emergency system" shall be printed or engraved on the label or decal in block letters at least 1/2 inch high and in a contrasting color.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-700, filed 9/10/90, effective 10/11/90.]

WAC 296-46-725 Class 2 and Class 3 cables. Class 2 and Class 3 cables shall be secured in compliance with Section 336-15 of the National Electrical Code and shall be secured to boxes in compliance with Section 370-7 of the National Electrical Code. Raceways for Class 2 and Class 3 conductors shall be installed in compliance with Chapter 3 of the National Electrical Code.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-725, filed 9/10/90, effective 10/11/90.]

WAC 296-46-770 Optical fiber cables. Optical fiber cables shall be secured in compliance with Section 336-15 of the National Electrical Code.

[Statutory Authority: RCW 19.28.060, 19.28.010(1) and 19.28.600. 90-19-015, § 296-46-770, filed 9/10/90, effective 10/11/90.]

WAC 296-46-910 Inspection fees. To calculate the inspection fees, the amperage is based on the larger of the conductor ampacity or the overcurrent device.

(1) The fee for inspection of the installation, alteration, or maintenance of the following service(s), or feeder(s), is:

	Residential Services Column A	Commercial/ Industrial Column B	Additional Feeders in Commercial/ Industrial Column C
1 - 100 AMP -	$ 33	$ 44	$ 11
101 - 200 AMP -	$ 44	$ 55	$ 17
201 - 400 AMP -	$ 60	$110	$ 28
401 - 600 AMP -	$ 77	$154	$ 39
601 - 1000 AMP -	$ 94	$198	$ 50
1001 - Over AMP -	$110	$242	$ 60
Two family dwelling	$ 55		
Temporary construction service	$ 30		

No additional fee for inspection of branch circuits when included on the service/feeder permit.

Column A - **Residential.**
- Single family residential services.
- Multi-family residential services.

Column B - **Commercial and industrial.**
- Each service or the first feeder when the service is not being installed, increased or altered.
- Feeders that terminate in a separate building.
- Secondaries of transformers that have a capacity greater than 600 VA.
- Each service or feeder that is over 600 volts.

Column C - **Additional feeders in commercial and industrial facilities.**
- Each feeder inspected with a service or feeder in Column B on the same permit.

(2) The following fees shall be provided for the inspection of each of the following units:

	Single/first Unit Column A	Additional Units Column B
a. Mobile home, modular home, or commercial coach service. (200 Amp. Max.)	28	7*
b. Mobile home feeder.	28	7*
c. Each lot for a recreational vehicle.	28	7
d. Berth at a marina or dock.	28	7
e. Yard pole meter loops or similar isolated metering installations.	28	7
f. Outbuilding(s) on residential property	28	7
g. Motors 10 HP or larger	28	7
h. Multi-family dwelling feeders	28	7
i. Signs	28	7
j. Low voltage temperature control circuits per building story or system	28	7

Column A The fee for inspection of a single unit or the first of several units when a service or feeder in (1)(A) or (1)(B) is not installed.

Column B The fee for inspection of additional units when they are inspected at the same time, at the same location and on the same permit as a unit in Column (1)(A), (1)(B), or (2)(A).

*Total fee for inspection of one service and feeder for a mobile home when they are inspected at the same time is $35.00.

The above fees are in addition to master-meter, mobile home park, recreational vehicle park, marina shore services and/or the main service(s).

(3) The fee for new circuits, circuit extensions, and circuit alterations where the service or feeder is not modified, shall be $28 for one to four circuits inspected at the same time on the same premises under a single permit plus $2 for each additional circuit. The total fee shall be no greater than the fee for a new service for the building.

(4) Low voltage systems. The fee for inspection of residential, burglar or fire alarm systems, and other Class 2, low voltage systems shall be $28. For commercial or industrial, Class 2, low voltage system installations, the minimum fee shall be $28 for the control panel and up to four circuits or zones plus $7 for each additional circuit (zone).

(5) In addition to the service and feeder installation fees, the fee for inspecting each electrically driven irrigation machine is $50 including tower and drive motors.

(6) The fee for emergency, standby, and resource recovery generators up to 50 KVA is $28. The fee for a generator installation larger than 50 KVA, or that is the main source of power, is that in the appropriate Column B or C in subsection (1) of this section.

(7) A firm, corporation or other entity which has a regularly employed electrical maintenance staff which is

exempted from the requirement to have an electrician certificate of competency by RCW 19.28.610, may choose to purchase an annual electrical work permit rather than a work permit for each installation or alteration in accordance with this section. A separate fee shall be provided for each plant location or complex. The following fee will entitle the purchaser to the number of inspections shown for a one year period after the date of purchase of an electrical work permit.

	FEE	INSPECTIONS
1 thru 3 plant electricians	1,430 per year	12
4 thru 6 plant electricians	$2,860 per year	24
7 thru 12 plant electricians	$4,290 per year	36
13 thru 25 plant electricians	$5,720 per year	52
more than 25 plant electricians	$7,150 per year	52

(8) Fees for carnival electrical inspections.

a. Preseason or first field inspection per year, $15 per ride and generator truck and $2 per remote distribution equipment, concession or gaming show with a minimum fee of $50. Amusement rides shall be set up prior to inspection.

b. For subsequent inspections, the fee shall be $50 for the first ten rides, concessions, generators, remote distribution equipment or gaming shows and $2 each for all additional rides, concessions, generators, remote distribution equipment and gaming shows. If a ride, concession, generator, remote distribution equipment or gaming show has no insignia of inspection for the calendar year, the fee shall be that charged in a. of this subsection.

(9) Trip fees. A fee shall be paid before approval of the installation if the following services are necessary:

a. $56 for requests to inspect existing installations.

b. $28 for trips to inspect when the permit submitter has given notice to the department that the work is ready for inspection when it is not.

c. $28 where an additional inspection trip is necessary because the submitter has given an erroneous or incomplete address.

d. $28 for more than one additional inspection trip per permit to inspect corrections or for repeated carelessness, neglect, or improperly installing electrical conductors or equipment.

e. $28 for each trip necessary to remove a noncompliance citation from the jobsite, posted because unlicensed electrical contractors or uncertified electricians or trainees were working on the jobsite.

f. $28 per day where corrections have not been made in the prescribed time, unless an exception has been requested and granted.

(10) Double fees. A double inspection fee shall be charged for:

a. Installations that are covered or concealed before inspection;

b. Failure to obtain the electrical work permit prior to beginning the installation or alteration. Exception – electrical work permits for emergency repairs to existing electrical systems shall be obtained no later than the next business day.

(11) On jobs requiring partial or progress inspections, "one" inspection of one half hour duration is allowed per $28 of fee.

(12) The fee for a plan review request pursuant to WAC 296-46-140 (1) and (2) is thirty-five percent of the electrical work permit fee as determined by WAC 296-46-495, plus a plans submission fee of $50. The fee for review of supplemental submissions of plans is $40 per hour or a fraction of an hour.

[Statutory Authority: RCW 19.28.060 and 19.28.210(6). 90-17-041, § 296-46-910, filed 8/10/90, effective 9/10/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-910, filed 5/1/87. Statutory Authority: RCW 19.28.060 and 19.28.210. 85-20-065 (Order 85-16), § 296-46-910, filed 9/27/85. Statutory Authority: RCW 19.28.210. 83-16-058 (Order 83-20), § 296-46-910, filed 8/2/83. Statutory Authority: RCW 19.28.060 and 19.28.210. 82-18-036 (Order 82-29), § 296-46-910, filed 8/26/82. Statutory Authority: RCW 19.28.060. 81-06-037 (Order 81-5), § 296-46-910, filed 2/27/81, effective 4/1/81; 78-02-098 (Order 77-31), § 296-46-910, filed 1/31/78.]

WAC 296-46-915 Electrical contractor license, administrator certificate and examination, and copy fees.

(1) General or specialty contractor license (per twenty-four month period)	$80
(2) Administrator certificate examination application (nonrefundable)	$25
(3) Administrator original certificate (submitted with application)	$40
(4) Administrator certificate renewal (per twenty-four month period)	$52
(5) Late renewal of administrator certificate (per twenty-four month period)	$104
(6) Transfer of administrator designation within 10 days	$20
after 10 days	$50
(7) Certified copy of each document (maximum $44 per file)	
$20 first document	
$2 each additional document	

[Statutory Authority: RCW 19.28.060, 19.28.120(2) and 19.28.510(2). 90-17-041, § 296-46-915, filed 8/10/90, effective 9/10/90. Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86-18-041 (Order 86-23), § 296-46-915, filed 8/29/86.]

WAC 296-46-920 Civil penalty. A person, firm, partnership, corporation or other entity that violates a provision of chapter 19.28 RCW, chapter 296-46 or 296-401 WAC is liable for a civil penalty based upon the following schedule.

(1) Offering to perform, submitting a bid for, installing or maintaining conductors or equipment that convey or utilize electrical current without having an unexpired, unrevoked and unsuspended electrical 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 RCW 19.28.510 through 19.28.620 who does not possess a valid certificate of competency or training certificate.	First offense:	$ 50
	Second offense:	$ 100
	Each offense thereafter:	$ 250
(3) Working as an electrician or electrical trainee in the electrical construction trade without having a valid certificate of competency or electrical training certificate.	First offense:	$ 50
	Second offense:	$ 100
	Each offense thereafter:	$ 250
(4) Employing electricians and trainees in an improper ratio.	First offense:	$ 50
	Second offense:	$ 100
	Each additional offense:	$ 250

(5) Failing to provide supervision to an electrical trainee as required by RCW 19.28.510.	First offense: Second offense: Each additional offense:	$ 50 $ 100 $ 250
(6) Working as an electrical trainee without proper supervision as required by RCW 19.28.510.	First offense: Second offense: Each additional offense:	$ 50 $ 100 $ 250
(7) Performing electrical installations, alterations or maintenance outside the scope of the firm's specialty electrical contractors license.	First offense: Second offense: Each additional offense:	$ 250 $ 500 $ 1,000
(8) Selling or exchanging electrical equipment associated with spas, hot tubs, swimming pools or hydromassage bathtubs which is not listed and labeled by an approved electrical testing laboratory.	First offense: Second offense: Each additional offense:	$ 500 $ 1,000 $ 2,000

Definition: The sale or exchange of electrical components 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) Violating any of the provisions of chapter 19.28 RCW or chapters 296-46 or 296-401 WAC which are not identified in subsections (1) through (8) of this section.	First offense: Second offense: Each additional offense:	$ 50 $ 100 $ 250

(10) Each day that a violation occurs will be a separate offense. A violation will be a "second" or "additional" offense only if it occurs within one year from the first violation.

(11) In case of continued, repeated or gross violation of the provisions of chapter 19.28 RCW, chapter 296-46 or 296-401 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 (9) of this section.

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 87-10-030 (Order 87-07), § 296-46-920, filed 5/1/87; 86-18-041 (Order 86-23), § 296-46-920, filed 8/29/86.]

WAC 296-46-930 Electrical contractor license and administrator certificate designation. See RCW 19.28.120.

(1) General electrical license and/or administrator's certificate encompasses all phases and all types of electrical 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 to be in nonmetallic sheathed cable, except service and/or feeders. This specialty does not include wiring commercial occupancies such as motels, hotels, offices, or stores.

(b) 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 license includes circuits, feeders, controls, and services to supply said pumps.

(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.

(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 license 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 system (06): Limited to the installation of signaling and power limited circuits and related equipment. Such license includes the installation of fire protection signaling systems, intrusion alarms, nonutility owned communications systems, and such similar low energy circuits and equipment.

(f) Nonresidential maintenance (07): Limited to maintenance, repair and replacement of electrical equipment and conductors on industrial or commercial premises. This specialty certificate of license does not include maintenance activities in hotel, motel, or dwelling units.

(3) Combination specialty electrical contractor license. The department may issue a combination specialty electrical contractor license to a firm which qualifies for more than one specialty electrical contractor license. The license shall plainly indicate the specialty licenses which are included in the combination electrical contractor license.

(4) Combination specialty electrical 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 shall plainly indicate the specialty administrators' certificate the holder has qualified for.

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86-18-041 (Order 86-23), § 296-46-930, filed 8/29/86.]

WAC 296-46-940 Electrical contractor license. (1) The department shall issue an electrical contractor license to a person, firm, partnership, corporation or other entity that complies with RCW 19.28.120 which shall expire twenty-four months following the date of issue. The department may issue an electrical contractor license for a period greater or less than twenty-four months for the purpose of equalizing the number of electrical contractor licenses which expire each month. The department shall prorate the electrical contractor license fee according to the number of months in the license period. All subsequent licenses shall be issued for a twenty-four month period.

(2) Cash or securities deposit release. A cash or security deposit which has been filed with the department in lieu of a surety bond, shall not be released until one year after the date the electrical contractor notifies the department in writing, that the person, firm, partnership, corporation, or other entity who (which) has been issued the electrical contractor license, has ceased to do business in the state of Washington.

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86-18-041 (Order 86-23), § 296-46-940, filed 8/29/86.]

WAC 296-46-950 Administrators certificate. (1) The department shall issue an administrator certificate to a person who qualifies for a certificate in accordance with RCW 19.28.125. The first certificate issued shall 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 shall expire on the holder's even numbered birthdate. If the person was born in an odd numbered year, the certificate shall expire on the holder's odd numbered birthdate. The department shall prorate the administrators certificate fee according to the number of months or major portions of months in a certificate period. All subsequent certificates shall be issued for a twenty–four month period. The signature of a person who desires to renew their certificate shall be notarized.

(2) Effective July 1, 1987, an administrator designated on the electrical contractor license shall be a member of the firm who shall fulfill 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 shall require that the person is named as the sole proprietor, a partner or an officer in a corporation as shown on the electrical contractor license application on file with the department. In determining whether a person is a full–time supervisory employee, the department shall consider whether the person is on the electrical contractor's full–time payroll; receives a regular salary or wage similar to other employees; has supervisory responsibility for work performed by the electrical contractor and carries out the duties shown in RCW 19.28.125(2).

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86–18–041 (Order 86–23), § 296–46–950, filed 8/29/86.]

Chapter 296-47 WAC
ELECTRICAL WIRING AND APPARATUS

Reviser's note: On March 29, 1961, the department of labor and industries filed with the code reviser's office the November 1959 edition of the N.B.F.U. National Electrical Code #70.

On March 31st, the code reviser received a letter from the department stating that such code was adopted by the procedure prescribed by law.

The text of the National Safety Code has been omitted from publication under the authority of RCW 34.04.050(3). Copies are available from the department of labor and industries.

Chapter 296-49 WAC
GOVERNOR'S MOBILE HOME AND RECREATIONAL VEHICLE ADVISORY BOARD

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296–49–001 Conditions of reciprocity. [Order 73–14, § 296–49–001 and 296–49–011, filed 7/31/73.] Recodified as WAC 296–48–011.

296–49–012 Agreements with out–of–state jurisdictions. [Order 73–14, § 296–49–012, filed 7/31/73.] Recodified as WAC 296–48–012.

WAC 296-49-005 Foreword. The state mobile home and travel trailer law, RCW 43.22.420, establishes the governor appointed mobile home and recreational vehicle advisory board and fixes its administrative responsibilities. The advisory board's principal function is to assist the director of labor and industries in adopting and promulgating reasonable rules and regulations in furtherance of safety to life and property with respect to plumbing, heating and electrical installations, minimum inspection procedures and the adoption of rules and regulations pertaining to the manufacture of mobile homes and recreational vehicles. While the advisory board will, upon request of the director of the department of labor and industries or the mobile home and recreational vehicle section thereof, aid in the administrative interpretation of the national codes and rules and regulations covering standards for plumbing, heating and electrical installations in the state of Washington, it will not function as board of appeal nor will it render decisions concerning the application or interpretation of any adopted rules and regulations to any person, firm or corporation engaged in the business of manufacturing mobile homes or recreational vehicles.

The primary purpose of the following rules is to provide a uniform procedure whereby persons, firms or corporations interested in communicating with the department of labor and industries on any subject matter relative to rules and regulations which should be adopted, amended or repealed for plumbing, heating or electrical installations in the state of Washington or relative to the operation of the mobile home and recreational vehicle section of such department may be heard.

[Order 70–3, § 296–49–005, filed 4/29/70.]

WAC 296-49-010 Definitions. Whenever used in these rules, the words:

BOARD: Shall mean the Washington state mobile home and recreational vehicle advisory board appointed by the governor pursuant to RCW 43.22.420.

DEPARTMENT: Shall mean the department of labor and industries of the state of Washington.

DIRECTOR: Shall mean the director of the department of labor and industries.

REGULAR MEETING: Shall mean the quarterly meetings held by the board on the last Friday of the months February, May, August and November.

SPECIAL MEETING: Shall mean any meeting of the board called by the chairman thereof or the director and held at times other than the regular meetings.

WAC 296-46-950 Administrators certificate. (1) The department shall issue an administrator certificate to a person who qualifies for a certificate in accordance with RCW 19.28.125. The first certificate issued shall 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 shall expire on the holder's even numbered birthdate. If the person was born in an odd numbered year, the certificate shall expire on the holder's odd numbered birthdate. The department shall prorate the administrators certificate fee according to the number of months or major portions of months in a certificate period. All subsequent certificates shall be issued for a twenty–four month period. The signature of a person who desires to renew their certificate shall be notarized.

(2) Effective July 1, 1987, an administrator designated on the electrical contractor license shall be a member of the firm who shall fulfill 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 shall require that the person is named as the sole proprietor, a partner or an officer in a corporation as shown on the electrical contractor license application on file with the department. In determining whether a person is a full–time supervisory employee, the department shall consider whether the person is on the electrical contractor's full–time payroll; receives a regular salary or wage similar to other employees; has supervisory responsibility for work performed by the electrical contractor and carries out the duties shown in RCW 19.28.125(2).

[Statutory Authority: RCW 19.28.060, 19.28.600 and chapter 19.28 RCW. 86–18–041 (Order 86–23), § 296–46–950, filed 8/29/86.]

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WAC

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296–49–012 Agreements with out–of–state jurisdictions. [Order 73–14, § 296–49–012, filed 7/31/73.] Recodified as WAC 296–48–012.

WAC 296-49-005 Foreword. The state mobile home and travel trailer law, RCW 43.22.420, establishes the governor appointed mobile home and recreational vehicle advisory board and fixes its administrative responsibilities. The advisory board's principal function is to assist the director of labor and industries in adopting and promulgating reasonable rules and regulations in furtherance of safety to life and property with respect to plumbing, heating and electrical installations, minimum inspection procedures and the adoption of rules and regulations pertaining to the manufacture of mobile homes and recreational vehicles. While the advisory board will, upon request of the director of the department of labor and industries or the mobile home and recreational vehicle section thereof, aid in the administrative interpretation of the national codes and rules and regulations covering standards for plumbing, heating and electrical installations in the state of Washington, it will not function as board of appeal nor will it render decisions concerning the application or interpretation of any adopted rules and regulations to any person, firm or corporation engaged in the business of manufacturing mobile homes or recreational vehicles.

The primary purpose of the following rules is to provide a uniform procedure whereby persons, firms or corporations interested in communicating with the department of labor and industries on any subject matter relative to rules and regulations which should be adopted, amended or repealed for plumbing, heating or electrical installations in the state of Washington or relative to the operation of the mobile home and recreational vehicle section of such department may be heard.

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DIRECTOR: Shall mean the director of the department of labor and industries.

REGULAR MEETING: Shall mean the quarterly meetings held by the board on the last Friday of the months February, May, August and November.

SPECIAL MEETING: Shall mean any meeting of the board called by the chairman thereof or the director and held at times other than the regular meetings.

[Order 70-3, § 296-49-010, filed 4/29/70.]

WAC 296-49-015 Officers. In addition to the chairman and secretary of the board, as provided for by RCW 43.22.420, the board shall elect from its members a vice chairman who shall perform all functions of the chairman in his absence.

[Order 70-3, § 296-49-015, filed 4/29/70.]

WAC 296-49-020 Internal management. The board shall adopt written rules of procedure for its internal management which shall include, *Roberts' Rules of Order, Revised*, copies of such rules of procedure shall be made available to interested persons upon written request.

[Order 70-3, § 296-49-020, filed 4/29/70.]

WAC 296-49-025 Duties. (1) The board shall study proposed rules and regulations submitted to it by the director or by the mobile home and recreational vehicle section of the department and shall make recommendations to the director concerning their adoption and promulgation.

(2) The board shall further develop and submit for consideration to the director administrative procedures, organizational plans and rules relating to improving the function of the mobile home and recreational vehicle section.

(3) The board shall at each regular or special meeting consider any written proposals made by any persons, firms or corporations for new rules or regulations or for changes in administrative procedures of the mobile home and recreational vehicle section provided such proposals are submitted in writing to the secretary of the board at least fifteen days prior to any such meeting so that the same may be properly included on the agenda for such meeting.

[Order 70-3, § 296-49-025, filed 4/29/70.]

WAC 296-49-030 Hearings. Any person, firm or corporation desiring to be heard on any subject matter relative to rules or regulations which should be adopted, amended or repealed for plumbing, heating and electrical installations in the state of Washington, or relative to the operation of the mobile home and recreational vehicle section of such department at any regular meeting of the board shall present a written request to that effect to the secretary of the board at least fifteen days prior to the next regular meeting, setting forth a summary of any and all proposals on which the hearing is requested.

[Order 70-3, § 296-49-030, filed 4/29/70.]

WAC 296-49-035 Appearance and practice before board. No person may appear in a representative capacity before the board other than the following:

(1) Attorneys at law duly qualified and entitled to practice before the supreme court of the state of Washington.

(2) Attorneys at law duly qualified and entitled to practice before the highest court of record of any other state, if the attorneys at law of the state of Washington are permitted to appear in a representative capacity before administrative agencies of such other state, and if not otherwise prohibited by Washington state law.

(3) A bona fide owner, officer, partner, or full-time employee of an individual, firm, association, organization, partnership, or corporation who appears for such individual, firm, association, organization, partnership or corporation or a person (other than an attorney at law as provided in subparagraphs (1) and (2) above) appointed in writing to represent an individual, firm, association, organization, partnership or corporation.

[Order 70-3, § 296-49-035, filed 4/29/70.]

WAC 296-49-040 Solicitation of business unethical. It shall be unethical for persons acting in a representative capacity before the board to solicit business by circulars, advertisements or by personal communication or interviews not warranted by personal relations, provided that such representatives may publish or circulate business cards. It is equally unethical to procure business by solicitors of any kind.

[Order 70-3, § 296-49-040, filed 4/29/70.]

WAC 296-49-045 Standards of ethical conduct. All persons appearing in proceedings before the board in a representative capacity shall conform to the standards of ethical conduct required of attorneys before the courts of Washington. If any such person does not conform to such standards, the board may decline to permit such person to appear in a representative capacity in any proceeding before the board.

[Order 70-3, § 296-49-045, filed 4/29/70.]

WAC 296-49-050 Appearance by former employee. No former employee of the board or member of the attorney general's staff may at any time after severing his employment with the board or the attorney general appear, except with the written permission of the board, in a representative capacity on behalf of other parties in any proceeding wherein he previously took an active part as a representative of the board.

[Order 70-3, § 296-49-050, filed 4/29/70.]

WAC 296-49-055 Former employee as expert witness. No former employee of the board shall at any time after severing his employment with the board appear, except with the written permission of the board, as an expert witness on behalf of other parties in any proceeding wherein he previously took an active part in the investigation as a representative of the board.

[Order 70-3, § 296-49-055, filed 4/29/70.]

WAC 296-49-060 Computation of time. In computing any period of time prescribed or allowed by the board rules, by order of the board or by any applicable statute, the day of the act, event, or default after which the designated period of time begins to run is not to be included. The last day of the period so computed is to be included.

[Order 70-3, § 296-49-060, filed 4/29/70.]

WAC 296-49-065 Administrative Procedure Act. All proceedings regarding supplemental rules and regulations shall comply, where applicable, with the provisions of the Administrative Procedure Act, chapter 34.04 RCW, and any amendments thereto.

[Order 70-3, § 296-49-065, filed 4/29/70.]

Chapter 296-50 WAC
SAFETY STANDARDS--MANUFACTURE OF EXPLOSIVES

WAC

WAC 296-50-010 Foreword. These safety standards are promulgated under and by authority of RCW 49.16.010, 49.16.080, 49.16.090, 49.16.100 and 49.16-.050 by hearing held at Olympia June 28, 1957 for the purpose of direction and guidance of manufacturers of explosives in order to comply with RCW 49.16.030. ". . . to render the work and place of work safe . . . " They shall become effective August 15, 1957. Attention is called to RCW 70.74.010 which reads as follows: "The term 'explosive' or 'explosives' whenever used in this act, shall be held to mean and include 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 detonator or 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 and limb."

[Foreword, filed 3/23/60, effective 8/15/57.]

WAC 296-50-020 Introductory. For reasons of brevity the safety educational standards as set forth in the general safety standards of the state of Washington, are not reprinted here but attention is called to several educational requirements contained in the above named standards.

[Introductory clause, filed 3/23/60, effective 8/15/57.]

WAC 296-50-030 Management's responsibility. (1) Report directly to the division of safety, Olympia, by telephone or telegraph (collect), immediately, any accident resulting in an immediate or probable fatality.

(2) Equipment involved in an accident resulting in an immediate fatality, shall not be moved, until a representative of the division of safety investigates the accident and releases such equipment, except where removal is essential to prevent further accident. Where necessary to remove the victim such equipment may be moved only to the extent of making possible such removal.

(3) Immediately upon notification of accident, department representative shall inform employer when investigator will be available. If circumstances exist whereby investigation will be delayed, department representative may permit employer to proceed with normal job operations.

(4) Upon arrival of division of safety investigator, employer shall assign to assist the investigator, the immediate supervisor and all employees who were eye witnesses to the accident, or whoever the investigator deems necessary to complete his investigation. Each witness shall give his own version and there shall be no discriminatory action taken for anyone testifying in any investigation.

(5) To prohibit any employee from working on or being in the vicinity of any job while under the influence of or affected by intoxicants. Employers shall be responsible for the actions of any employee known to be in an intoxicated condition while on the job.

(6) Assume the responsibility of work assignment so that no member of any production or maintenance crew shall be required to work in a position or location so isolated from other members of the crew that he is not in ordinary calling distance in case of an emergency.

(7) Make sure that every man has been trained for the work he is assigned to and has been thoroughly instructed in his duties and responsibilities.

[Rule 1, filed 3/23/60, effective 8/15/57.]

WAC 296-50-040 Employee's responsibility. He shall not report to the job while under the influence of intoxicants and shall not use intoxicants or drugs covered by the federal narcotics act while on the job.

To advise inexperienced fellow employees of safe ways to do their work and warn them of dangers to be guarded against.

Employees shall wear, use and properly care for personal protective safety equipment issued to them and return same to employer on termination of employment.

Workmen exposed to overhead hazards shall wear approved safety hats.

Employees should wear safety shoes when their feet are exposed to hazards of falling materials.

Safety inspector plan.

Settlement of disputes (safety inspectors).

Safety committee plan.

Settlement of disputes (safety committee).
Safety educational reports.
Safety bulletin board.

[Rule 2, filed 3/23/60, effective 8/15/57.]

WAC 296-50-050 Minimum requirements for first aid. (1) RCW 51.36.030 provides that: "Every employer, who employs less than fifty workmen, shall keep at his plant a first aid kit equipped as required by the department with materials for first aid to his injured workmen. Every employer who employs within a radius of one-half mile of any plant or establishment fifty or more workmen, shall keep one first aid station equipped as required by the department with materials for first aid to his injured workmen, and shall cooperate with the department in training one or more employees in first aid to the injured. The maintenance of such first aid kits and stations shall be deemed to be a part of any educational standards established under the provisions of sections 7734 and 7736."*

(2) Adequate provisions for the first aid treatment of injured persons shall be maintained at all times in every industrial establishment and on every operation covered by the act.

(3) Employers shall arrange to have as many workmen as possible take a full course in first aid training.

(4) There shall be at least one employee who has either a Red Cross, U.S. bureau of mines, or department of labor and industries current first aid certificate available during all operating hours in each plant, department or branch establishment employing less than 15 persons. (A current first aid certificate is one which is less than 3 years old.)

(5) There shall be at least two employees who have either Red Cross, U.S. Bureau of Mines, or department of labor and industries current first aid certificates available during all operating hours in each plant, department, or branch establishment employing more than 15 persons. (A current first aid certificate is one which is less than 3 years old.)

[Rule 3, filed 3/23/60, effective 8/15/57.]

***Reviser's note:** Section 7734 above is now RCW 49.16.050. Section 7736, which was repealed by Laws of 1927, section 19, page 762, read as follows: "The educational standards for coal mines and coal mining shall be prescribed by a board hereby created to be known as the 'state mining board' consisting of two members to be appointed by the state safety board."

For later law see RCW 43.22.120 et seq. and 78.40.780 et seq.

WAC 296-50-060 First-aid kit. (1) A first-aid kit shall be available on small construction jobs, line crews, and other transient or short duration jobs. On all such operations, or at small plants or division establishments employing less than fifty workmen, there shall be a first aid kit containing the following supplies or their equals as recognized by the plant or establishment medical director or medical consultant, or by the department of labor and industries.

1 package iodine applicators (not less than 6) and 1 package antiseptic applicators (not less than 6) containing some other approved antiseptic.

1 package aromatic spirits of ammonia ampoules and 1 package of ammonia inhalants in ampoules.

1 package water soluble base burn treatment.

6 triangle bandages 40" size.

1 tourniquet – buckle type.

1 1/2" x 5 yards Z. O. adhesive (sterilized).

6 compress bandages 4" x 4" pads (sterilized and individually wrapped in water proof packages).

4 compress bandages 2" x 2" pads (sterilized and individually wrapped in water proof packages).

2 2" roller bandages (sterilized).

6 3" x 3" gauze pads (sterilized and individually wrapped).

1 package 3/4" x 1" water proof adhesive compresses (100 in package).

1 pair scissors and 1 pair tweezers.

Proper antidotes for poisons to which workers may be exposed.

1 package approved eye dressing.

A chart showing clearly the pressure points and tourniquet points of the human body shall be fastened on the inside of the cover or door of the container for ready reference.

(2) All crew trucks, power shovels, cranes, locomotives, loaders, cats, logging trucks, speeders, freight trucks and similar equipment and vehicles shall be equipped with a standard dust and moisture proof first-aid kit (a moisture proof kit is one having a rubber seal around the inside of either of the closing edges to keep moisture from entering kit when closed) containing the following items:

1 package iodine applicators (not less than 6) and 1 package antiseptic applicators (not less than 6) containing some other approved antiseptic.

4 triangle bandages 40".

3 2" compress bandages.

3 4" compress bandages.

1 package 3/4" or 1" waterproof adhesive compresses (16 in package).

1 tourniquet – buckle type.

1 pair scissors and 1 pair tweezers.

1 package aromatic spirits of ammonia ampoules for internal use.

1 package ammonia inhalants in ampoules.

1 package water soluble base burn treatment.

2 packages 3" x 3" sterile gauze pads—4 to a package.

1 package 18" x 36" gauze (sterile).

1 package 36" x 36" gauze (sterile).

1 package approved eye dressing.

2 2" roller bandages (sterilized).

1 chart showing clearly the pressure points and tourniquet points of the human body shall be fastened on the inside of the cover of the container for ready reference.

(3) In addition to the first-aid kit which must be kept on the equipment or at the place of work, there shall be available within the closest practicable distance from the operations (not to exceed 1/2 mile) the following items:

1 set of arm and leg splints.

2 all wool blankets (properly protected and marked).
1 stretcher.

(4) First-aid instructors will, upon request, be furnished to industries by the division of safety of the department of labor and industries.

(5) All foremen, supervisors, or persons in direct charge of crews should have either a Red Cross, U.S. bureau of mines, or department of labor and industries current first-aid certificate; it being understood that a certificate is void 3 years from date of issue.

(6) Workers whose injuries require the use of a stretcher or ambulance or while being transported by other means shall be accompanied to the hospital by an attendant other than the driver. This attendant shall be first aid trained if possible, and shall ride with the patient.

(7) All ambulances used to transport injured workers shall be equipped with a fracture board as approved by the department of labor and industries.

(8) All drivers of ambulances transporting workmen covered by industrial insurance shall be trained in basic and advanced first aid as approved by the department of labor and industries.

(9) Immediate and proper transportation shall be provided for injured persons requiring the same, and such transportation shall have precedence over all other transportation under the control of the firm or party upon whose operation the accident occurs.

(10) All first-aid kits shall be kept filled and maintained in proper condition.

(11) When practical, a poster shall be fastened and maintained either on or in the cover of each first-aid cabinet and at or near all phones plainly stating the phone numbers of all available doctors, hospitals, and ambulance service within the district of the employer.

(12) Every fixed establishment employing more than 200 persons shall have a first aid room plainly designated as such. It shall be well lighted and well ventilated, kept spotlessly clean and orderly, provided with hot and cold running water, and fully equipped at all times. There shall be either a person who has a current first-aid certificate, or a trained nurse in charge of the first-aid room.

[Rule 4, filed 3/23/60, effective 8/15/57.]

WAC 296-50-070 First-aid room. (1) The minimum first-aid supplies to be kept in the first-aid room shall be:

1 package iodine applicators (not less than 24 in a package) and 1 package antiseptic applicators (not less than 24 in a package) containing some other approved antiseptic.

1 package aromatic spirits of ammonia ampoules and 1 package ammonia inhalants in ampoules.

2 packages water soluble base burn treatment.

6 triangle bandages 40" size.

1 tourniquet – buckle type.

1 1" x 5 yds. Z. O. adhesive (sterilized).

1 2" x 5 yds. Z. O. adhesive (sterilized).

6 compress bandages 2" x 2" pads sterilized and individually wrapped in waterproof packages.

6 compress bandages 4" x 4" pads sterilized and individually wrapped in waterproof packages.

1 package approved eye dressing.

White vaseline.

2 each of 2", 3" and 4" roller bandages (sterilized).

12 3" x 3" sterile gauze pads (individually packaged).

18" x 36" sterile gauze.

1 pair scissors, 1 pair tweezers, medicine droppers, assorted safety pins and paper drinking cups.

1 bottle rubbing alcohol and 1 package absorbent cotton.

6 finger cots.

1 set arm and leg splints.

Proper antidotes for poisons to which workers may be exposed.

A chart clearly showing pressure and tourniquet points shall be fastened on inside of cover or door of materials container.

1 stretcher and 2 all wool blankets (properly protected and marked).

1 container, dust proof, to be used solely for storage of first aid materials.

1 cot, complete with springs, mattress, blankets and 2 pillows (if both men and women are employed in the plant or establishment, privacy shall be provided).

2 hot water bottles.

1 emergency first aid kit, 24 unit size.

Some means of sterilizing tweezers shall be provided for.

(2) The foregoing minimum safety educational and first aid program, of necessity, is briefly covered, and calls for less than average safety work. It is not anticipated that there will be conflict with other existing programs or requirements. It is expected that these minimum requirements will become the basis on which a more complete program, suited to the size and the needs of the individual establishment, will be set up.

(3) Where any firm or majority group of employees of any firm finds that these educational standards cannot be adhered to in the operation involved, an application for adoption of a different plan of safety organization (on the form furnished by the department) may be filed with the division of safety, department of labor and industries. After full investigation of the operation of the firm, and consultation with the management and employees, the department may, if it is found that these educational standards cannot be complied with, approve the plan proposed or another type of plan recommended by the department (at its option) provided it conforms to the following provisions:

(a) The plan provides full management-employee participation.

(b) The plan is based on sound principles of accident prevention.

(c) The result will not be less than that provided in these educational standards.

(d) Any plan approved may be canceled on 30 days' notice by the division of safety after consultation with the management and employees.

(4) No safety program will run itself. To be successful, the wholehearted interest of the employees' group and management must not only be behind the program, but the fact must also be readily apparent to all.

[Rule 5, filed 3/23/60, effective 8/15/57.]

WAC 296-50-080 General regulations. (1) Smoking is positively prohibited on the plant site except in buildings designated.

(2) No matches or lighters shall be permitted in the plant area except in locations designated by management.

(3) A search of the employees for matches shall be made frequently, and at no time shall the interval between searches exceed one month.

(4) Special clothing and shoes free of metal fasteners shall be worn by all employees regularly working in buildings where explosives are handled. Powder shoes shall not be resoled. Any pockets provided should be constructed of cloth mesh.

(5) Neither the shoes or the special clothing as set forth in (4) above shall be worn off the premises but shall be left in the change room.

(6) New employee shall not handle explosives or operate any equipment in connection with the manufacture of explosives until he has received thorough instructions in accordance with established practices.

(7) Employees shall not engage in practical jokes or horseplay.

(8) All tools and brooms must be kept in their proper place when not in use.

(9) Gloves must be changed frequently.

(10) Oily rags, waste and refuse must be kept in special covered containers and contents removed to the waste quite frequently.

(11) All fire equipment such as extinguishers, hose, etc., shall be kept in good condition and inspected quarterly.

(12) All employees shall be instructed in the use of fire extinguishers and other fire apparatus.

(13) Great care shall be exercised in the handling and transportation of all explosives and acids.

(14) Any material known to be contaminated shall not be sent to the powder line.

(15) All major equipment used in connection with the manufacture of explosives shall be grounded and grounding inspected at regular intervals to be determined by management.

(16) Dope cans or buggies shall be kept covered or inverted at all times except when being filled or emptied.

(17) Breathing of fumes of oxides of nitrogen is to be avoided. Should an employee inhale a sufficient amount to cause irritation, the employee should cease work immediately and report to first aid station.

(18) Instruction shall be posted in the first aid station pertaining to the treatment of acid burns and nitric oxide vapors.

(19) Goggles shall be worn by employees grinding sulphur, and respirators shall be stand-by equipment in case of bad atmospheric conditions.

(20) All buildings used in the manufacture of explosives shall be kept clean at all times. Daily, weekly and other regular cleanup schedules shall be established.

(21) No explosives in excess of the normal house limit shall be allowed to remain in operating buildings over night.

(22) Suitable maintenance and lubricating schedules shall be set up for each piece of powder machinery.

(23) All electric switches operating equipment shall be turned off during lunch period and at termination of shift.

(24) Equipment in buildings where explosives are manufactured shall not be worked on unless switch is locked in open position, except for minor adjustments.

(25) Shield shall be provided around all acid valves.

(26) Respirators shall be washed daily and cartridges changed when once used.

(27) All safety doors and exits in the houses handling explosives shall be kept clear at all times. Two alternate exits such as chutes or outside stairways shall be provided for each floor.

(28) Rubber mats or suitable shoe cleaning devices shall be provided and used when entering and before leaving the building.

(29) Do not make any repairs to equipment or to buildings until they have been thoroughly cleaned.

(30) All tools shall be handled carefully and oil desensitizer used liberally on the parts being worked on.

(31) Extreme care shall be used by all employees in connection with the use of or repairing of acid equipment.

(32) Any unusual conditions occurring should be reported to supervision immediately.

(33) Goggles and rubber gloves should be worn when working on acid cars.

(34) Brooms should be washed frequently.

(35) Employees in powder operations shall not respond to fire alarms to fight fire in clothing contaminated with powder or nitro-cotton.

(36) Operations in all buildings when explosives are being manufactured shall be closed down when there is an electric storm in the vicinity; all light and power switches shall be pulled, and employees are to go to change house until storm is over, except N.G. line must be secured.

(37) Whenever the state explosive inspector enters the plant to inspect the powder line, arrangements shall be made previously by the inspector in setting the date and time of inspection. While the inspection is in progress, the powder line shall not operate.

(38) In order to guard against inadvertent trespasses, all explosive manufacturing plants must be enclosed on all sides by a substantial fence of at least four barbed wires with warning signs (white background – red letters) attached at 100 ft. intervals, reading as follows: EXPLOSIVES—DANGER—KEEP OUT.

If natural barriers such as rivers, lakes, high cliffs, etc., form a boundary line, no fencing shall be required.

[Rules A-1 through A-38, filed 3/23/60, effective 8/15/57.]

WAC 296-50-090 Dope house. (1) Clean and inspect dope screens and brushes twice each shift. Leave screens out overnight. Oil machinery once per shift.

(2) Where electro magnets are used and when ammeter shows less than 3 amperes through magnets, trouble must be corrected before continuing operation.

(3) Keep spare screen on hand at all times for replacing screens with holes, or breaks. Remove defective screen from house immediately after it is replaced.

(4) All materials for delivery to the mixing house shall be thoroughly screened. Dope which falls on the floor under the screen should be swept up and hand screened into the mixing to which it belongs.

(5) Do not send hot dopes to mixing houses. Notify foreman or supervisor if unusual temperatures exist.

(6) Never slide sulfur over floor or down chutes or drop into an empty bin. (Sulfur is subject to static electricity and friction fires and must be handled carefully.) Keep bins full at all times.

(7) Keep dope cans or buggies covered or inverted at all times except when filling or emptying. Examine buggies' interior before filling.

(8) Collect all foreign objects from screen or magnet and send to powder line foreman. Report immediately any unusual material.

(9) Keep house clean and as free of dust as possible at all times.

(10) The following tools are permitted in this building:

Wooden or rubber mallets
Bronze bars on thong
Metal–clad thermometer on thong
Aluminum scoops or
Shovels of aluminum or wood
Brooms and counter brushes
Spare dope screen
Small scales
Wooden hoes

(11) Daily clean–up. Remove screen, clean (wash if necessary) and inspect. Leave screen out overnight. Clean scales, radiators and all interior with compressed air and brush. Brush dirt from exterior of screen and dope cans or buggies. Sweep floors and send all sweepings to waste shed when the accumulation justifies.

(12) Weekly clean–up. In addition to daily clean–up, blow and brush down ceiling, walls and equipment and clean platforms outside the house. Sweep motor room.

(13) Semiannual clean–up. Remove dopes and wash down house.

(14) Powder uniforms and shoes in accordance with WAC 296–50–080(4) must be worn by employees in this house. Goggles and respirators shall be provided for use where needed, particularly when blowing or brushing down a house.

(15) Never work on equipment without pulling switches and locking the starting equipment, except for minor repairs. Pull all electric switches at the end of operating day.

(16) Inspect screens twice each shift or oftener, reporting any holes or breaks immediately to supervisor. Remove defective screen from house for repairs immediately.

(17) Where electro magnets are used, make certain that magnet lights are on during operation of screens. Remove tramp iron from magnets twice per shift and deliver accumulation to the line foreman at regular intervals.

(18) Check grounding frequently. The safety of the powder lines is dependent on receiving supplies free of foreign materials. Do not send any material to the lines unless every reasonable precaution has been taken to eliminate contamination.

(19) Before starting repairs on equipment, such as bins, dryers and screens, adequate precautions should be taken to prevent contamination with foreign substances. Check house and equipment for loose parts after repairs are made.

(20) Keep house clean.

(21) Keep tools, brooms, implements, etc. (when not in use) in the boards, racks or paper bags provided for them.

(22) Keep materials neatly and safely piled and protected to prevent entrance of any foreign material.

(23) See that all fire–fighting equipment is maintained in adequate condition for use at all times.

(24) Keep all bearings well lubricated and free from dust accumulation.

(25) All material prepared for delivery to the powder lines must be screened through six mesh stainless steel screen.

(26) Oily waste and rags must be placed in covered cans provided for that purpose. Clean rags and waste shall be kept in separate covered cans.

(27) Keep oily waste cans outside of buildings.

(28) No welding or open lights to be used at any time in this house without it being washed down prior, and written permission by the management is required.

[Rules B–1 through B–28, filed 3/23/60, effective 8/15/57.]

WAC 296-50-100 Dynamite mixing house. (1) Man limit – 3 employees, except supervision and truckers, provided, however, that 5 men may be used in tray–bagging operations where open tray is used for bagging and the operation is entirely manual.

(2) Oil machines and inspect carefully before starting to see that all equipment is in proper operating condition and that no foreign material is in bowls. See that bonding is secure. Run bowls empty for a short interval.

(3) If machine is not operating satisfactorily, shut down and notify foreman.

(4) Inspect screens used over bowls carefully before starting operation and before each mixing.

(5) If powder does not appear normal or there is any indication that it will not work satisfactorily for cartridging machines, notify foreman.

(6) Clean accumulation of dopes from equipment over bowl and edge of bowl after each dope is dumped.

(7) Sweep floor after each mixing.

(8) Do not mix and hold more powder in the house than is necessary for smooth operation. Mixed powder

must not be held in mixer, except under unusual circumstances.

(9) Do not clean bowl or wheels while mixer is in motion.

(10) Examine buggies interior before adding any powder.

(11) It is advisable to use a respirator while shoveling out powder or working over the bowl.

(12) Not more than one N.G. buggy shall be permitted in this house at a time.

(13) The following equipment is allowed in this building while machine is in operation:

Wooden shovels
Wooden hoe and wooden scraper
Floor broom
Whisk brooms on tongs
Aluminum dust pan
Wall thermometer in a case
Oil can
Nitro-cotton scale
Fibre hand scoop
Permissible flash light
Plastic bottles
Rubber mallet
Wooden box for rags and cloth

(14) All tools shall be handled carefully and oil desensitizer used liberally on the parts being worked on. Before resuming operation, all tools and pieces of equipment shall be accounted for to be certain they do not become a hazard to the operation.

(15) Daily clean-up. Remove all powder and nitrocotton from building and wipe inside of mixer and wheels. Wipe outside of N.G. buggy before returning to neutralizing house. Brush off powder buggies and trucks, and sweep floor thoroughly, sending sweepings to waste shed. Sweep platforms, track and motor rooms.

If mixer is operated more than one shift, the floor shall be thoroughly clean at end of earlier shift, and house left in orderly condition. Motors shall be stopped. Incoming operator shall inspect bowls and equipment before starting motors.

(16) The weekly clean-up shall be established in accordance with safe practices and such clean-up shall be agreed upon by management and the state safety inspector.

(17) Management is held responsible for the strict observance of all the above rules.

(18) See that all fire-fighting equipment is maintained in adequate condition for use at any time.

[Rules C-1 through C-18, filed 3/23/60, effective 8/15/57.]

WAC 296-50-110 Dynamite pack machine house. (1) Man limit - 3 employees, except supervision and truckers, provided that in cases where bag-packing and long length, large diameter cartridges are packed, 4 men shall be the limit.

(2) Before starting machine for the day or after repairs or changes, inspect it thoroughly for foreign material and see that all moving parts are oiled. Inspect inside of hopper, install stirrers and examine tamps. Operate machine empty for a short interval. It is very important that machine be accurately lined up and correctly timed.

(3) If machine is not operating satisfactorily, shut down and notify foreman. If any part of equipment is missing or tools unaccounted for, the machine must be shut down, the foreman called and all powder in the house screened, if the part is not located.

(4) Do not replace a broken shear-pin in drive shaft and restart machine until, (a) the foreman has been notified, (b) the powder has been cleaned from the hopper and sent to the waste opening house for screening and (c) you have assured yourself that machine is in satisfactory operating condition.

(5) Do not tighten tamps while machine is in motion.

(6) Keep floor clean. Remove powder from under front of machine as often as a hazard would indicate. Floor sweepings should be screened and sent to the waste house.

(7) Keep covers on buggies except when shoveling powder out, or filling with cartridged powder.

(8) Check drive to stirrers to see that there is no slippage. If it is slipping, shut down machine and notify foreman at once. Keep stirrer bearing well oiled. Applies to Starrett type of machine.

(9) No spare parts are to be kept in house, fan or motor rooms or in waste shed. Keep in parts house.

(10) The following miscellaneous equipment is allowed in house while machine is in operation:

Wooden or aluminum hoes
Wooden shovels
Wooden or aluminum floor scrapers
Floor brooms
Oil cans
Scale (stick count) chart
Aluminum dust pans on thong
Whisk brooms on thong
Wall thermometer
Wooden tamp on thong

(11) All tools shall be handled carefully and oil desensitizer used liberally on the parts being worked on. Before resuming operation, all tools and pieces of equipment shall be accounted for to be certain they do not become a hazard to the operation.

(12) Clean-up for machine change or repairs. All powder must be cleaned from the hopper. Clean loose powder from machine and floor and remove all powder, including waste, from the house. When changing stirrers, tamps and nipple plate, it is necessary to clean the hopper thoroughly in addition to doing the above.

For major repairs to house or machine, make clean-up as specified below for weekly clean-up.

No powder shall be delivered to building until machine operator advises that machine is ready for operation.

(13) Remove all waste and cartridged powder from buildings before starting machine clean-up. Clean powder hoppers and stirrers. Clean off all parts of machine and radiators. Remove all dry clean powder recovered to

the waste house for screening. Sweep floor thoroughly and send dirty sweepings to waste shed. Leave stirrers out for operators to install on the following operating day. Sweep outside platforms and track. If the house is operated two shifts, at the end of the first shift all powder is put into hopper and worked down to the allowable limit and the floor swept. All waste and sweepings shall be removed.

(14) The weekly clean–up shall be established in accordance with safe practices and such clean–up shall be agreed upon by management and the state safety inspector.

(15) Management is responsible for the enforcement of all of the above rules.

(16) See that all fire–fighting equipment is maintained in adequate condition for use at any time.

[Rules D–1 through D–16, filed 3/23/60, effective 8/15/57.]

WAC 296-50-120 Gelatin mixing house. (1) Man limit – 3 employees, except supervision and truckers.

(2) Lubricate all machinery thoroughly and inspect bowls and stirrers carefully before starting up on each shift, to insure that all equipment is in good operating condition and the bowls are free of foreign material. Where figure eight type of mixer is used, house operator should check clearance of mixer paddles each morning before starting by passing the hand under and around end of paddles to determine if there is satisfactory clearance at these points. Run empty bowls for a short interval and lower and raise paddles.

(3) Dope screens above mixers. These screens shall be inspected daily and before each mixing.

(4) Shut down and notify foreman if machine is not working properly.

(5) Where figure eight mixer is used, stirrers must be locked. Lock wheels on both sides in the "up" position while digging out or dumping powder, and lock wheels on both sides in the "down" position before starting to mix. Removable covers must be in place over the mixing bowls while mixing is in operation.

(6) Floor around bowl shall be swept after each mixing and sweepings stored in a closed container and sent to the waste shed.

(7) Mixing house buggies shall be inspected for foreign material before filling from mixer.

(8) Wooden shovels or scraper should be used to remove powder from stirrers on figure eight mixer.

(9) Mixing bowl temperatures shall not exceed 130°F.

(10) Not more than one N.G. buggy shall be permitted in this house at a time. The buggy shall be removed from the house after emptying.

(11) Do not add any material; use brush or whisk broom on any object within the immediate vicinity of a figure eight mixer while it is in operation; do not take sample from bowl while it is in operation.

(12) Floors to be kept clean. Walls and equipment to be maintained reasonably free of dust.

(13) The following miscellaneous equipment is permitted in this building while machine is in operation:

Wooden or aluminum hoes
Wooden shovels
Wooden or aluminum floor scrapers
Floor brooms
Oil cans
Scale (stick count) chart
Aluminum dust pans on thong
Whisk brooms on thong
Wall thermometer
Wooden tamp on thong

(14) All tools shall be handled carefully and oil desensitizer used liberally on the parts being worked on. Before resuming operation, all tools and pieces of equipment shall be accounted for to be certain they do not become a hazard to the operation.

(15) Daily clean–up. Clean thoroughly with solvent the inside of bowl and stirrers. Brush off powder buggies and trucks. Wipe outside of N.G. buggy before returning to store house. Brush down outside of bowls. Sweep floors, platforms, track and motor rooms. Send all sweepings to waste shed. It is recommended that goggles be used in clean–up operations.

If mixer is operated more than one shift, the floor shall be swept thoroughly at end of earlier shift and house left in orderly condition. Motors shall be stopped and electric switches disconnected. Incoming operator shall inspect bowls and equipment before starting motors.

(16) The weekly clean–up shall be established in accordance with safe practices and such clean–up shall be agreed upon by management and the state safety inspector.

(17) The management is held responsible for the strict observance of all of the above rules.

[Rules E–1 through E–17, filed 3/23/60, effective 8/15/57.]

WAC 296-50-130 Gelatin cartridge machine house. (1) Man limit – 3 employees, except supervision and truckers.

(2) Before starting machine for the day or after repairs or changes, inspect carefully to see that machine is well oiled and bowl is free of foreign material. For Starrett Stuffer type of machine, check rigidity of worms. Operate machinery empty for a short interval.

(3) If machine is not operating satisfactorily, shut down and notify foreman. Do not attempt to run powder which is too stiff.

(4) If any part of equipment is missing or tool unaccounted for, the machine must be shut down and the foreman called. Do not start it again until missing material is found or inspection of machine and powder has shown it safe to resume operations.

(5) When feeding powder into bowl, care should be exercised in keeping the hands well out of the bowl and away from worm to avoid injury.

(6) Clean tables and floor frequently, storing waste in closed containers for removal to waste shed.

(7) All tools shall be handled carefully and oil desensitizer used liberally on the parts being worked on. If removed string nipple plate nuts on a thong or aluminum

wire and immerse in engine oil until plate is again assembled.

(8) Keep no spare parts in house, fan or motor houses or waste shed. Keep only in parts house.

(9) No tools are permitted in this building while the machine is running. The following miscellaneous equipment is allowed in house while machine is in operation:

Wooden shovel
Scale
Cartridge chart
Aluminum dust pan on thong
Floor brooms
Whisk brooms and counter brushes on thong
Oil can
Floor scraper
Wall thermometer
Brass screwdriver on counter-weight
Hand scraper

(10) On Starrett Stuffer machine make certain that auger is secured in threaded coupling before starting machine. Always check to see that machine is operating in proper direction so that auger will not screw out.

(11) Where Starrett Stuffer machine is used, make sure that auger, when out of place, has ample clearance between liner and check clearance between nipple plate by turning machine by hand after nipple plate is assembled.

(12) On Starrett Stuffer, always use a gasket which has been freshly lubricated with oil between nipple plate and bowl. Oil resistant synthetic rubber is preferable.

(13) All tools shall be handled carefully and oil desensitizer used liberally on the parts being worked on. Before resuming operation, all tools and pieces of equipment shall be accounted for to be certain they do not become a hazard to the operation.

(14) Daily clean-up. Remove all punched and unpunched powder from the house and cut off power to machine motor before starting the machine clean-up. Remove and clean the nipple plate and horizontal auger. Wipe inside and outside of bowl, vertical worms and inside of lower worm housing as well as possible with rags and solvent. Leave nipple off until start of next shift. Clean crimper and leave crimper head in oil overnight. Clean floor and table carefully and wipe with solvent if necessary. Send sweepings to waste shed.

(15) The weekly clean-up shall be established in accordance with safe practices and such clean-up shall be agreed upon by management and the state safety inspector.

(16) The management is responsible for the enforcement of the above rules.

(17) See that all fire-fighting equipment is maintained in adequate condition for use at any time.

[Rules F-1 through F-17, filed 3/23/60, effective 8/15/57.]

WAC 296-50-140 Handpack house. (1) Man limit - 3 employees, except supervision and truckers.

(2) Keep powder in buggies covered as much as possible.

(3) Keep floor and benches clean. Store sweepings in covered container and send to waste shed frequently.

(4) Spare equipment shall be stored in spare parts house. No parts shall be stored in waste shed, fan or motor rooms.

(5) The following miscellaneous equipment is allowed in this building:

Wooden shovels
Wooden or aluminum hoes
Wooden tamps
Whisk brooms on thong
Wooden or aluminum floor scrapers
Scale (stick count) chart
Aluminum hand scoops
Floor brooms

(6) At end of day, remove powder from building, clean equipment and sweep floors, platforms and track thoroughly.

(7) The management is responsible for the enforcement of the above rules.

(8) See that all fire-fighting equipment is maintained in adequate condition for use at any time.

[Rules G-1 through G-8, filed 3/23/60, effective 8/15/57.]

WAC 296-50-150 Waste opening house. (1) Man limit - 3 employees, except supervision and truckers.

(2) Hardwood wedges and rubber mallets shall be used to open wooden cases.

(3) Open cartridges with short knife or wooden spatula attached to long rawhide thong or opening boards.

(4) Inspect screens before use and often during the day. Clean and deliver to repairman immediately any screen found to be defective.

(5) Screen all dynamite grades, except semi-gel, by brushing through the screen. Semi-gel may be opened and rolled with an all wood rolling pin on a table to facilitate inspection for foreign material, Semi-gel may also be screened. Gelatin grades shall be unrolled and inspected.

(6) Under normal conditions full size cartridges or large pieces of powder should not be sent to the burning ground but should be cut or broken into small pieces before delivery to waste shed.

(7) The following miscellaneous equipment is allowed in this building during opening operations:

Solid knives on thongs (or a cutting bench)
Wooden shovels
Wooden spatulas on thongs
Powder screens
Wooden floor scraper
Scale
Floor brooms
Whisk brooms on thong and aluminum scoop
Counter brush on thong
Brass picks on thong
Wall thermometer

(8) House shall be kept orderly and be cleaned thoroughly at end of shift.

(9) The management is held responsible for the strict observance of the above rules.

(10) See that all fire–fighting equipment is maintained in adequate condition for use at any time.

[Rules H–1 through H–10, filed 3/23/60, effective 8/15/57.]

WAC 296-50-160 Box packing house. (1) Man limit – 6 employees, except supervision and truckers.

(2) Paraffin temperature in the dip pot must not exceed 220 degrees F.

(3) Machines in this house shall be kept clean and the bearings oiled.

(4) No explosives in excess of the normal house limit shall be allowed to remain in building overnight.

(5) Do not handle cases roughly.

(6) Inspect cases carefully and remove all protruding nails.

(7) Keep floor swept and loose nails cleaned up.

(8) The following tools and miscellaneous equipment are permitted in this house:

1 Pair pliers
1 Screwdriver
1 Crescent or end wrench for nailing
1 Box scraper
1 Wire cutter
1 Butcher knife
Scales
Paraffin transfer tube
1 Floor scraper, aluminum
1 Metal–clad thermometer on thong
1 Oil can
1 Set stencils with brush and pot
2 Test weights – 25 lbs. and 50 lbs.
Box lining forms
2 Floor brooms
2 Aluminum dust pans
Or other necessary items

(9) Daily clean–up. Clean nailing machine, roller conveyor, scales and radiators each evening with appropriate tools. Scrape and sweep floor. Shut off steam in paraffin heater kettle. Remove and clean dip tank screen. Remove sludge from the dip tank, mix with sawdust and transfer to waste shed. (At plants where paraffin is pumped to dip tank, leave tank empty overnight and noon.) Sweep platforms, track and magazine cars. Clean powder buggies and replace paper in bottom. If house is operated more than one shift, the floors shall be thoroughly cleaned at end of each shift.

(10) The management is responsible for the strict observance of all the above rules.

[Rules I–1 through I–10, filed 3/23/60, effective 8/15/57.]

WAC 296-50-170 Powder repair shop. (1) This building is classed as an explosive building and general rules for powder apply here. Approved shoes and uniforms are required.

(2) No powder shall be brought into this building at any time.

(3) All parts shall be thoroughly cleaned of powder.

(4) Extreme care shall be taken in making repairs to any equipment having been in contact with dynamite or N.G. Careful inspection shall be made of all wooden parts before starting repairs. If they appear to be saturated with N.G., they shall be discarded and taken to the burning ground.

(5) Use engine oil liberally on tools being used and parts being repaired.

(6) Never make any repairs to a danger building or adjacent equipment while such is in operation and until you are familiar with the special rules applying to that operation.

(7) All tools, metallic parts and spare parts shall be checked into and out of explosive building before and after making repairs. Inspect thoroughly all repaired equipment before removal from this shop to operating building and spare parts storage.

(8) Keep benches clean and orderly and sweep floor often enough to keep clean.

(9) The responsibility for the observance of the above rules rests with the management.

[Rules J–1 through J–9, filed 3/23/60, effective 8/15/57.]

WAC 296-50-180 Batch nitrator. (1) Every nitrator shall be provided with an auxiliary power unit capable of safely disposing of N.G. in process in the event of a power failure.

(2) Employees shall be limited to three excluding supervision.

(3) The nitrator temperature must never exceed 50°F. The charge should not be dropped at a temperature lower than 32°F. (34°F. in winter) as received in the separator except for regular N.G. (100% glycerin), which should not drop below 40°F. to prevent freezing.

(4) Nitrator operator shall give his undivided attention to a charge being nitrated and when drawing charge from nitrator to separator.

(5) Nitrator charge, N.G., or waste acid shall never be sent to the next operation until proper notification has been received that the store–house is ready to receive the charge.

(6) Open, wash, and inspect nitrator interior every 3 months.

[Rules K–1 through K–6, filed 3/23/60, effective 8/15/57.]

WAC 296-50-190 Separator and prewash operation. (1) No prewash or soda water shall be heated above 140°F.

(2) N.G. gutter to neutralizers must be sponged at the end of shift.

(3) All sponges must be kept in weak soda water.

(4) Rubber gloves must be worn when washing gutter and equipment.

(5) Gutters should be painted as often as necessary to maintain them in good condition.

(6) When painting tank interiors, a life belt and a gas mask (or air line respirator) shall be worn. Two attendants must be present while a man is in tank.

(7) Daily clean–up. Clean house and all equipment at end of day and oil lead work when necessary. Remove, wash and leave out overnight the glycerin distributor.

Check glycerin screen. Open drain on waste acid blow case and leave open overnight. Examine all tanks and catch boxes for slums and clean if any are present.

(8) Weekly clean-up. Clean and inspect all equipment, water drains, ditch, etc. Paint catch boxes and gutters if needed. Clean glycerin heater house.

(9) Periodic clean-up. Test air and steam accumulators (monthly). Empty and clean large drowners. Clean glycerin scale tanks. At least biennially examine interior of all acid blow cases.

(10) The management is held responsible for the enforcement of all these rules.

[Rules K-7 through K-16, filed 3/23/60, effective 8/15/57.]

WAC 296-50-200 N.G. neutralizing house and store house. (1) Man limit - 2 employees, except supervision.

(2) Start ventilator fan and wait a few minutes before entering house.

(3) Inspect all rubber hoses on tanks and buggies daily for any signs of leakage. Replace all hose where any sign of deterioration exists.

(4) Carrying of N.G. in buckets shall be avoided as much as possible.

(5) In case of N.G. spill, sponge up N.G. into a bucket and put in catch box, wipe thoroughly with sponge and soda ash solution and clean thoroughly with N.G. Remover. Report spills to management at once.

(6) N.G. sponges must be kept in weak soda solution when not in use, and wiping rags must be kept in closed container.

(7) Sweep up or mop floor and keep house clean and tidy at all times.

(8) Wash N.G. buggies at end of day. Always leave fresh or weak soda water in N.G. buggy tanks overnight.

(9) At the end of each week the catch boxes and all equipment not containing N.G. in storage must be emptied of water and thoroughly scrubbed out and refilled with fresh water.

(10) The following is the only miscellaneous equipment allowed in this building except when it is being cleaned for repairs:

Rubber buckets
Sample carrier
Hose
Plastic or rubber covered scale
Weights and balance
Clock in box
Lead pan for sample bottles
Blue litmus paper
2 brooms
Tank markers
Brom phenol blue solution
Thermometers
Hydrometers
Rubber covered flashlight on thong for wrist
Rubber dipper
2 dust pans

[Rules L-1 through L-10, filed 3/23/60, effective 8/15/57.]

WAC 296-50-210 Acid operations. (1) The greatest care must be observed in the handling and transportation of acids. Avoid doing things which will cause splashing.

(2) Wash acid or ammonia burns with great quantities of water over a long period of time, then report to hospital.

(3) Every employee working with acids should know the location of and how to operate the safety showers. Test them every shift and do not permit obstructions in front of them. If shower is not nearby, have bucket of water at hand for use in case of acid burns when making repairs or when operation is being carried on.

(4) Use water from drinking fountain to wash acid out of eye or use the eye cup and solution provided for this purpose. Report any accident immediately to foreman, supervisor or hospital.

(5) Nitrous fumes: Breathing of nitrous fumes is to be avoided and any man who has inhaled sufficient to cause even slight irritation should cease work immediately and report to the foreman and proceed to the plant hospital at once. He should not exert himself after exposure to the fumes because complete rest is the best first-aid treatment to prevent serious complications. Men exposed to red fumes, even though they do not produce coughing, must follow the above rule. When it is absolutely necessary to enter an area laden with these fumes, a gas mask must be worn.

(6) Know the location and use of the gas masks for acid and ammonia fumes and use them when fumes are strong. Return any mask that has been used to laboratory for inspection and repairs.

(7) Glasses shall be worn by all employees in acid area at all times except when performing duties requiring goggles. Approved type acid goggles must be worn whenever acid or ammonia is outside, or may get out of, its normal pipe line or tank. This includes taking samples, working on valves, gaskets or pumps, measuring tanks, or carrying on any work where acid or ammonia might reasonably be expected to come in contact with the eyes.

(8) Under especially hazardous conditions, a rubber suit and helmet must be worn.

(9) Employees should wear proper clothing and "safety" shoes. Hats with brims must be worn around operations for protection against drips from overhead lines and equipment. Rubber gloves should be worn when sampling acid and handling equipment contaminated with acid and anhydrous ammonia.

(10) All ladders other than step-ladders or special ladders must be equipped with spiked feet or other approved friction feet. When used on concrete or smooth floors, plants must be placed under the spiked feet and the ladder must be securely fastened to prevent slipping. If this cannot be done, another man must hold the ladder.

(11) Repair work on acid equipment must not be started unless water is at hand. Whenever possible, acid equipment should be washed off thoroughly with fresh water before repairs are started.

(12) Before opening a line for repairs, be certain that the line is drained, all valves are closed and locked, and motors or pumps which deliver acid through the lines are locked out. Remove blanks, valve tags and motor locks when work is completed.

(13) When braking flanges in a pipe line, or removing a flange from a vessel, make sure there is no pressure on the line or vessel. Do not take all bolts out. At least two nuts must remain on two bolts in a loosened condition until the joint is broken and possible pressure released. Stand away from the flange when actually breaking the line so that if acid spurts out it will not come in contact with you.

(14) Observe the following rules before entering any acid tank: (a) Disconnect and blank off all connections, (b) wash and neutralize interior, (c) obtain permission to enter from foreman or supervisor who has inspected the tank and seen that all precautions and preparations have been made, (d) be equipped with protective clothing, goggles, gas masks, if necessary, and safety harness with line attached. Two men shall be in attendance outside tank to render assistance, if required.

(15) Always wear a gas mask when entering a brick-line tank which has been used for acid.

(16) Acid samples must be conveyed in suitable carriers and rubber gloves must be worn while taking samples.

(17) It is recommended that safety shields be in place around bonnets of valves, pipe flanges and over pumps at all times. Tighten bolts on valves and pumps frequently, and repack when necessary.

(18) Report to your foreman or supervisor at once any unsafe condition or any apparatus which is leaking acid or seems likely to become leaky. Block off entire area whenever there is an acid leak.

(19) Do not use a carbon tetrachloride fire extinguisher where it may come in contact with acid. Carbon tetrachloride and acid react to form phosgene, a poisonous gas.

[Rules M-1 through M-19, filed 3/23/60, effective 8/15/57.]

WAC 296-50-220 Spare parts houses. (1) No powder is to be brought into this building at any time.

(2) All powder is to be cleaned from spare parts before delivering to storage.

(3) Floors, benches, and racks shall be kept clean and in order.

(4) The following rules govern the cleaning of powder machine equipment for storage:

Parts are to be cleaned of all powder as they are removed from the machine unless special cleaning facilities are provided elsewhere.

[Rules N-1 through N-4, filed 3/23/60, effective 8/15/57.]

WAC 296-50-230 Nitrocotton screening and drying houses. (1) Matches, torches, or other flame-producing devices are strictly prohibited in nitrocotton areas. Only nonsparking tools are permitted.

(2) The walls and floor of nitrocotton dryer building and screening building when in regular use should be washed or brushed down each week.

Hoops and nuts on nitrocotton barrels or containers must be wet with water prior to removing them and prior to placing them back on the containers, also the socket wrench used for this purpose must be wet with water.

(3) Extreme cleanliness must be maintained in all nitrocotton operations. Waste or dirty nitrocotton should never be mixed with other refuse or waste material.

(4) Dry nitrocotton is extremely hazardous and after cotton has been dried, extraordinary precautions must be observed in handling.

(5) Do not store nitrocotton in open containers.

(6) Employees whose clothing may contain or be covered with nitrocotton must not answer fire alarms, assist in fighting fires or leave plant until clothing has been changed.

(7) Under no condition is frozen nitrocotton to be opened and handled. It must be thawed before removing from drums and screening.

(8) Steel drums shall be opened outside, or at least in a place removed from the screening operation.

(9) The nitrocotton shall be taken from the drums by means of wooden tools or a fibre scoop, or brass cotton fork.

(10) All wet nitrocotton shall be screened before delivery to the drying and mixing houses.

(11) Dry nitrocotton containing less than 5% moisture shall never be screened.

(12) The drums, when emptied, must be thoroughly cleaned of all nitrocotton, both inside and out.

(13) Partially filled drums of unused nitrocotton shall be removed from screen room and carefully closed to prevent evaporation of moisture, taking the precaution of wetting clamp and drum before closing.

(14) Screened nitrocotton shall be placed in covered fibre cans, or aluminum barrels, or paper bags.

(15) The amount of nitrocotton in the screening house shall be held to a minimum and never exceed the posted limit.

(16) The screening house must be clean at all times.

(17) The following miscellaneous equipment is stored outside, in a cabinet, for opening drums before taking them into the building:

2 Brass socket wrenches on thong
1 Brass end wrench on thong
1 Wooden wedge
1 Rubber mallet

(18) Only screened nitrocotton shall be placed on the dryer.

(19) Wooden boxes, fibre cans and aluminum barrels are the only containers that may be taken into the dryer.

(20) Do not allow air temperature to exceed 135°F.

(21) Operators and visitors are not permitted to wear rubber soled shoes or overshoes in dry house.

(22) Care should be used in discharging dryer to keep friction to a minimum.

(23) Check ground connections from supporting screen under cloth.

(24) The miscellaneous equipment permitted in this house is a wooden hoe, a wooden shovel, and broom.

(25) Clean-up. The floors shall be kept clean at all times. The walls, ceilings, floors, and air ducts from the blower shall be washed at frequent intervals to prevent an accumulation.

(26) The management is held responsible for the observance of the above rules.

(27) See that all fire-fighting equipment is maintained in adequate condition for use at any time.

[Rules O-1 through O-27, filed 3/23/60, effective 8/15/57.]

Chapter 296-52 WAC

SAFETY STANDARDS FOR THE POSSESSION AND HANDLING OF EXPLOSIVES

WAC

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.

296-52-012 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.

296-52-020 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.

296-52-025 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.

296-52-027 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.

296-52-030 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.

296-52-040 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.

296-52-043 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.

296-52-050 Transportation. [Statutory Authority: RCW 49.17-.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-050, filed 12/24/81; 81-07-048 (Order 81-4), § 296-52-050, filed 3/17/81; Order 75-41, § 296-52-050, filed 12/19/75; Order 70-4, § 296-52-050, 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.

296-52-060 More stringent ordinances prevail. [Order 70-4, § 296-52-060, 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.

296-52-080 Temporary permit for existing storage facilities. [Order 70-4, § 296-52-080, 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.

296-52-090 Construction of magazines. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-52-090, filed 12/11/84; 82-08-026 (Order 82-10), § 296-52-090, filed 3/30/82; 81-07-048 (Order 81-4), § 296-52-090, filed 3/17/81; Order 75-41, § 296-52-090, filed 12/19/75; Order 70-

4, § 296-52-090, 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.

296-52-095 Storage of explosives. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-52-095, filed 12/11/84; 81-07-048 (Order 81-4), § 296-52-095, filed 3/17/81; Order 75-41, § 296-52-095, 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.

296-52-100 Quantity and distance tables for storage. [Order 75-41, § 296-52-100, filed 12/19/75; Order 70-4, § 296-52-100, 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.

296-52-110 Limit on storage quantity. [Order 70-4, § 296-52-110, 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.

296-52-120 Quantity and distance tables for factory buildings. [Order 70-4, § 296-52-120, 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.

296-52-140 Quantity and distance table for separation between magazines. [Order 75-41, § 296-52-140, filed 12/19/75; Order 70-4, § 296-52-140, 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.

296-52-150 Storage of blasting caps with other explosives prohibited. [Statutory Authority: RCW 49.17.040 and 49-.17.050. 82-02-003 (Order 81-32), § 296-52-150, filed 12/24/81; Order 70-4, § 296-52-150, 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 License for manufacturing. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-52-160, filed 12/11/84; Order 70-4, § 296-52-160, 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 Blasting agents. [Statutory Authority: RCW 49.17-.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-165, filed 12/24/81; Order 76-6, § 296-52-165, filed 3/1/76; Order 75-41, § 296-52-165, 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.

296-52-167 Water gel (slurry) explosives and blasting agents. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-167, filed 12/24/81; Order 75-41, § 296-52-167, 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 Storage magazine license. [Order 70-4, § 296-52-170, 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.

296-52-180 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 Small arms ammunition, primers, and propellants—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, and propellants—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 1/11/90, 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 34.04 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) 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 division of industrial safety and health shall cooperate with all other law enforcement agencies in carrying out the intent of the explosive code and the State Explosives Act.

(5) 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 division of industrial safety and health, (WISHA). 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. 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.

[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 duly authorized representative, the assistant director, division of industrial safety and health, department of labor and industries, Olympia, Washington. Variance application forms may be obtained from the department upon request.

[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 or the Bureau of Mines, 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: 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:

(1) "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 his attention so that in case of an emergency he 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.

(2) "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.

(3) "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.

(4) "Blast area" means the area of a blast within the influence of flying rock missiles, gases, and concussion.

(5) "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.

(6) "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.

(7) "Blaster" means that qualified person in charge of and responsible for the loading and firing of a blast.

(8) "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.

(9) "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 296-52-457(7).

(10) "Dealer" means any person who purchases explosives or blasting agents for the sole purpose of resale, and not for use or consumption.

(11) "Department" means the department of labor and industries.

(12) "Detonating cord" means a round, flexible cord containing a center core of high explosive and used to initiate other explosives.

(13) "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.

(14) "Director" means the director of the department of labor and industries, or his designated representative.

(15) "Division" means the division of industrial safety and health of the department.

(16) "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.

(17) "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: *Provided*, That 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: *Provided*, That such black powder is intended to be used solely for sporting, recreational, or cultural purposes in antique firearms. Classification of explosives shall include but not be limited to the following:

Note: Classification of explosives is described by the U.S. Department of Transportation as follows (see 49 CFR, Parts 100–199) (1984):

(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.

(18) "Explosive–actuated power devices" means any tool or special mechanized device which is actuated by explosives, but not to include propellant–actuated power devices.

(19) "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.

(20) "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.

(21) "Factory building" means the same as "manufacturing building."

(22) "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.

(23) "Fuel" means a substance which may react with oxygen to produce combustion.

(24) "Fuse cap (fuse detonator)" means a detonator which is initiated by a safety fuse; also referred to as an ordinary blasting cap.

(25) "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.

(26) "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.

(27) "Handloader" means any person who engages in the noncommercial assembling of small arms ammunition for his own use, specifically the operation of installing new primers, powder, and projectiles into cartridge cases.

(28) "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.

(29) "Highway" means any public street, public alley, or public road.

(30) "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.

The magazine for indoor storage is not required to be a cubic yard in size as long as it is constructed as stated in WAC 296–52–090(3).

The interpretation of an uninhabited building as defined by the "Bureau of Alcohol, Tobacco, and Firearms" Department of the Treasury, which is the federal regulatory agency of explosives, allows 50 pounds of high explosives or 5,000 caps in a warehouse, wholesale, or retail establishments. It also states: "No indoor facilities for storage of high explosive shall be located in a residence or dwelling."

We only allow 1,000 caps, which is computed to 1–1/2 pounds of explosives and is much less than the Bureau of Alcohol, Tobacco, and Firearms allows. Therefore, the department will allow indoor storage to include shops and maintenance buildings.

(31) "Magazine" means any building, structure or container, other than an explosive manufacturing building, approved for the storage of explosive materials.

(32) "Manufacturer" means any person engaged in the business of manufacturing explosive materials for purposes of sale, distribution, or use.

(33) "Motor vehicle" means any self–propelled automobile, truck, tractor, semitrailer or full trailer, or other conveyance used for the transportation of freight.

(34) "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 "dobying."

(35) "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.

(36) "Oxidizer" means a substance that yields oxygen readily to stimulate the combustion of organic matter or other fuel.

(37) "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.

(38) "Person" means any individual, firm, copartnership, corporation, company, association, joint stock association, and including any trustee, receiver, assignee, or personal representative thereof.

(39) "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.

(40) "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.

(41) "Possess" means the physical possession of explosives in one's hand, vehicle, magazine or building.

(42) "Primer" means a unit, package, cartridge, or explosive used to initiate other explosives or blasting agents.

(43) "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.

(44) "Public conveyance" means any railroad car, streetcar, ferry, cab, bus, airplane, or other vehicle which is carrying passengers for hire.

(45) "Public utility transmission system" means power transmission lines over 751 volts, 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.

(46) "Purchaser" means any person who buys, accepts, or receives any explosives or blasting agents.

(47) "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.

(48) "Railroad" means any steam, electric, or other railroad which carries passengers for hire.

(49) "Railroad freight car" means cars that are built for and loaded with explosives and operated in accordance with DOT rules.

(50) "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.

(51) "Shall" means that the rule establishes a minimum standard which is mandatory.

(52) "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.

(53) "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.

(54) "Smokeless propellants" means solid chemicals or solid chemical mixtures in excess of fifty pounds which function by rapid combustion.

(55) "Special industrial explosive devices" means explosive-actuated power devices and propellant-actuated power devices.

(56) "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.

(57) "Sprung holes" means to spring or chamber the bottom of the drilled hole to allow room for additional explosives as a bottom load.

(58) "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.

(59) "Unclassified explosives" means any two components which, when mixed become capable of detonation by a No. 6 test blasting cap.

(60) "User" means any natural person, manufacturer, or blaster who acquires, purchases, or uses explosives as an ultimate consumer or who supervises such use.

(61) "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:

(a) Those which are sensitized by a material classed as an explosive, such as TNT or smokeless powder,

(b) 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.

(62) "DOT specification" are regulations of the Department of Transportation published in 49 CFR Chapter I.

[Statutory Authority: Chapter 49.17 RCW. 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, use, or store any explosive 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 gross misdemeanor.

(2) Upon notice from the department of labor and industries or any law enforcement agency having jurisdiction, a person manufacturing, purchasing, selling, using, or storing any explosives without a license shall immediately surrender any and all such explosives 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 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.

[Statutory Authority: Chapter 49.17 RCW. 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.

(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.

Note: See also WAC 296-52-425 and 296-52-433.

[Statutory Authority: Chapter 49.17 RCW. 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.

[Statutory Authority: Chapter 49.17 RCW. 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, Division of Industrial Safety and Health, 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.

(6)(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 or blasting agent on any highway, street, sidewalk, public way, or public place.

[Statutory Authority: Chapter 49.17 RCW. 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, applies.

(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 Industrial Safety and Health, 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: Chapter 49.17 RCW. 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, applies.

(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.

(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: Chapter 49.17 RCW. 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, applies.

(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 Industrial Safety and Health, 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.

(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 RCW 70.74.010, does not require a user's license.

[Statutory Authority: Chapter 49.17 RCW. 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 Industrial Safety and Health, 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 requirements 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) The unlawful entry into an explosives magazine or an actual or suspected theft of explosives shall be reported immediately to the department and to the local law enforcement agency.

(8) 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.

(9) 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.

(10) 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. 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: Chapter 49.17 RCW. 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.

(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, countersunk 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. They are to 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, countersunk, 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.

(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.

(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 100 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, 1973." 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. 70-1984). 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 70-84), 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: 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. 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.

(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 competent 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) Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.

(4) Surrounding area.

(a) Firearms (except firearms carried by guards) shall not be permitted inside of or within 50 feet of magazines.

(b) The land surrounding a magazine shall be kept clear of all combustible materials, brush, dried grass, leaves and other materials for a distance of at least 25 feet.

(c) Combustible materials shall not be stored within 50 feet of magazines.

(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 containing the words "EXPLOSIVES - KEEP OFF" in letters at least three inches high. 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.

(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 in a separate magazine until competent personnel has determined from the manufacturer the method of disposal. 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) Packages of explosives shall be laid flat with top side up. 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. 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. Packages of explosives shall be piled in a stable manner. When any kind of explosive is removed from a magazine for use, the oldest explosive of that particular kind shall always be taken first.

(b) Packages 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.

(c) 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.

(d) Magazines shall not be used for the storage of any metal tools nor any commodity except explosives, but this restriction shall not apply to the storage of blasting agents and blasting supplies.

(e) 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.

(f) 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.

(g) When magazines need inside repairs, all explosives shall be removed therefrom and the floors cleaned. In making outside repairs, if there is a possibility of causing sparks or fire the explosives shall be removed from the

magazine. Explosives removed from a magazine under repair shall either be placed in another magazine or placed a safe distance from the magazine where they shall be properly guarded and protected until repairs have been completed, when they shall be 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 the American table of distances for storage of explosive materials.

(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, highways, and public utility transmission systems 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 should 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 should be computed on the combined weight of explosives.

TABLE H-20
TABLE OF DISTANCES FOR STORAGE OF EXPLOSIVES

Column 1 Quantity that may be had, kept or stored		Column 2 Distance From Nearest Inhabited Building		Column 3 Distance from Nearest Railroad		Column 4 Distance from Nearest Highway & Pub. Util. Trans. System	
EXPLOSIVES							
Pounds over	Pounds not over	Barricaded Feet	UnBarricaded Feet	Barricaded Feet	UnBarricaded Feet	Barricaded Feet	UnBarricaded Feet
2	5	70	140	51	102	30	60
5	10	90	180	64	128	35	70
10	20	110	220	81	162	45	90
20	30	125	250	93	186	50	100
30	40	140	280	103	206	55	110
40	50	150	300	110	220	60	120
50	75	170	340	128	254	70	140
75	100	190	380	139	278	75	150
100	125	200	400	150	300	80	160
125	150	215	430	159	318	85	170
150	200	235	470	175	350	95	190
200	250	255	510	189	378	105	210
250	300	270	540	201	402	110	220
300	400	295	590	221	442	120	240
400	500	320	640	238	476	130	260
500	600	340	680	253	506	135	270
600	700	355	710	266	532	145	290
700	800	375	750	278	556	150	300
800	900	390	780	289	578	155	310
900	1,000	400	800	300	600	160	320
1,000	1,200	425	850	318	636	165	330
1,200	1,400	450	900	336	672	170	340
1,400	1,600	470	940	351	702	175	350
1,600	1,800	490	980	366	732	180	360
1,800	2,000	505	1,010	378	756	185	370
2,000	2,500	545	1,090	408	816	190	380
2,500	3,000	580	1,160	432	864	195	390
3,000	4,000	635	1,270	474	948	210	420
4,000	5,000	685	1,370	513	1,026	225	450
5,000	6,000	730	1,460	546	1,092	235	470
6,000	7,000	770	1,540	573	1,146	245	490
7,000	8,000	800	1,600	600	1,200	250	500
8,000	9,000	835	1,670	624	1,248	255	510
9,000	10,000	865	1,730	645	1,290	260	520
10,000	12,000	875	1,750	687	1,374	270	540
12,000	14,000	885	1,770	723	1,446	275	550
14,000	16,000	900	1,800	756	1,512	280	560
16,000	18,000	940	1,880	786	1,572	285	570

18,000	20,000	975	1,950	813	1,626	290	580
20,000	25,000	1,055	2,000	876	1,752	315	630
25,000	30,000	1,130	2,000	933	1,866	340	680
30,000	35,000	1,205	2,000	981	1,962	360	720
35,000	40,000	1,275	2,000	1,026	2,000	380	760
40,000	45,000	1,340	2,000	1,068	2,000	400	800
45,000	50,000	1,400	2,000	1,104	2,000	420	840
50,000	55,000	1,460	2,000	1,140	2,000	440	880
55,000	60,000	1,515	2,000	1,173	2,000	455	910
60,000	65,000	1,565	2,000	1,206	2,000	470	940
65,000	70,000	1,610	2,000	1,236	2,000	485	970
70,000	75,000	1,655	2,000	1,263	2,000	500	1,000
75,000	80,000	1,695	2,000	1,293	2,000	510	1,020
80,000	85,000	1,730	2,000	1,317	2,000	520	1,040
85,000	90,000	1,760	2,000	1,344	2,000	530	1,060
90,000	95,000	1,790	2,000	1,368	2,000	540	1,080
95,000	100,000	1,815	2,000	1,392	2,000	545	1,090
100,000	110,000	1,835	2,000	1,437	2,000	550	1,100
110,000	120,000	1,855	2,000	1,479	2,000	555	1,110
120,000	130,000	1,875	2,000	1,521	2,000	560	1,120
130,000	140,000	1,890	2,000	1,557	2,000	565	1,130
140,000	150,000	1,900	2,000	1,593	2,000	570	1,140
150,000	160,000	1,935	2,000	1,629	2,000	580	1,160
160,000	170,000	1,965	2,000	1,662	2,000	590	1,180
170,000	180,000	1,990	2,000	1,695	2,000	600	1,200
180,000	190,000	2,010	2,010	1,725	2,000	605	1,210
190,000	200,000	2,030	2,030	1,755	2,000	610	1,220
200,000	210,000	2,050	2,055	1,782	2,000	620	1,240
210,000	230,000	2,100	2,100	1,836	2,000	635	1,270
230,000	250,000	2,155	2,155	1,890	2,000	650	1,300
250,000	275,000	2,215	2,215	1,950	2,000	670	1,340
275,000	300,000	2,275	2,275	2,000	2,000	690	1,380

(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.

[Statutory Authority: Chapter 49.17 RCW. 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.

(b) This section does not apply to the transportation of ammonium nitrate.

(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) The storage of ammonium nitrate and ammonium nitrate mixtures that are more sensitive than allowed by

the "definition of test procedures for ammonium nitrate fertilizer" is prohibited.

(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 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 National Plant Food Institute, 1700 K Street N.W., 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., 500 Fifth Avenue, New York, NY 10036.

(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 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 of a combustible building, forest, piles of combustible materials and similar exposure hazards shall be of fire-resistive 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.

(d) Bags of ammonium nitrate shall not be stored within 30 inches of the storage building walls and partitions.

(e) The height of piles shall not exceed 20 feet. The width of piles shall not exceed 20 feet and the length 50 feet 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 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 in width. At least one service or main aisle in the storage area shall be not less than 4 feet 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.

(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 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 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.

(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.

(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 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.

(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.

(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 296-46 WAC 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 78-1968.)

(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: 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 quality 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 of any warehouse used for the storage of blasting agents. Combustible materials shall not be stored within 50 feet 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: 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 magazines 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
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. "Natural barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare of leaves.

Note 2. "Artificial barricade" means an artificial mound or revetted wall of earth of a minimum thickness of 3 feet.

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 manufacture and 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.

(4) WAC 296-52-461(1) does not apply to:

(a) 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;

(b) Explosive-actuated power devices when in quantities less than 50 pounds net weight of explosives;
(c) Fuse lighters and fuse igniters;
(d) Safety fuses other than cordeau detonant fuses.

[Statutory Authority: Chapter 49.17 RCW. 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]

TABLE H-22

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
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-21 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-21 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 National Plant Food 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, 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. Earth, or sand dikes, or enclosures filled with the prescribed minimum thickness of earth or sand are acceptable artificial barricades. Natural barricades, such as hills or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the "donor" when the trees are bare of leaves, are also acceptable.

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 .... 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 [$D_{1(2,3\ldots n)}$ 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:

$$D_{1(2,3\ldots n)} = M_2 x D_{12} + M_3 x D_{12} \ldots + M_n x D_{12} M_2 + M_3 \ldots + M_n$$

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-21), 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 as prescribed in Table H-21, Note 5.

(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. 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 Pounds Over	Pounds Not Over	Distance Feet
		Separate Building or Within Substantial Dividing Walls
.....	10	
10	25	40
25	50	60
50	100	80
100	200	100
200	300	120
300	400	130
400	500	140
500	750	160
750	1,000	180
1,000	1,500	210
1,500	2,000	230
2,000	3,000	260
3,000	4,000	280
4,000	5,000	300
5,000	6,000	320
6,000	7,000	340
7,000	8,000	360
8,000	9,000	380
9,000	10,000	400
10,000	12,500	420
12,500	15,000	450
15,000	17,500	470
17,500	20,000	490
20,000	25,000	530
25,000	30,000	560
30,000	35,000	590
35,000	40,000	620
40,000	45,000	640
45,000	50,000	660
50,000	55,000	680
55,000	60,000	700
60,000	65,000	720
65,000	70,000	740
70,000	75,000	770
75,000	80,000	780
80,000	85,000	790
85,000	90,000	800
90,000	95,000	820
95,000	100,000	830
100,000	125,000	900
125,000	150,000	950
150,000	175,000	1,000
175,000	200,000	1,050
200,000	225,000	1,100
225,000	250,000	1,150
250,000	275,000	1,200
275,000	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. 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 United States Department of the Treasury, Bureau of Alcohol, Tobacco and Firearms, may be located in accordance with Table H-24.

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. 88-23-054 (Order 88-25), § 296-52-487, filed 11/14/88.]

PART E--EXPLOSIVES TRANSPORTATION

WAC 296-52-489 Transportation. (1) The transportation of explosives by vehicle on public highways shall be administered by the United States Department of Transportation, CFR 49-1978, Parts 100 through 199, and the Washington state patrol under RCW 46-.48.170. The following sections cover the transportation of explosives on the job site.

(a) No employee shall be allowed to smoke, carry matches or any other flame-producing device, or 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 the disabled vehicle to another, only when proper and qualified supervision is provided.

(2) Transportation vehicles. Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty and be in good mechanical condition. If vehicles do not have a closed body, the body shall be covered with a flameproof and moisture-proof tarpaulin or other effective protection against moisture and sparks. All vehicles used for the transportation of explosives shall have tight floors and any exposed spark-producing metal on the inside of the body shall be covered with wood or other nonsparking materials to prevent contact with packages of explosives. Packages of explosives shall not be loaded above the sides of an open-body vehicle.

(3) Vehicles shall be placarded and displayed as specified by the United States Department of Transportation, CFR 49-1981, Parts 100 through 199.

(4)(a) Each motor vehicle used for transporting explosives shall be equipped with a minimum of two extinguishers, each having a rating of at least 10-BC.

(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.

(5) 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.

(b) Except under emergency conditions, no vehicle transporting explosives shall be parked before reaching its destination, even though attended.

(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. He shall have been made familiar with the vehicle he is 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 his 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 his attention from the vehicle.

(ii) However, an explosive-laden vehicle may be left unattended if parked within a securely fenced or walled area properly barricaded with all gates or entrances locked where parking of such vehicle is otherwise permissible, or at a magazine site established solely for the purpose of storing explosives.

(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 shall only be made to authorized persons and into authorized magazines of authorized temporary storage or handling area.

(6) Transporting of explosives and blasting caps or electric blasting caps in the same vehicle. Blasting caps, blasting caps with safety fuse, blasting caps with metal clad mild detonating fuse and/or electric blasting caps may be transported in the same vehicle with other explosives, provided the following condition is complied with:

The top, lid or door, sides and bottom of each container must be of laminate construction consisting of A/C grade or better exterior plywood, solid hardwood, asbestos board or sheetrock and sheet metal. In order of arrangement, from inside to outside, the laminate must consist of the following with the minimum thickness of each lamination as indicated: 1/4–inch plywood, 1–inch solid hardwood, 1/2–inch plywood, 1/2–inch sheetrock or 1/4–inch asbestos board, and 22–gauge sheet metal constructed inside to outside in that order.

(7) 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 one day's usage.

(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) Only a state approved powder car or vehicle shall be used underground.

(e) 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.

(f) Wires on electric caps shall be kept shunted until wired to the bus wires.

(g) The powder car or vehicle 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 record of such inspection shall be kept on file for the duration of the job.

(8) When explosives are carried to the blasting site from the main storage magazines by the blaster or helper:

(a) Special insulated 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: Chapter 49.17 RCW. 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 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.

(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 item of such blasting. Verbal notice shall be confirmed with written notice.

(g) Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent powerlines, dust storms, or other sources of extraneous electricity. These precautions shall include:

(i) The suspension of all blasting operations and removal of persons from the blast site during the approach and progress of an electric storm.

(ii) The posting of signs, warning against the use of mobile radio transmitters, on all roads shall be in accordance with the applicable provisions of the *American National Standards Institute D6.1–1971, Manual on Uniform Traffic Control Devices for Streets and Highways*, as amended by *Washington State Department of Highways Manual M24–01 (HT)*, (February 22, 1972).

(iii) Ensuring that mobile radio transmitters which are less than 100 feet away from electric blasting caps, when the caps are in other than original containers, shall be deenergized and effectively locked.

(iv) Compliance with the recommendations of The Institute of the Makers of Explosives (IME) with regard to blasting in the vicinity of radio transmitters as stipulated in *Radio Frequency Energy—A Potential Hazard in the Use of Electric Blasting Caps*, IME Publication No. 20, September 1981.

(v) When electric blasting caps are being used in blasting operations in the proximity of fixed radio transmitters, the following table of distances must be observed, unless it is determined by designated test procedures that there is not sufficient radio frequency

energy present to create a hazard. The test procedure shall be to attach a No. 47 radio pilot lamp in place of the cap in the blasting circuit progressively as the circuit is connected, starting with the initial hole. In the event the lamp glows, the length of the wires connecting the circuit shall be altered by adding or cutting off wire until the lamp does not glow. A radio frequency field strength meter may be used in lieu of the test lamp.

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 given below can be observed.

Transmitter Power Except FM Mobile (Watts)	Minimum Distance (Feet)
5 – 25	100
25 – 50	150
50 – 100	220
100 – 250	350
250 – 500	450
500 – 1,000	650
1,000 – 2,500	1,000
2,500 – 5,000	1,500
5,000 – 10,000	2,200
10,000 – 25,000	3,500
25,000 – 50,000	5,000
50,000 –100,000	7,000

Transmitter Power FM Mobile (Watts)	Minimum Distance (Feet)
1 – 10	5
10 – 30	10
30 – 60	15
60 – 250	30

(vi) When necessary to perform blasting operations at distances less than those shown in table, detonating type fuse or other approved type systems shall be used.

(h) 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.

(i) Electric detonators shall be shunted until wired into the blasting circuit.

(j) Explosives shall not be handled near open flames, uncontrolled sparks or open electric circuits.

(k) 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.

(l) All loading and firing shall be directed and supervised by licensed persons thoroughly experienced in this field.

(m) The employer shall permit only persons having proof of valid safety explosive training to handle explosives at the blasting site.

(2) Storage at use sites.

(a) Empty boxes and paper and fiber packing materials which have previously contained high explosives shall not be used again for any purpose, but shall be destroyed by burning at an approved isolated location out of doors, and no person shall be nearer than 100 feet after the burning has started.

(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 discoloration or 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.

(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.

(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.

(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 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.

(l) Holes shall not be drilled where there is danger of intersecting a charged or misfired hole.

(m) 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.

(n) Warning signs, indicating a blast area, shall be maintained at all approaches to the blast area. The warning sign lettering shall not be less that 4 inches in height on a contrasting background. All loaded stumps must be marked for identification on logging sites.

(o) A bore hole shall never be sprung when it is adjacent to or near a hole which has been loaded. Batteries shall not be used for springing holes.

(p) No loaded holes shall be left unattended.

(q) 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.

(r) When loading blasting agents pneumatically over electric blasting caps, semiconductive delivery hose shall be used and the equipment shall be bonded and grounded.

(4) Initiation of explosive charges – electric blasting.

(a) Only electric blasting caps shall be used for blasting operations in congested districts, or on highways, or adjacent to highways open to traffic, except where sources of extraneous electricity make such use dangerous. 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.

(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 leading 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 connecting them before they are connected to the leg wires or connecting wires, and they shall be kept in the possession 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 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 user (blaster) shall be in charge of the blasting machines, and no other person shall connect the leading 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 leading line or blasting wire might be thrown over a live powerline 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, or that the wires are securely anchored to the

ground. If neither of these requirements can be satisfied, a nonelectric system shall be used.

(w) In electrical firing, only the person making leading wire connections shall fire the shot. All connections shall be made from the bore hole back to the source of firing current, and the leading 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.

(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.

(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) If using a detonating type cord for blasting the double-trunk-line or loop systems shall be used.

(e) Trunk lines in multiple-row blasts shall make one or more complete loops, with crossties between loops at intervals of not over two hundred feet.

(f) All detonating cord knots shall be tight and all connections shall be kept at right angles to the trunk lines.

(g) 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.

(h) Detonating cord shall be handled and used with care to avoid damaging or severing the cord during and after loading and hooking-up.

(i) 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.

(j) 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.

(k) All detonating cord connections shall be inspected before firing the blast.

(l) 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.

(m) 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.

(n) 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) 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. Danger signs shall be placed at suitable locations.

(b) All charges shall be covered with blasting mats 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) Flagmen 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.

(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.

(8) 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.

(9) Misfires.

(a) If a misfire is found, the user (blaster) shall provide proper safeguards for excluding all employees 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.

(10) Underwater blasting.

(a) A user (blaster) shall conduct all blasting operations.

(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 blasting caps and detonating cords shall be used for all underwater blasting. Loading shall be done through a nonsparking metal 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(9).

(11) 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.

(b) When detonators or explosives are brought into an air lock, no employee except the powderman, 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 powderman 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.

(12) 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.

(13) Black blasting powder shall not be used for blasting except when a desired result cannot be obtained with another type of explosive such as in quarrying certain types of dimension stone.

(14) In the use of black blasting powder:

(a) Containers shall not be opened in, or within fifty feet of any magazine; within any building in which a fuel-fired or exposed-element electric heater is in operation; where electrical or incandescent-particle sparks could result in powder ignition; or within fifty feet of any open flame.

(b) Granular powder shall be transferred from containers only by pouring.

(c) Spills of granular powder shall be cleaned up promptly with nonsparking equipment, contaminated powder shall be put into a container of water and its content disposed of promptly after the granules have disintegrated, or the spill area shall be flushed with a copious amount of water to completely disintegrate the granules.

(d) Containers of powder shall be kept securely closed at all times other than when the powder is being transferred from or into a container.

(e) Containers of powder transported by vehicles shall be in a wholly enclosed cargo space.

(f) Misfires shall be disposed of by:

(i) Washing the stemming and powder charge from the bore hole, and

(ii) Removal and disposal of the initiator as a damaged explosive.

(iii) Bore holes of shots that fire but fail to break, or fail to break promptly, shall not be recharged for at least twelve hours.

(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 49.17.040 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-21. In determining the distance separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H-21), 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 firewall. 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 WAC 296–24–956 through 296–24–960; 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 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 over 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 WAC 296-24-956 through 296-24-960. 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-21 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: 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 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 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 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 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 mixing 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-21), 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 mixing 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 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. 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 firewall. 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 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 WAC 296-24-956 through 296-24-960.

(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 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 over 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: 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.

	Maximum Pounds Permitted	Special Restrictions
Private residence or car	25 pounds or less	None
	25 to 50 pounds	Store in strong box or cabinet constructed of 3/4–inch plywood (minimum) or equivalent, on all sides, top and bottom.
Dealer's warehouse	100 pounds	20 to 100 pounds shall be stored in portable 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 100 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 750 pounds shall be stored in nonportable storage cabinets having wooden walls of at least 1 inch nominal thickness. Not more than 400 pounds shall be permitted in any one cabinet.

(f) Quantities in excess of 750 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.

	Maximum Number Permitted	Special Restrictions
Private residence	10,000 primers	None
Private car	25,000 primers	None
Dealer's display	10,000 primers	None

	Maximum Number Permitted	Special Restrictions
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.

	Maximum Pounds Permitted	Special Restrictions
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.

[Statutory Authority: Chapter 49.17 RCW. 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 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.]

Chapter 296-54 WAC
SAFETY STANDARDS--LOGGING OPERATIONS

WAC

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.

296-54-003 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.

296-54-010 Definitions of terms used in the logging standards for the purpose of this chapter. [Order 76-29, § 296-54-010, filed 9/30/76; Order 72-14, § 296-54-010, filed 7/31/72, effective 9/1/72; Rules (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/30/62; 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.

296-54-020 Introduction. [Order 72-14, § 296-54-020, filed 7/31/72, effective 9/1/72; Rules (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.

296-54-030 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.

296-54-040 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.

296-54-050 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.

296-54-051 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.

296-54-052 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.

296-54-130 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.

296-54-140 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.

296-54-150 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.

296-54-160 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.

296-54-170 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.

296-54-180 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.

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.

296-54-190 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 79-10-081 (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.

296-54-990 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.

296-54-99011 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 296-54-45001 Pulpwood logging. (1) Application.

(a) General. This section applies to pulpwood logging operations including, but not limited to the operations of felling, limbing, marking, bucking, loading, skidding, prehauling and other operations associated with the preparation and movement of pulpwood timber from the stump to the point of delivery. The provisions of this section do not apply to logging operations relating to sawlogs, veneer bolts, poles, piling and other forest products.

(b) Standards incorporated by reference. Standards covering issues of occupational safety and health which are of general application without regard to any specific industry are incorporated by reference in subsections of this section and made applicable to pulpwood logging.

(2) Definitions applicable to this section.

(a) "Arch" means an extension to rear section of a vehicle used in skidding used to raise the forward part of a load clear of the ground.

(b) "Back cut" means the final cut in a felling operation made on the opposite side from the undercut.

(c) "Backfill" means excavated material used to build up a road higher than the original level.

(d) "Ballistic nylon" means a fabric of high tensile properties designed to provide protection from lacerations.

(e) "Borrow" means road construction material which is taken to another location for use. The source area is called "borrow pit."

(f) "Buck" means the process of severing a tree into sections (logs or bolts).

(g) "Choker" means a length of wire rope or chain with a loop or noose at one end used to secure trees or sections of trees for skidding.

(h) "Debark" means the action of removing bark from trees or sections of trees. Debark generally denotes mechanical means as opposed to manual peeling. Synonyms are "bark" and "barking."

(i) "Fairlead" means an arrangement of horizontal, and sometimes vertical, rollers usually mounted at the end of an arch to allow free play of wire rope during winching.

(j) "Fell" means the process of severing a tree from the stump so that it drops to the ground. Note that "fell" and "feller" are used in this standard. The terms "fall" and "faller" are commonly used in the Western United States and they have the same meaning as "fell" and "feller."

(k) "Grade" means the slope of a surface such as a roadway. Also, the elevation of a real or planned surface or structure. (See slope.)

(l) "Guarded" means protected by a cover, shield, rail, or other device, or by location, so as to reduce the probability of injury.

(m) "Guyline" means a line used to stay or support spar trees, booms, etc.

(n) "Landing" means any area where wood is concentrated. It is also called "yard," "deck," "brow."

(o) "Lodged tree" means a tree that has not fallen to the ground after being partly or wholly separated from its stump or otherwise displaced from its natural position.

(p) "Pickaroon" means a device with a head similar to an axe but with a point rather than a blade mounted on the end of a handle which is used to assist in the lifting and placement of bolts of wood.

(q) "Prehaul" means the hauling of forest products by off-the-road vehicles, nonhighway transport, or other movement prior to highway or rail movement, where the pulpwood travels clear of the ground. The term "forward" has the same meaning.

(r) "Pulpwood" means portions of a tree cut into short (normally 4 ft.) lengths to facilitate hand handling. It is intended to be used in the making of pulp rather than any lumber or veneer type finished product.

(s) "Riprap" means rock, metal stripping, or wooden timbers used to contain and stabilize earth embankments and fills.

(t) "Root wad" means the ball of roots which extends above ground level when a tree is pushed over by wind or other means.

(3) Additional definitions.

(a) "Skid" means the movement of bolts, logs, or trees by pulling or towing across the terrain. It may be accomplished by a stationary machine, a moving vehicle, or animal. The term is also called "yarding." The definitive feature is contact between the terrain and the product during movement.

(b) "Slope" is a term of measurement in percent and means the increase in height over the distance measured. An increase of 1 foot over a distance of 5 feet is expressed as a 20 percent slope (see grade).

(c) "Snag" means any dead standing tree or portion thereof remaining standing.

(d) "Spring pole" means a section of tree, sapling, limb, etc., which is, by virtue of its arrangement with relation to other material, under tension.

(e) "Undercut" means a notch cut in a tree to guide the tree in felling.

(f) "Widow maker" means an overhanging limb or section of tree which could become dislodged and drop to the ground (see also "lodged tree").

(g) "Wood hook" and "pulp hook" mean a device to be held in one hand which is fitted with a pointed section. The device is used to assist in the manual piling and handling of bolts of wood (see Pickaroon).

(4) General requirements.

(a) Clothing, personal protective devices, and first aid.

(i) Gloves shall be provided for use when working with wire rope in any form.

(ii) The employer shall ensure that employees exposed to the danger of foot injury due to falling or rolling pulpwood shall wear foot protection which equals or exceeds the crushing and impact specifications of ANSI Z41.1–1967.

(iii) Safety helmets of approved design in accordance with American National Standard for Safety Requirements for Industrial Head Protection, Z89.1–1969 shall be provided and worn.

(iv) Eye or face protection in accordance with American National Standard for Practice for Occupational and Educational Eye and Face Protection, Z87.1–1968 shall be provided and used where chips and sawdust or flying particles are present.

(v) Dust masks in accordance with American National Standard Practices for Respiratory Protection, Z88.2–1969 shall be provided and used where exposure exceeds the limits specified in the general occupational health standards, chapter 296–62 WAC.

(vi) Protection against the effects of noise exposure shall be provided and used when the sound levels exceed those shown in WAC 296–62–09011, Table 7, of the general occupational health standards, when measured on the A scale of a standard sound level meter at slow response.

(vii) First–aid kits in compliance with the requirements of the general safety and health standards, WAC 296–24–065, shall be provided at the work site and on all transport vehicles. In all areas where poisonous snakes may exist, snake bite kits shall be a part of the regular first–aid equipment. First–aid kits shall be regularly inspected and replenished.

(b) Handtools.

(i) The employer shall be responsible for the condition of tools when furnished by him and the user shall inspect any tool prior to using it to determine that it is in proper operating condition. Defective tools shall be removed from service.

(ii) Handles shall be sound, straight and tight fitting.

(iii) Driven tools shall be dressed to remove any mushrooming.

(iv) Cutting tools shall be kept sharp and properly shaped.

(v) Wood hooks and pickaroons of good grade steel shall be used.

(vi) Tools shall be used for purposes for which they were designed.

(vii) Hand tools shall be sheathed or boxed if transported in a vehicle with personnel. If not contained in a box, the sheathed tools shall be fastened to the vehicle.

(viii) Proper storage facilities shall be provided for hand tools. Tools shall be stored in the provided location at all times when not in use.

(c) Environmental conditions.

(i) All work shall terminate and employees moved to a place of safety during electrical storms and periods of high winds or when other unusual weather conditions are dangerous to personnel.

(ii) Dead, broken, or rotted limbs or trees that are a hazard (widow makers) shall be felled or otherwise removed before commencing logging operations, building roads, trails or landing, in their vicinity.

(d) Work areas.

(i) All persons shall be instructed to work within the vocal range of other workers unless a procedure has been established for periodically checking their location and welfare.

(ii) All persons shall be accounted for at the end of each work day.

(iii) An approved fire extinguisher shall be provided at locations where machines are operating and/or on each vehicle. Refer to WAC 296–24–58501(19) for definition of approved.

(iv) Fuel shall be stored only in approved well–marked containers located for safe access for fueling vehicles and equipment and at a safe distance from all fire hazards. Refer to WAC 296–24–58501(19) for definition of approved. The provisions of the general safety and health standards, WAC 296–24–330 through 296–24–33019, shall be applied in the storage and use of flammable fuel.

(e) Chain saw operations.

(i) Chain saw operators shall be instructed to inspect saws daily to assure that all handles and guards are in place and tight, that all controls function properly and that the muffler is operative. Defective equipment shall not be used.

(ii) Chain saw operators shall be instructed to follow manufacturer's instructions as to operation and adjustment.

(iii) Chain saw operators shall be instructed to fuel the saw only in safe areas and not under conditions conducive to fire such as near persons smoking, hot engine, etc.

(iv) Chain saw operators shall be instructed to hold the saw with both hands during operation.

(v) Chain saw operators shall be instructed to start the saw at least 10 feet away from fueling area.

(vi) Chain saw operators shall be instructed to start the saw only on the ground or when otherwise firmly supported.

(vii) Chain saw operators shall be instructed to be certain of footing and to clear away brush which might interfere before starting to cut.

(viii) Chain saw operators shall be instructed not to use engine fuel for starting fires or as a cleaning solvent.

(ix) Chain saw operators shall be instructed to shut off the saw when carrying it for a distance greater than from tree to tree or in hazardous conditions such as slippery surfaces or heavy underbrush. If the operator is carrying a running saw, the saw shall be at idle speed.

(x) Chain saw operators shall be instructed to carry the saw in a manner to prevent contact with the chain and muffler.

(xi) Chain saw operators shall be instructed not to use the saw to cut directly overhead or at a distance that would require the operator to relinquish a safe grip on the saw.

(xii) Supervision shall be adequately maintained to assure that the instructions required by this chapter are followed.

(f) Stationary and mobile equipment operation.

(i) Equipment operators shall be instructed as to the manufacturers' recommendations for equipment operation, maintenance, safe practices, and site operating procedures.

(ii) Equipment shall be kept free of flammable material.

(iii) Equipment shall be kept free of any material which might contribute to slipping and falling.

(iv) Engine of equipment shall be shut down during fueling, servicing, and repairs except where operation is required for adjustment.

(v) The operator shall inspect the equipment he will be operating at the start of each shift for evidence of failure or incipient failure. Equipment found to have defects which might affect the operating safety shall not be used.

(vi) The equipment operator shall walk completely around machine and assure that no obstacles or personnel are in the area before startup.

(vii) The equipment operator shall start and operate equipment only from the operator's station or from safe area recommended by the manufacturer.

(viii) A seat belt shall be provided on mobile equipment.

(ix) The equipment operator shall check all controls for proper function and response before starting working cycle.

(x) The equipment operator shall ground or secure all movable elements when not in use.

(xi) The foreman shall advise the equipment operator of the load capacity, operating speed and stability limitations of the equipment.

(xii) The equipment operator shall maintain adequate distance from other equipment and personnel.

(xiii) Where signalmen are used, the equipment operator shall operate the equipment only on signal from the designated signalman and only when signal is distinct and clearly understood.

(xiv) The equipment operator shall not operate movable elements (boom, grapple, load, etc.) close to or over personnel.

(xv) The equipment operator shall signal his intention before operation when personnel are in or near the working area.

(xvi) The equipment operator shall dismount and stand clear for all loading and unloading of his mobile vehicle by other mobile equipment. The dismounted operator shall be visible to loader operator.

(xvii) The equipment operator shall operate equipment in a manner that will not place undue shock loads on wire rope.

(xviii) The equipment operator shall not permit riders or observers on the machine unless approved seating and protection is provided.

(xix) The equipment operator shall shut down the engine when the equipment is stopped, apply brake locks and ground moving elements before he dismounts.

(xx) The equipment operator shall when any equipment is transported from one job location to another, transport it on a vehicle of sufficient rated capacity and the equipment shall be properly secured during transit.

(xxi) When any equipment is being moved or operated in the vicinity of an electric distribution line a minimum clearance of ten feet shall be maintained between the electric distribution line and all elements of the machine.

(g) Explosives. Only trained and experienced personnel shall handle or use explosives. Usage shall comply with the requirements of chapter 296-52 WAC and chapter 70.74 RCW.

(5) Equipment protective devices—Stationary and mobile equipment.

(a) Operator's manual. There shall be an operator's manual or operating instructions with each machine. It will describe operation, maintenance, and safe practices.

(b) On all mobile equipment specified in WAC 296-54-216, rollover protective structures (ROPS) shall be installed and maintained in accordance with the provisions of that section. On equipment requiring ROPS, the provisions of WAC 296-54-210, 296-54-215, 296-54-217 and 296-54-218 shall also apply.

(c) Equipment on which ROPS are not required shall be equipped with the following operator protective devices:

(i) Protective canopy. A protective canopy shall be provided for the operator of mobile equipment. It shall be so constructed as to protect the operator from injury due to falling trees or limbs, saplings or branches which might enter the compartment side areas, and snapping winch lines or other objects.

(A) The canopy shall be of adequate size so as not to impair the operator's movements.

(B) The canopy framework shall consist of at least two arches, either transverse or longitudinal. If transverse, one arch shall be installed behind the operator and one immediately in front of the operator. They shall be joined at the top by at least two longitudinal braces. There shall be two braces which shall act as deflecting guards extending from the leading edge of the forward arch to the front part of the frame of the tractor. If longitudinal arches are used, they shall be extended from behind the operator to the front part of the frame and each arch shall have an intermediate support located immediately ahead of the operator so that ingress or egress is not impeded. Regardless of the type of construction used, the fabrication and method of connecting to the tractor shall be of such design as to develop a strength equivalent to the upright members.

(C) The overhead covering shall be solid material and extend the full width of the canopy.

(D) The lower portion of cab shall be completely enclosed with solid material, except at entrances, to prevent the operator from being injured from obstacles entering the cab.

(E) The upper rear portion of cab shall be fully enclosed with open mesh material with openings of such a size as to reject the entrance of an object larger than 1 3/4 inch in diameter. It shall provide maximum rearward visibility.

(F) Open mesh shall be extended forward as far as possible from the rear corners of the cab sides so as to give the maximum protection against obstacles, branches, etc., entering the cab area.

(G) Deflectors shall also be installed ahead of the operator to deflect whipping saplings and branches. These shall be located so as to not impede ingress or egress from the compartment.

(H) The entrance opening of the canopy shall be not less than 52 inches in vertical height.

(I) Where glass is used it shall be safety glass. An approved substitute may be used.

(aa) An additional metal screen shall be used where glass alone is not adequate operator protection.

(bb) Provision shall be made to clean glass to assure adequate visibility.

(ii) Guards. Guards shall be provided for exposed moving elements such as shafts, pulleys, belts, conveyors and gears in accordance with WAC 296-24-205 through 296-24-20527 and American National Standard Safety Code for Conveyors, Cableways, and Related Equipment, B20.1-1957. Guards shall be in place at all times machine is in operation.

(iii) Mufflers. Mufflers provided by the manufacturer or their equivalent shall be in place at all times the machine is in operation.

(iv) Guylines. Guylines shall be arranged in such manner that stresses will be imposed on not less than two guylines. Stumps used for anchoring guylines shall be carefully chosen as to position and strength. They shall be tied back if necessary. Standing trees shall not be used for this purpose.

(v) Stability and reliability. Crane and loader stability and boom reliability shall be in accordance with American National Standard Safety Code for Cranes, Derricks and Hoists Overhead and Gantry Cranes, B30.2.0-1967, and American National Standard Safety Code for Cranes, Derricks and Hoists—Crawler, Locomotive, and Truck Cranes, B30.5-1968.

(6) Pulpwood harvesting.

(a) Felling, general.

(i) Work areas shall be assigned such that a tree cannot fall into an adjacent work area. The recommended distance between workers is twice the height of trees being felled.

(ii) When trees may fall into public roads a flagman shall be assigned to direct traffic.

(iii) Workers shall not approach a feller closer than twice the height of trees being felled until the feller has acknowledged the signal of approach.

(iv) Lodged trees shall be pulled to the ground at first opportunity with mechanical equipment or animal.

(v) Workers shall not work under a lodged tree.

(vi) Special precautions shall be taken to prevent felling trees into powerlines.

(vii) If a tree does make contact with a powerline the power company shall be notified immediately and all personnel shall remain clear of the area until power company personnel advises that conditions are safe.

(b) Manual felling.

(i) The feller shall plan a retreat path and clear the path as necessary before cut is started.

(ii) The feller shall appraise situation for dead limbs, the lean of tree to be cut, wind conditions, location of other trees and other hazards and exercise proper precautions before cut is started.

(iii) Undercuts shall be about one-third the diameter of the tree to guide tree and reduce possibility of splitting. (Local practice where small diameter trees are felled without being undercut is acceptable if the direction of fall is controlled by the practice.)

(iv) Back or felling cut shall be parallel to the inner edge of the undercut and approximately two inches higher than the undercut.

(v) The saw shall be shut off before feller starts his retreat.

(vi) On terrain where trees are likely to slide or roll fellers shall fell trees from the uphill side and arrange to keep uphill from previously felled trees.

(c) Bucking.

(i) Bucking on slopes shall be from the uphill side unless the log has been securely blocked to prevent rolling or swinging.

(ii) Spring poles and trees under stress shall be cut so that employee is clear when the tension is released. (This is accomplished by cutting under the bend.)

(iii) Trees piled for bucking shall be piled in an orderly parallel manner that minimizes hazard to employees.

(d) Limbing. Spring poles and limbs under stress shall be cut in such a manner that the employee is clear when tension is released.

(e) Mechanical debarking and delimbing. Guarding shall be provided so as to protect employees from flying chunks, logs, chips, bark, limbs, and other material and to prevent the worker from contacting moving parts.

(f) Skidding and prehauling, general.

(i) Only a designated, trained operator shall operate a skid or prehaul machine.

(ii) Choker setters shall work on uphill side of log.

(iii) No passenger personnel shall ride on a prehaul vehicle, logs, pallets, skid pans or other load unless adequate seating and protection is provided except on animal powered wagons.

(iv) Chokers shall be positioned near the end of the log or tree length to allow turning of the prehaul vehicle, to prevent the penetration of the operator station and to reduce possibility of striking the wheel or track.

(v) During winching, the equipment shall be positioned so that the winch line is in alignment with the long axis of the prehaul machine.

(vi) A stuck or inoperative vehicle shall be towed. A loaded pallet shall not be pushed.

(vii) Stakes shall not be added to permit a load beyond the rated capacity of pallets and trailers.

(viii) The operator shall be instructed to be observant and cautious of height of load and vehicle when traveling under trees, limbs, and other overhead obstructions.

(g) Skidding and prehauling equipment requirements.

(i) Arches, fairleads, drawbars, hitches and bumpers or fenders shall be designed and constructed to allow a minimum radius vehicle turn without the load contacting a rear tire or the rear of a track assembly.

(ii) Towed equipment such as skid pans, pallets and trailers shall be attached in such a manner as to allow a full 90° turn, prevent overrunning of the towed vehicle, and assure control of the towed equipment.

(iii) Animal towed equipment shall be equipped with a hand brake within reach of the driver.

(iv) Prehaulers shall have a means for securely retaining pallets or pulpwood.

(v) Prehaulers shall have a means of securely retaining loader for transport when so equipped.

(vi) Provision shall be made to securely fasten and to protect all tools and material on the carrier.

(h) Personnel transport.

(i) The driver shall be licensed as required by the Washington state department of motor vehicles.

(ii) Explosives or flammable liquids shall not be transported on crew vehicles except as specifically provided for in WAC 296-54-160.

(iii) Seats shall be securely fastened.

(i) Off highway truck transport. Truck drivers shall be instructed to stop their vehicles, dismount, check and tighten loose load binders, either just before or immediately after leaving a private road to enter a public road.

(j) Manual loading.

(i) The carrier shall be positioned to provide a safe working clearance between carrier and pile.

(ii) Proper lifting techniques shall be used, i.e., straight back and bend knees.

(iii) The stick shall be placed in the carrier in such manner that it is or will be properly secured.

(iv) Manual handling shall be limited to a weight consistent with correct lifting practices and individual lifting capacity.

(k) Machine loading.

(i) Piles shall be located to provide a safe work area.

(ii) Only the machine operator and slingman where used, shall be in the work area.

(iii) The load shall be positioned for balance and to prevent slippage or loss. Slings shall be placed to secure and balance the load.

(l) Storage. Piles shall be located and constructed in a manner to provide safe working area around them.

(m) Banding and piling bundles.

(i) Steel bands used in the making of bundles shall have a 5 to 1 safety factor for the weight of the bundles and shall be free of any visible defect which might detract from their designed strength.

(ii) Bands shall be placed when bundle is close to ground.

(iii) No part of the body shall be under the bundle at any time. Bundles shall be placed on runners. Bundles may be double stacked with top end bundle one half or more back from the lower rank end bundle.

(n) Chipping (in-woods locations).

(i) Access covers or doors shall not be opened until the drum or disk is at a complete stop.

(ii) Infeed and discharge ports shall be designed to prevent contact by personnel with disc, knives, or blower blades.

(o) Roads and trails, general.

(i) Roads shall be maintained and hazardous conditions corrected.

(ii) Where vision is limited warnings shall be posted.

(iii) Curve radii shall be the maximum consistent with terrain.

(iv) When night work is necessary, lighting shall be provided in accordance with WAC 296-54-280.

(v) Local road standards and maximum weight of traffic expected shall be used as guides for materials, construction features and drainage.

(p) Road and trail pioneering and earthwork.

(i) Banks at the borrow area shall be sloped to prevent slides.

(ii) Backfill shall be firmly compacted.

(iii) Roadside banks shall be sloped or stabilized to prevent slides.

(iv) Overhanging banks, large rocks and debris shall be removed or secured.

(v) Where riprap is used the material and design shall assure containment of material.

(vi) Trees or snags which may fall into the road shall be felled.

(q) Road and trail drainage.

(i) Drainage shall be provided to prevent washouts and landslides.

(ii) Culverts shall be of adequate strength and of a size to handle maximum runoff.

(iii) Where necessary, ditches and banks shall be stabilized by vegetation, riprap, or other adequate means.

(r) Road and trail surfacing. Road surface shall be properly compacted, graded and crowned.

(s) Bridges.

(i) Bridges shall be constructed in accordance with the provisions of WAC 296-54-150.

(ii) Bridges shall be decked and curbed.

[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.]

WAC 296-54-501 Scope and application. The requirements of this chapter augment those requirements of the general safety standards promulgated by the department of labor and industries, division of industrial safety and health, applicable to this industry, and apply to all persons, firms, corporations or others engaged in logging operations that come within the jurisdiction of the department of labor and industries. The requirements herein contained do not apply to log handling at sawmills, plywood mills, pulp mills or other manufacturing operations governed by their own specific safety standards.

The safety requirements herein contained are not to be construed to imply that other safe work practices, procedures or methods should not be employed where such methods, means or practices may be required to prevent accidents. Both employers and employees have a duty to do whatever is reasonable and practical to avoid causing accidents. These requirements are minimum safety requirements and shall augment other safety standards developed by the department which are of a general nature and apply to all industrial operations such as those contained in the general safety standards, chapter 296-24 WAC; occupational health standards, chapter 296-62 WAC; and precautionary labeling of containers of hazardous materials, chapter 296-64 WAC, or others which may be applicable. Regulations adopted by the department concerning certain types of equipment or conditions, such as metal and nonmetallic mines, quarries, pits and crushing operations, chapter 296-61 WAC, and possession, handling and use of explosives, chapter 296-52 WAC shall be complied with when applicable.

Some of the factors involving safe practices are use of good judgment, and the avoidance of taking chances. Accidents can be avoided in many instances by everyone conscientiously applying their knowledge of safety.

Copies of all society of automotive engineers reports (SAE) referred to in these standards are on file in all district offices of the division of industrial safety and health of the department of labor and industries, and may be reviewed by any interested person. Individuals desiring to obtain copies of such material shall arrange to do so directly from the publishers or from other sources. The division of industrial safety and health will not assume the responsibility of acquiring such material for uses other than its own needs.

Note: Safety standards for pulpwood logging are contained in a separate edition titled "Safety standards for pulpwood logging," WAC 296-54-45001.

[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. The assistant director may, upon receipt of application and after adequate investigation by the department, permit a variation from these requirements when an approved alternate means or manner of protection is provided, which affords an equivalent measure of safety as required by the rule from which a variance is requested.

[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 applicable to this chapter. (1) 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.

(2) Alternate communication system - a system approved by the department of labor and industries, which by voice or other media than horn or whistle, provides a safe and reliable method of communication between crew members.

(3) A side - any place of activity involving a group in the yarding and loading of logs.

(4) An operation - any place where logging or log related activities are taking place.

(5) Approved - approved by the department of labor and industries, division of industrial safety and health.

(6) Arch - any device attached to the back of a vehicle and used for raising one end of logs to facilitate movement.

(7) 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).

(8) Back line - that section of the haulback that runs between the spar tree and the corner block.

(9) Ballistic nylon - a fabric of high tensile properties designed to provide protection from lacerations.

(10) Barrier - a fence, wall or railing to prevent passage or approach.

(11) Base of tree - that portion of a natural tree not more than three feet above ground level.

(12) Bight of the line - any area where a person is exposed to a controlled or uncontrolled moving line.

(13) Binder - a hinged lever assembly for connecting the ends of a wrapper to tighten the wrapper around the load of logs or materials.

(14) Boomboat - any boat used to push or pull logs, booms, bundles, or bags, in booming ground operations.

(15) Boomscooter – a small boat, usually less than fourteen feet in length, equipped with an outboard motor, having directional pushing capabilities of 360 degrees.

(16) 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.

(17) 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.

(18) Bullbuck – the supervisor of the cutting crew.

(19) Butt welding – the practice of welding something end to end.

(20) Cable tree thinning – the selective thinning of a timber stand utilizing mobile yarding equipment specifically designed or adapted for the purpose. Such systems may be of the skyline, slackline, or modified slackline, overhead cable system.

(21) Choker – a length of wire rope with attachments for encircling the end of a log to be yarded.

(22) Chunking – the clearing of nonusable material from a specified area.

(23) Cold deck – any pile of logs which is yarded and left for future removal.

(24) Competent person – one who is capable of identifying hazards in the surrounding or working conditions which are unsanitary, hazardous or dangerous.

(25) Corner block – the first block the haulback passes through on its way to the tail block.

(26) Crew bus or vehicle – any vehicle furnished by or for the employer that will transport five or more persons.

(27) Crotch line – two short lines attached to the same ring or shackle, used for loading or unloading.

(28) 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.

(29) Directional falling – a mechanical means to control the direction of falling timber.

(30) Dog line – type of line used to fasten logs or timber products together by the use of dogs.

(31) Donkey – any machine with a series of drums used to yard logs.

(32) Double ended logs – two logs end to end on the same lay.

(33) Droplines – a short line attached to the carriage or carriage block which is used as an extension to the main line.

(34) Drum – a mechanical device on which line is spooled or unspooled.

(35) Dry land storage – decks of logs stored for future removal or use.

(36) Dutchman –

(a) A block used to change direction of line lead.

(b) A method of falling timber consisting of inserting a piece of material into one side of the undercut to assist in pulling a tree against the lean or a section of the undercut can be left in a corner to accomplish the same purpose.

(37) 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.

(38) F.O.P.S. – falling object protective structure.

(39) 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.

(40) 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.

(41) Guard rail – a railing to restrain a person.

(42) Guyline – a line used to support or stabilize a spar.

(43) 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.

(44) Haulback – a line used to pull the buttrigging and mainline to the logs to be yarded.

(45) Haulback block – any block the haulback line passes through including the corner block and tailblock.

(46) Hay rack –

(a) A type of loading boom where two tongs are used and logs are suspended.

(b) A transporting vehicle with multiple sets of bunks attached to a rigid frame usually used for hauling logs.

(47) 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.

(48) Head tree – the tree where yarding and/or loading takes place. (See spar tree)

(49) Heel boom – a type of loading boom where one tong is used and one end of the log is pulled up against the boom.

(50) 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.

(51) Hobo log and/or hitchhiker – a free or unattached log that is picked up by a turn and is transported with the turn.

(52) Hooktender – the worker that supervises the method of moving the logs from the woods to the landing.

(53) Hot deck – a landing where logs are being moved.

(54) Hydraulic jack – a mechanical device, powered by internal pressure, used to control the direction in which a tree is to be felled.

(55) In the clear – being in a position where the possibility of harmful physical contact is minimized.

(56) Jackstrawed – trees or logs piled in an unorderly manner.

(57) Jaggers – any projecting broken wire in a strand of cable.

(58) Kerf – that portion of timber products taken out by the saw teeth.

(59) Knob – a metal ferrule attached to the end of a line.

(60) Landing – any place where logs are laid after being yarded, awaiting subsequent handling, loading, and hauling.

(61) Lift tree – an intermediate support for skylines.

(62) Loading boom – any structure projecting from a pivot point to guide a log when lifted.

(63) Lodged tree – a tree leaning against another tree or object which prevents it from falling to the ground.

(64) 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.

(65) Log dump – a place where logs are removed from transporting equipment. It may be either dry land or water, parbuckled over a brow log or removed by machine.

(66) Logging machine – a machine used or intended for use to yard, move, or handle logs, trees, chunks, trailers, and related materials or equipment. This shall include self–loading log trucks only during the loading and unloading process.

(67) Logs – tree segments suitable for subsequent processing into lumber, pulpwood, or other wood products, including but not limited to poles, piling, peeler blocks and bolts.

(68) 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.

(69) Long sticks – an overlength log that creates a hazard by exceeding the safe perimeters of the landing.

(70) Mainline – the line attached to the buttrigging used to pull logs to the landing.

(71) Mainline block – the block hung in the spar through which the mainline passes.

(72) Mainline train – any train that is made up for travel between the woods and log dump.

(73) Matchcutting – the felling of trees without using an undercut.

(74) Mechanized falling – falling of standing timber by a self–propelled mobile wheeled or tracked machine equipped with a shear or other powered cutting device.

(75) Mechanized feller – any such machine as described in WAC 296–54–535 and 296–54–537, and includes feller/bunchers and similar machines performing multiple functions.

(76) Mobile log loader – a self–propelled log loading machine mounted on wheels or tracks, incorporating a grapple–rigged Bohemian, goose neck, or straight boom fabricated structure, employed in the loading or unloading of logs by means of grapples or tongs.

(77) 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 yarding systems.

(78) Must – the same as "shall" and is mandatory.

(79) New area or setting – a location of operations when both the loading station and the yarder are moved.

(80) Pass line – a small line threaded through a block at the top of the spar to assist the high climber.

(81) 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.

(82) 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.

(83) 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.

(84) 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.

(85) Receding line – the line on a skidder or slackline comparable to the haulback line on a yarder.

(86) Reload – an area where logs are dumped and reloaded or transferred as a unit to another mode of transportation.

(87) Rollway – any place where logs are dumped and they roll or slide to their resting place.

(88) R.O.P.S. – roll over protection structure.

(89) Rub tree – a tree used to guide a turn around a certain area.

(90) Running line – any line which moves.

(91) SAE – society of automotive engineers.

(92) Safety factor – the ratio of breaking strength to a safe working strength or loading.

(93) Safety glass – a type of glass that will not shatter when broken.

(94) Sail block – a block hung inverted on the sail guy to hold the tong block in proper position.

(95) Scaler – the person who measures the diameter and length of the logs, determines specie and grade, and makes deductions for footage calculations.

(96) Shall – a requirement that is mandatory.

(97) Shear log – a log placed in a strategic location to divert passage of objects.

(98) Shore skids – any group of timbers spaced a short distance apart on which logs are rolled.

(99) Signal person – the person designated to give signals to the machine operator.

(100) Siwash – to change the lead of a line with a physical object such as a stump or tree instead of a block.

(101) Skidder – a machine or animal used to move logs or trees to a landing.

(102) Skidding – movement of logs or trees on the surface of the ground to the place where they are to be loaded.

(103) Skyline – the line suspended between two points on which a block or carriage travels.

(104) Slackline – a form of skyline where the skyline cable is spooled on a donkey drum and can be raised or lowered.

(105) Slack puller – any weight or mechanical device used to increase the movement of a line when its own weight is inadequate.

(106) Snag – a dead standing tree or a portion thereof. (See Danger tree)

(107) Snorkel – a loading boom modified to extend its limitations for the purpose of yarding.

(108) Spar – a device rigged for highlead, skyline or slackline yarding.

(109) Spar tree – (see spar).

(110) Speeder – a small self–powered vehicle that runs on a railroad track.

(111) Spike – a long heavy nail similar to a railroad spike.

(112) Springboard – a board with an iron tip used by fallers to stand on while working above ground level.

(113) Square lead – the angle of 90 degrees.

(114) Squirrel – a weight used to swing a boom when the power unit does not have enough drums to do it mechanically.

(115) 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.

(116) Stiff boom – two or more boom sticks wrapped together on which boom persons walk or work.

(117) Strap – any short piece of line with an eye or "D" in each end.

(118) Strawline – a small line used for miscellaneous purposes.

(119) Strap socket or D – a socket with a closed loop and 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.

(120) Strip – a definite location of timber on which one or more cutting crews work.

(121) Swamping – the falling or cutting of brush around or along a specified place.

(122) Swifter – a piece of equipment used to tie the side sticks of a log raft together to keep the raft from spreading.

(123) Swing cut – a back cut in which the holding wood on one side is cut through.

(124) Tail block – the haulback block at the back end of the show.

(125) Tail hold – an anchor used for making fast any line or block.

(126) Tail tree – the tree at the opposite end from the head tree on which the skyline or other type rigging is hung.

(127) 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.

(128) Tong line block – the block hung in a boom through which the tong line operates.

(129) Tongue – a device used to pull and/or steer a trailer.

(130) Topping – cutting off the top section of a standing tree prior to rigging the tree for a spar or tail tree.

(131) Tower – (see portable spar or tower).

(132) Tractor – a machine of wheel or track design used in logging.

(133) Tractor logging – the use of any wheeled or tracked vehicle in the skidding or yarding of logs.

(134) Transfer (as used in loading) – changing of logs in a unit from one mode of transportation to another.

(135) 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.

(136) 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.

(137) Tree pulling – a method of falling trees in which the tree is pulled down with a line.

(138) Tug – a boat, usually over twenty feet in length, used primarily to pull barges, booms of logs, bags of debris, or log rafts.

(139) Turn – any log or group of logs attached by some means to power and moved from a point of rest to a landing.

(140) "V" lead – a horizontal angle of less than 90 degrees formed by the projected lines of the mainline from the drum of the logging machine through the block or fairlead and the yarding load or turn.

(141) WAC – Washington Administrative Code.

(142) Waistline – that portion of the haulback running between the corner block and the tail block.

(143) Wrapper – a cable assembly or chain used to contain a load of logs.

(144) Wrapper rack – barrier used to protect a person while removing binders and wrappers from a loaded logging truck.

(145) Yarder – a machine with a series of drums used to yard logs. (See donkey)

(146) Yarding – the movement of logs from the place they are felled to a landing.

[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.]

WAC 296-54-507 Management's responsibility. In addition to observance of the general safety and health standards:

(1) The employer shall assume the responsibility of safety training for new employees.

(2) The employer shall develop and maintain a hazard communication program as required by WAC 296–62–054 through 296–62–05427 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) The employer shall assume the responsibility of work assignments so that no employee shall be allowed to work in a position or location so isolated that he is not

within ordinary calling distance of another employee who can render assistance in case of emergency. In any operation where cutting, yarding, loading, or a combination of these duties is carried on, there shall be a minimum of two employees who shall work as a team and shall be in visual or hearing contact with one another to allow prompt awareness of injury or cessation of work activity of one employee by the other. No employee shall be left alone for a period of time to exceed fifteen minutes without visual or hearing contact. In addition, there shall be some system of back-up communication in the near proximity to enable an employee to call for assistance in case of emergency.

Note: This does not apply to operators of motor vehicles, watchmen 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) The employer shall establish a method of checking the employees in from the woods at the end of each shift. Each immediate supervisor shall be responsible for his crew being accounted for. This standard also includes operators of all movable equipment.

(5) Prior to the commencement of logging operations in a new area or setting, a safety meeting shall be held and a plan shall be developed and implemented whereby management shall ascertain by direct supervision that the work is being carried out with special emphasis on safety and safe work practices.

(6) When extreme weather or other extreme conditions are such that additional hazards arise, additional precautions shall be taken to assure safe operations. If the operation cannot be made safe because of the aforementioned conditions, the work shall be discontinued until safe to resume.

(7) Danger trees within reach of landings, roads, rigging, buildings or work areas shall be either felled before regular operations begin or work shall be arranged so that employees shall not be exposed to hazards involved.

(8) Management shall ensure that intoxicating beverages and narcotics are not permitted or used by employees on or in the vicinity of the work site. Management shall cause employees under the influence of alcohol or narcotics to be removed from the work site. This requirement does not apply to employees taking prescription drugs and/or narcotics as directed by a physician providing such use shall not endanger the employee or others.

[Statutory Authority: Chapter 49.17 RCW. 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 shall coordinate and cooperate with management and other employees in an attempt to eliminate accidents.

(2) Employees shall study and observe all safe work practices governing their work.

(3) They should offer safety suggestions, wherein such suggestions may contribute to a safer work environment.

(4) Intoxicating beverages and narcotics shall not be permitted or used by employees in or around the work sites. Employees under the influence of alcohol or narcotics shall not be permitted on the work site. This rule does not apply to employees taking prescription drugs and/or narcotics as directed by a physician providing such use shall not endanger the employee or others.

(5) Employees shall conduct themselves in a workmanlike manner while on the work site.

[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. (1) General requirements.

(a) Protective equipment, including personal protective equipment for eyes, face, head, hearing 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 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.

(b) Employee owned equipment. Where employees are required to provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance and sanitation of such equipment.

(c) Design. All personal protective equipment shall be of safe design and construction for the work to be performed. All safety belts and attachments shall meet the requirements of section 3 of ANSI A10.14-1975.

(2) Eye and face protection. Protective eye and/or face equipment shall be required and worn where there is a probability 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. Suitable eye protectors shall be provided and worn where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.

(3) Respiratory protection. The respiratory protection requirements of the general occupational health standards, chapter 296-62 WAC, shall apply.

(4) Occupational head protection. Hard hats meeting the specifications contained in American National Standards Institute (ANSI) Z89.1-1969, shall be worn by all employees involved in the logging operation or any of its related activities unless such employees are protected by F.O.P.S., cabs or canopies. Hard hats shall be maintained in serviceable condition.

(5) Personal flotation devices. Employees working on, over or along water, where the danger of drowning exists, shall be provided with and shall wear approved personal flotation devices in accordance with General safety and health standards, WAC 296-24-086.

(6) Occupational footwear.

(a) All employees whose duties require them to walk on logs or boomsticks, shall wear sharp-calked shoes, or the equivalent, except when conditions such as ice, snow, etc., render calks ineffective. When calks are ineffective and other footwear does not afford suitable protection, workers shall not be required to work on logs or boomsticks.

(b) When nonslip type shoes or boots afford a greater degree of employee protection than calk shoes, such as at scaling stations, log sorting yards, etc., then this type footwear may be worn in lieu of calk shoes providing firm ankle support and secure footing are maintained.

(7) Leg protection. Employees whose normal duties require them to operate a power saw shall wear a flexible ballistic nylon pad or pads, sewn or otherwise fastened into the trousers, or other equivalent protection, that will protect the vulnerable area of the legs.

(8) Hand protection. All employees handling lines or other rough materials where there is a reasonable possibility of hand injury, shall wear suitable gloves or other hand protection to prevent injury.

(9) Hearing protection. The hearing protection requirements of the general occupational health standards, chapter 296-62 WAC, shall apply.

(10) Protective clothing. Employees working on landings or in log sorting yards, when working on or from the ground, shall wear highly visible hard hats and/or yellow or orange vests, or similarly colored garments, to enable equipment operators to readily see them. It is recommended that such hard hats and vests or outer garments be of a luminous or reflectorized material. Employees performing duties of a flagperson shall wear a hard hat and vest or garment of contrasting colors. Warning vests and hard hats worn at night shall be of a reflectorized material.

[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 296-54-513 Safety educational and first-aid requirements. See the general safety and health standards, WAC 296-24-040 through 296-24-065.

[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 General requirements. (1) Emergency stops. Speed limiting devices, safety stops or emergency shut down devices or shut off valves shall be provided, with the controls so located that in the event of an emergency, the prime mover may be shut down from a safe place.

(2) Machine operators. Machine operators shall be experienced in operating the equipment they are using, except that inexperienced persons may operate the equipment to gain experience while in training and may do so only while working under immediate supervision of an experienced authorized person.

(3) Refueling vehicles. Vehicles shall not be fueled while the motors are running with the exception of helicopters, which is permitted under certain conditions. (See WAC 296-54-559(36).)

(4) Hydraulic lines. If failure of hydraulic lines would create a hazard to an equipment operator while at the operating station, safeguards shall be installed in such a manner as to eliminate the hazard. All hydraulic lines shall be maintained free of leaks and shall be shielded from damage wherever possible.

(5) Defective equipment. Equipment in need of repair shall be reported to management in writing as soon as possible and such equipment shall not be used until repairs are completed if there is a possible hazard to safety of the operator or other employees.

(6) Lock out - tag out. Procedures for lock out - tag out shall be established and implemented to prevent the accidental starting of equipment that is shut down for repairs, maintenance or adjustments.

(7) Control marking. The controls of all machines shall be marked as to their purpose in the operation of the machine.

(8) Metal objects. Metal objects driven into trees or logs shall be removed immediately after serving their intended purpose.

(9) Fire protection. An approved, fully charged and maintained, fire extinguisher shall be available at locations where machines are operating or on each vehicle.

(10) Hand tools. Hand and portable powered tools and other hand-held equipment shall be maintained and used in accordance with the general safety and health standards, WAC 296-24-650.

(11) Storage, handling and marking of fuel. Fuel shall be stored, handled and marked in accordance with WAC 296-24-330.

(12) Smoking prohibited. Smoking shall be prohibited in battery charging areas and within fifty feet of all refueling operations. Precautions shall be taken to prevent open flames, sparks or electric arcs in battery charging or refueling areas.

(13) Charging batteries. When charging batteries, the vent caps shall be kept in place to avoid electrolyte spray. Care shall be taken to ensure caps are functioning. The battery (or compartment) cover(s) shall be open to dissipate heat.

(14) Uncovered batteries. Tools and other metallic objects shall be kept away from the tops of uncovered batteries.

[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, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-515, filed 9/21/79.]

WAC 296-54-517 Camps. Rules, regulations and standards for camps shall be in accordance with WAC 296-24-125.

[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 Transportation of crews by motor vehicle. (1) Seats. Anchored seats shall be provided for each person when riding in any vehicle.

(2) Seat belts. The driver of a crew vehicle shall be provided with and shall wear a seat belt at all times the crew vehicle is in motion.

(3) Barricade. After May 1, 1980, a substantial barricade shall be provided behind the driver of a crew bus or vehicle that will transport nine or more passengers. The barricade shall extend from the floor to at least a level even with the top of the driver's head.

(4) Safe entrance and exits. Adequate provisions shall be made for safe entrance and exits.

(5) Enclosed racks. When equipment or tools are carried inside the vehicle, they shall be stored in enclosed racks or boxes, which shall be properly secured to the vehicle.

(6) Vehicle to be stopped. Persons shall not enter or exit from any vehicle until the vehicle is completely stopped.

(7) Keep within vehicle. Persons shall keep all parts of the body within the vehicle.

(8) Stoves prohibited. Provisions shall be made for heat and light in the passenger portion of the vehicle. Use of stoves in vehicles is prohibited.

(9) Emergency exit. On vehicles designed to transport nine or more passengers, an emergency exit not less than six and one-half square feet in area, with the smaller dimension being not less than 18 inches, shall be placed at the back of the vehicle or near the back on the side opposite the regular entrance. The route to and egress from the exit must be unobstructed at all times.

(10) Fire extinguisher. When no fuel is transported in the crew vehicle, a minimum rated 5/BC dry chemical fire extinguisher shall be kept in the passenger compartment. When fuel is transported on the crew vehicle in accordance with subsection (14) of this section, a minimum rated 10/BC dry chemical fire extinguisher shall be kept in the passenger compartment. The extinguishing agent shall be nontoxic and preferably a noncorrosive type.

(11) Crew and emergency vehicles. Vehicles designed to transport five or more passengers shall be equipped with stretchers, two blankets, and first-aid kits. If used as a means of transporting injured persons, it shall be designed to enable persons to pass a loaded stretcher into the vehicle. Provisions shall be made for proper securing of the stretcher.

(12) Exhaust systems. Exhaust systems shall be designed and maintained to eliminate the exposure of passengers to toxic agents.

(13) Limitation of transportation of explosives. Explosives shall not be carried on any vehicle while the vehicle is being used to transport workers other than the driver and two persons.

(14) Limitation of transportation of fuels. Fuels shall be transported or stored only in approved safety containers. Enclosed areas where fuels are carried or stored shall be vented in such a manner that a hazardous concentration of fumes cannot accumulate. All containers or drums shall be properly secured to the vehicle while being transported. Commercially built vehicles of the pick-up or flatbed type with a seating capacity of not to exceed six persons may be used to carry fuels in or on the bed of such vehicles, providing such fuels are not carried in the crew compartment. Van-type vehicles may be used to carry fuels only when a vapor-proof bulkhead is installed between the passenger compartment and storage compartment. Not more than forty-two gallons of gasoline may be carried or stored in the compartment and each container shall have a capacity not exceeding seven gallons.

(15) Motor vehicle laws. Motor vehicles used as crew vehicles regularly for the transportation of workers shall be covered against the weather and equipped and operated in conformity with applicable state of Washington motor vehicle laws.

(16) Operator's license. All operators of crew vehicles shall be experienced drivers and shall possess a current valid drivers license.

(17) Daily vehicle check. Operators of crew vehicles shall check brakes and lights daily and shall keep windshields and mirrors clean.

(18) Good repair. Crew vehicles shall be maintained in good repair and safe condition.

(19) Dump trucks. Dump trucks shall only be used in an emergency to transport workers and shall be equipped with adequate safety chains or locking devices which will eliminate the possibility of the body of the truck being raised while employees are riding in the truck. Emergency shall mean any unforeseen circumstances which calls for immediate action when danger to life or danger from fire exists.

(20) Means of signaling. An effective means of signaling shall be provided for communication between the driver and the passengers being transported when they are in separate compartments.

(21) Load limit. The passenger load limit of a crew vehicle shall not exceed the seating capacity of the vehicle.

(22) Vehicle check. Crew vehicles shall be thoroughly inspected by a mechanic for defects which could create a hazardous condition for operation. Such inspections shall be carried out at least every month. Defects known to the operator shall be reported in writing to the mechanic or person in charge. If defects are found, they shall be corrected before the vehicle is used for the transportation of crews.

[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 Transportation of crews by use of speeders and trailers. (1) Braking systems. All speeders shall be equipped with two separate and independently operated braking systems either of which shall be of sufficient capacity to lock all wheels when speeder is fully loaded.

(2) Sanding methods. All speeders used for transporting crews shall be equipped with methods for sanding tracks, operative for both directions of travel.

(3) Lights, windshield wipers. 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, shall be provided on all speeders. Adequate tail lights shall be installed and maintained in good order. Automatic windshield wipers of sufficient capacity to maintain clear visibility shall be installed on all speeders.

(4) Trailers. When trailers are coupled behind speeders, they shall be equipped with two separate and independent braking systems, either shall be of sufficient capacity to lock all wheels when the trailer is fully loaded. One of these shall be power operated and shall be controlled from the speeder; the other manually operated from the trailer. One man shall be designated to operate this brake in case of emergency.

(5) Trailer coupling. All trailers shall be coupled to speeders with metal couplings and safety chains or straps of sufficient strength to withstand the impact caused by a broken coupling.

(6) Trailer not to coast. No trailer shall coast or be used as a crew car without being attached to a speeder.

[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 296-54-523 Methods of crew transportation other than those specified. Special approval. Persons or firms desiring to transport crews by methods other than those specified in these rules shall so inform the division of industrial safety and health, department of labor and industries, so that an evaluation of that method may be made. Should the proposed method be found to afford a measure of safety acceptable to the division of industrial safety and health, department of labor and industries, a written order stating that finding shall be issued to the person or firm concerned by the division of industrial safety and health and the proposed method may be utilized.

[Statutory Authority: 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 296-54-525 Railroad construction and maintenance. (1) Construction. All construction shall be according to safe logging practice as to size of rails, ties, track accessories and methods of installing same.

(2) Rail guards. Rail guards shall be placed on main lines and spurs, consistent with type of traffic and general local conditions.

(3) Rail anchors. Rail anchors of approved design shall be installed wherever practicable.

(4) Frogs, switches and guard rail ends. Frogs, switches and ends of guard rails shall have either patent or wooden foot guard blocking installed.

(5) Slip plates. Slip plates shall be used under all switches and switch points.

(6) Wire for telephone lines. All above ground wire for permanent telegraph or telephone lines used for dispatching must be well strung on insulators and shall be clear of ground and obstruction.

(7) Insulators. 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.

(8) Trestles. Foundations, pile trestles, framed bent trestles, mud sills, or other framework of all structures shall be adequate to support the maximum imposed loads without exceeding the maximum safe working unit stresses. Such structure shall be maintained in good condition and repair and shall be inspected at least annually by a qualified person and a record maintained of inspection which shall be made available to the division of industrial safety and health on request.

(9) Wooden guard. Outside wooden guard rails shall be installed on all railroad bridges except that outside wooden rails will not be required where inside steel guard rails are used. They shall extend not less than six inches above the top of the ties and shall be bolted or spiked to ties at intervals of not more than five feet. Spacer blocks shall be used unless ties are spiked to stringers, or guard rails are dapped to avoid need for spacer blocks.

(10) Bridge ties. Regular bridge ties of not less than ten feet in length shall be used on all railroad bridges constructed after the effective date of these standards.

(11) Safety platforms. On trestles and bridges whose length exceeds two hundred fifty feet, safety platforms providing safe standing space for two persons shall be installed and 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.

(12) Bridges and trestles used as footways. All railroad bridges and trestles used habitually as footways shall be provided with a plank walkway not less than twelve inches wide and two inches thick, located between the rails, and shall extend from end to end of bridge or trestle.

(13) Walkway. A suitable substantial walkway not less than three feet wide with handrail shall be installed on bridges or trestles where train crews are required to perform routine inspection or repair work on trains. Substantial platforms and handrails shall be provided where switches are located on bridges or trestles. Adequate clearance shall be allowed for the throw of the switch.

(14) Clearing right of way. All dangerous trees, snags or brush shall be cleared a safe distance from both sides of the track and any obstruction that will create a transportation hazard shall be removed.

(15) Secure footing at switches. Material shall be provided which will promote secure footing at places alongside the track where employees customarily perform duties, such as inspect loads, set brakes by hand or throw switches.

(16) Clearance between tracks. The distance between any main tracks and side track shall be such that there shall be a clearance of four feet between bunk ends and locomotive cabs.

(17) Clearances. The minimum horizontal clearances on each side of the center line of standard gauge mainline railroads shall be eight feet, and the vertical clearance shall be twenty–two feet above the top of each rail (in accordance with standard railroad engineering practices).

(18) Derailers.

(a) Derailers shall be installed and used on all landings, passing tracks and spurs where cars are left on a grade.

(b) These derails shall be located in such a manner that they will be close to standing equipment and will not operate to create a hazard to buildings and other railroad lines.

(c) Derailers shall not be located on the inside rail on a sharp curve.

(d) Derail signs shall be set on both sides of the track even with derailer.

(e) When a derailer is no longer needed, it shall be removed or rendered inoperative.

[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.]

WAC 296–54–527 Truck roads. (1) Truck road grades. Truck road grades shall not be too steep for safe operation of logging or work trucks which operate over them and shall not exceed twenty percent in any case unless a positive means of lowering trucks is provided.

(2) Truck road surfaces.

(a) Truck roads shall be of sufficient width and evenness to insure the safe operation of equipment.

(b) Hazards such as broken planking, deep holes, large rocks, logs, etc., which prevent the safe operation of equipment, shall be immediately corrected.

(c) Road width. On blind curves, truck roads shall be of sufficient width for two trucks to pass, or some type of signal system shall be maintained or speed limited to such that the vehicle can be stopped in one–half the visible distance.

(3) Safe roadways. All danger trees shall be felled a safe distance back from the roadway. Rocks, which present a hazard, shall be cleared from banks. Brush and other materials that obstruct the view at intersections or on sharp curves shall be cleared. (This subsection is applicable only to those portions of roads under direct control of the employer.)

(4) Bridges. All structures shall be adequate to support the maximum imposed loads without exceeding the maximum safe working unit stresses. All bridges shall have an adequate number of reflectors to clearly define the entrance to the bridge. All structures shall be maintained in good condition and repair and shall be inspected at least annually by a qualified authorized person and a record maintained of each inspection, which shall be made available to the division of industrial safety and health, department of labor and industries on request.

(5) Shear rails. Shear rails shall be installed on both outside edges of bridges. The shear rails must be securely fastened and made of material capable of withstanding the impact generated by contact with the wheels of a loaded vehicle. The top of shear rails shall be not less than fifteen inches above the bridge surface. Bridges in use prior to the effective date of these regulations with outside shear rails of a minimum of ten inches high or center type shear rails of not less than five inches high are permissible until such time repairs are needed.

(6) Control of dust on logging roads. Measures shall be instituted which will minimize dust to such degree that visibility will not be reduced beyond the point where an operator can safely operate a vehicle. Vehicle operators shall govern the speed of vehicles by road conditions.

(7) Fenders. Pneumatic–tired equipment shall be equipped with fenders as described in the Society of Automotive Engineers Technical Report J321a.

[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 296–54–529 Falling and bucking—General. (1) Before starting to fall or buck any tree or snag, the cutter shall survey the area for possible hazards and proceed according to safe practices. Snags which are unsafe to cut shall be blown down with explosives or felled by other safe methods.

(2) Workers shall not approach a faller within reach of the trees being felled unless a signal has been given and acknowledged by the faller that it is safe to approach.

(3) Before falling or bucking any tree, sufficient work area shall be swamped and an adequate escape path shall be made. An escape path shall be used as soon as the tree or snag is committed to fall, roll or slide.

(4) Warning to be given. Fallers shall give timely and adequate warning prior to falling each tree; such warning shall be given with the saw motor at idle or shut off. Persons in the area shall give response to the faller and shall also notify him when they are in the clear.

(5) A competent person, properly experienced in this type of work, shall be placed in charge of falling and bucking operations. Inexperienced workers shall not be allowed to fall timber or buck logs unless working under the direct supervision of an experienced worker.

(6) Snags that have loose bark in the area of the proposed cut shall have the bark removed before being felled. When a snag has elevated loose bark which cannot be removed, the buddy system shall be used to watch for and give warning of falling bark or other hazards.

(7) Tools of fallers and buckers, such as axes, sledges, wedges, saws, spring boards, etc., must be maintained in safe condition. Case hardened or battered sledges and wedges shall not be used. All tools shall be used for their intended purposes.

(8) Trees shall not be felled if the falling tree can endanger any worker or strike any line or any unit in the operation.

(9) When practical, strips shall be laid out so cutters face out into opening when starting strip, and all trees shall be felled into the open whenever conditions permit.

(10) Trade leaners. Cutters shall not fall into another strip; leaners on the line shall be traded.

(11) When there is danger from kickback of a sapling, the same must be either undercut or felled.

(12) Cutters shall place an adequate undercut and leave sufficient holding wood to insure the tree will fall in the intended direction. When required, mechanical means shall be used to accomplish this objective.

(13) Cutters shall be careful their chopping range is unobstructed.

(14) Cutters shall confer with their supervisor regarding a safe manner of performing the work and in unusually hazardous situations shall not proceed with the work until their method has been approved by their supervisor.

(15) The person in charge of cutting crews shall regularly inspect the work of the cutting crews and shall be responsible for seeing the work is performed in a proper and safe manner.

(16) Common sense and good judgment must of necessity govern the safety of cutters as affected by weather conditions. At no time shall they work if wind is strong enough to prevent the falling of trees in the desired direction or when vision is impaired by dense fog or darkness.

(17) Cutters shall be assigned to work in locations where they are in contact with others or their welfare shall be checked on as provided for by WAC 296-54-507(2).

(18) Persons in charge of cutting crews shall account for all persons in their crews being on hand when work ceases as provided for by WAC 296-54-507(3).

(19) All fallers and buckers shall have a current first-aid card.

(20) All fallers and buckers shall carry or have with them in near proximity at all times, an axe, a minimum of two wedges, a whistle and a first-aid kit. The whistle shall be carried on their person.

(21) Special precautions shall be taken to prevent trees from falling into power lines. If it appears that a tree will hit a power line, the power company shall be notified before it is attempted to fall the tree. If an unsuspected tree does contact a power line, the power company shall be notified immediately and all persons shall remain clear of the area until the power company personnel advise that conditions have been made safe to resume operations.

(22) Wedges shall be of soft metal, hardwood or plastic.

(23) Wedges shall be driven with a hammer or other suitable tool. Double-bitted axes or pulaskies shall not be used for this purpose.

(24) While wedging, fallers shall watch for falling limbs or other material that might be jarred loose. Cutting of holding wood in lieu of using wedges is prohibited.

(25) Undercuts are required except in matchcutting, and shall be large enough to safely guide trees and eliminate the possibility of splitting. Trees with no perceptible lean having undercuts to a depth of one-fourth of the diameter of the tree with a face opening equal to one-fifth of the diameter of the tree, will be assumed to be within reasonable compliance with this rule. Swing cuts are prohibited except by an experienced person.

(26) Undercuts shall be completely removed except when a dutchman is required on either side of the cut.

(27) Backcuts shall be as level as possible and shall be approximately two inches higher than the undercut, except in tree pulling.

(28) Trees with face cuts or backcuts shall not be left standing. When a tree is not completely felled, the faller shall clearly mark the tree, shall discontinue work in the hazardous area and notify his immediate supervisor. The supervisor shall be responsible for notifying all workers who might be endangered and shall take appropriate measures to ensure that the tree is safely felled before other work is undertaken in the hazardous area.

(29) To avoid use of wedges, which might dislodge loose bark or other material, snags shall be felled in the direction of lean unless other means (mechanical or dynamite) are used.

(30) Lodged trees shall be clearly marked and identified by a predetermined method and all persons in the area shall be instructed not to pass or work within two tree lengths of such trees except to ground them.

(31) Work areas shall be assigned so that a tree cannot fall into an adjacent occupied work area. The distance between work areas shall be at least twice the height of the trees being felled. A greater distance may be required on downhill slopes depending on the degree of the slope and on the type of trees and other considerations.

(32) Where felled trees are likely to roll and endanger workers, cutting shall proceed from the bottom toward the top of the slope, and performed uphill from previously felled timber.

(33) Cutters shall not be placed on a hillside immediately below each other or below other operations where there is probable danger.

(34) Fallers shall be informed of the movement and location of buckers or other cutters placed, passing or approaching the vicinity of trees being felled.

(35) A flagperson(s) shall 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 shall be used.

(36) No tree or danger tree shall be felled by one cutter where and when the assistance of a fellow cutter is necessary to minimize the dangers or hazards involved.

(37) Cutters shall be in the clear as the tree falls.

(38) Undercuts and backcuts shall 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 to be in the clear from a falling tree.

(39) When falling, a positive means, method or procedure that will prevent accidental cutting of necessary

holding wood shall be established and followed. Particular care shall be taken to hold enough wood to guide the tree or snag and prevent it prematurely slipping or twisting from the stump.

(40) The undercut shall not be made while buckers or other workers are in an area into which the tree could fall.

(41) Matchcutting should not be permitted and shall be prohibited for trees larger than six inches in diameter breast high.

(42) The tree (and root wad if applicable) shall 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.

(43) Logs shall be completely bucked through whenever possible. If it becomes hazardous to complete a cut, then the log shall be marked and identified by a predetermined method. Rigging crews shall be instructed to recognize such marks and when possible, cutters shall warn the rigging crew of locations where such unfinished cuts remain.

(44) Cutters shall give timely warning to all persons within range of any log which may have a tendency to roll after being cut off.

(45) Propping of logs or trees as a means to protect workers downslope from the logs or trees, shall be prohibited.

(46) Logs shall not be jackstrawed when being bucked in piles or decks at a landing.

[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 296-54-531 Falling and bucking--Power saws and power equipment. (1) Operators shall inspect chain saws daily to ensure that handles and guards are in place, and controls and other moving parts are functional.

(2) Fuel outdoors. The chain saw shall be fueled outdoors at least fifty feet from persons smoking or from other potential sources of ignition.

(3) Chain saws shall not be operated unless equipped with a muffler.

(4) Idler end of power chain saw blade on all two-man machines shall be adequately guarded.

(5) Combustion-engine type power saws shall be equipped with a positive means of stopping the engine.

(6) Electric power saws shall be equipped with an automatic (deadman type) control switch. Saws with faulty switches shall not be used.

(7) Unless the carburetor is being adjusted, the saw shall be shut off before any adjustments or repairs are made to the saw, chain or bar.

(8) Combustion-engine type power saws shall be equipped with a clutch.

(9) The chain saw clutch shall be properly adjusted to prevent the chain from moving when the engine is at idle speed.

(10) Power chain saws with faulty clutches shall not be used.

(11) The bar shall be handled only when the power chain saw motor is shut off.

(12) Power chain saws shall have the drive end of the bar guarded.

(13) Combustion-engine driven power saws shall be equipped with an automatic throttle control (deadman type), which will return the engine to idle speed upon release of the throttle (idle speed is when the engine is running and the chain does not rotate on the bar).

(14) When falling of tree is completed, the power saw motor shall be at idle or shutoff. Where terrain or brush creates a hazardous condition, the power saw motor shall be shutoff while the operator is traveling to the next cut. The power saw motor shall also be shutoff while fueling.

(15) Saw pinching and subsequent chain saw kickback shall be prevented by using wedges, levers, guidelines, and saw placement, or by undercutting.

(16) Cutters shall not use the chain saw to cut directly overhead or at a distance that would require the operator to relinquish a safe grip on the saw.

(17) Reserve fuel shall be handled and stored in accordance with WAC 296-24-37009.

(18) Hand-held files shall be equipped with a handle.

(19) Only experienced cutters shall buck windfalls.

[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 296-54-533 Falling and bucking--Springboards and tree jacking. (1) Springboards shall be of clear, straight-grained sound stock of sufficient length, width and strength and shall be replaced when they will no longer safely support the expected load at the extreme end.

(2) Springboard irons shall be well lipped and firmly attached with bolts or a means of attachment furnishing equivalent strength.

(3) Two workers shall be present when falling any tree or snag when springboards are used.

(4) Power saw chains shall be stopped while shifting springboards.

(5) Jack plates shall be used with hydraulic tree jacks and the base plate shall be seated on solid wood inside the bark ring as close to level as possible.

(6) Two workers shall be present at all times during the use of tree jacks.

(7) Wedges shall be used as a follow-up method while using tree jacks. The wedges shall be continuously moved in as the tree is jacked.

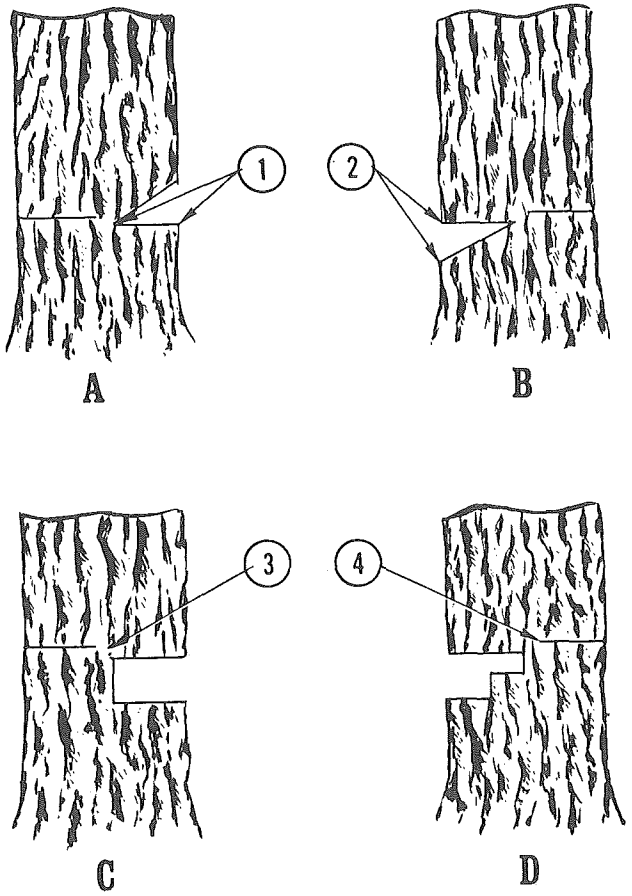
(8) Effective January 1, 1980, all hydraulic tree jacks shall be equipped with an operable velocity fuse (check valve) and the pump shall be equipped with an operable pressure gauge.

(9) When tree jacking, the facecut shall be nominally one-fourth the diameter of the tree.

(10) The vertical height of the facecut shall be not less than one-fifth of the diameter of the tree when tree jacking.

Note: See Figure No. 1, for illustrations of undercuts.

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) **Both cuts made with the saw.** 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 chipped 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 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-533, filed 9/21/79.]

WAC 296-54-535 Tree pulling. (1) The cutter shall 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 shall be conventionally felled.

(2) When using radio positive radio communications shall be maintained at all times between the tree pulling machine and cutter when tree pulling. An audible signal shall be blown when the initial pull is made on the tree and the line is tightened. Hand signals, in lieu 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, choker bell, or a line and sleeve shackle shall be used as the means of attachment around the tree when tree pulling. The bight on the line shall be only that necessary to hold the choker or line around the tree.

(4) The tree pulling machine shall be equipped with a torque converter, fluid coupler, or an equivalent device to insure a steady even pull on the line attached around the tree.

(5) The tree pulling line shall have as straight and direct path from the machine to the tree as possible. Physical obstructions which prevent a steady even pull on the tree pulling line shall be removed or the line shall be rerouted.

(6) Siwashing, in lieu of a block, in order to change tree pulling lead, is prohibited.

[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 296-54-537 Mechanized falling. (1) When using selfpropelled mobile falling devices, a watchman and/or warning signs shall be posted at appropriate locations indicating that devices of this type are being used to fall trees.

(2) Self-propelled mobile falling equipment used for falling trees shall be designed in a manner or shall have auxiliary equipment installed which will cause the tree to fall in the intended direction.

(3) Mechanized falling shall be conducted in such a manner as not to endanger persons or equipment.

(4) Where a mechanized feller incorporates a cab structure having a single entrance door, it shall be equipped with an alternate means of escape from the cab should the door be blocked in the event of vehicle rollover or fire. Cab doors shall be fitted with latches operable from both sides of the door.

[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 Climbing equipment and passline. (1) Standard climbing equipment shall be furnished by the employer; however, this shall not be construed to mean that the climber may not use his own equipment, provided it meets the following standards and is permitted by the employer. The climbing ropes shall be of steelcore type. The climber may fasten his rope by passing it through "D" rings fastened to the belt and around his body before tying it to itself. When topping standing trees, it is recommended that a steel chain of 3/16-inch or larger, with appropriate fittings attached, shall be

used in addition to the climbing rope. All climbing equipment shall be maintained in good condition. An extra set of climbing equipment shall be kept at the climbing operation and another person with climbing experience shall be present.

(2) A person shall ride only the passline to thread lines, oil blocks or to inspect rigging.

(3) No one shall work directly under a tree except when directed by the climber. Warning shall be given prior to intentionally dropping any objects or when objects are accidentally dropped.

(4) Running lines shall not be moved while the climber is working in the tree, except such "pulls" as he directs and are necessary for his work.

(5) One experienced person shall be dispatched to transmit the climber's signals to the machine operator and shall not otherwise be occupied during the time the climber is in the tree, nor shall the machine operator be otherwise occupied while the climber is using the passline. The designated signalman shall position himself clear of hazards from falling, flying or thrown objects.

(6) Long or short splices and knots in passline are not permitted. Chains used in passlines shall be in good condition and shall not contain cold shuts or wire strands.

(7) The climber shall be an experienced logger with proper knowledge of logging methods and the safety of rigging spar and tail trees.

(8) Trees shall not be topped during windy weather.

(9) At no time shall topping, rigging-up, or stripping work be done when visibility is impaired.

(10) When the friction lever and passline drum is on the opposite side of the machine from the operator, an experienced person shall operate the friction lever while the engineer operates the throttle. While being used, the passline drum shall be properly attended by another person to guide the passline onto the passline drum with a tool suitable for the purpose.

(11) The use of a gypsy drum for handling persons in the tree is prohibited.

(12) Danger trees leaning towards and within reach of landings, roads, rigging or work areas shall either be felled before the regular operations begin or work shall be arranged so that workers will not be exposed to hazards involved.

(13) Noisy equipment such as power saws, tractors and shovels shall not be operated around the area where a climber is working when such noise will interfere with the climber's signals.

(14) Climbing and passline equipment shall not be used for other purposes.

(15) Defective climbing equipment shall be immediately removed from service.

(16) The climber shall be equipped with a climbing equipment assembly having a breaking strength of not less than five thousand four hundred pounds.
The equipment shall include:

(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.

(17) When the climber is using a chain saw in the tree, the climbing rope shall be made of material that cannot be severed by the saw.

(18) Lineman hooks shall not be used as spurs.

(19) When power saws are used in topping or limbing standing trees, the weight of the saw shall not exceed thirty pounds.

(20) Tools used by the climber, except the power saw, shall be safely secured to his belt when not in use.

(21) Snaps shall not be used on a climber's rope unless a secondary safety device between the belt and snap is used.

(22) A climber's rope shall encircle the tree before the climber leaves the ground except when the climber is riding the passline.

(23) While the climber is working in the tree, persons shall keep at sufficient distance from the tree to be clear of falling objects.

(24) When used, passline fair-leads shall be kept in alignment and free from fouling at all times.

(25) Spikes, used by the climber as a temporary aid in hanging rigging, shall be removed before the tree is used for logging.

(26) Loose equipment, rigging or material shall either be removed from the tree or securely fastened.

(27) All spar trees shall be equipped with passlines that shall:

(a) Be not less than 5/16-inch and not be over 1/2-inch in diameter;

(b) Not be subjected to any sawing on other lines or rigging, and kept clear of all moving lines and rigging;

(c) Be of one continuous length and in good condition with no splices, knots, molles, or eye-to-eye splices between the ends;

(d) Be long enough to provide three wraps on the drum before the climber leaves the ground.

(28) Drums used for passlines shall have sufficient flange depth to prevent the passline from running off the drum at any time.

(29) Passline chains shall:

(a) Be not less than 5/16-inch alloy or 3/8-inch high test chain and shall not contain cold shuts or wire strands;

(b) Be attached to the end of the passline with a screw-pin shackle, a slip-pin shackle with a nut and molle, or a ring large enough to prevent going through the pass block; and

(c) Be fitted with links or rings to prevent workers from being pulled into the passline block.

(30) Pass blocks shall:

(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 be of the type which positively secures the nut and pin;

(d) Equipped with sheaves not less than six inches in diameter; and

(e) Comply with applicable portions of WAC 296-54-543(6) pertaining to blocks.

(31) When workers are required to go up vertical metal spars, passlines, chains and blocks shall be provided and used.

[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 296-54-541 Selection of spar, tail and intermediate trees. (1) Douglas fir or spruce shall be used as spar, tail, or intermediate support trees when they are available. If other species must be used, additional guylines, tree plates, or other precautions shall be taken to insure the tree will withstand the strains to be imposed.

(2) Spar, tail and intermediate support trees shall be examined carefully for defects before being selected. They shall be sound, straight, green and of sufficient diameter to withstand the strains to be imposed.

(3) Trees having defects that impair their strength shall not be used for spar, tail or intermediate support trees. Raised trees shall be identified and marked as such.

(4) Before raising spar trees, dummy trees shall be topped and guyed with three guylines equivalent in breaking strength to the mainline.

[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 General requirements. (1) Rigging.

(a) Rigging shall be arranged and operated so rigging or loads will not foul, or saw against lines, straps, blocks or other equipment.

(b) A thorough inspection of all blocks, straps, guylines and other rigging shall be made before they are placed in positions for use. Inspections shall include an examination for damaged, cracked or worn parts, loose nuts and bolts, and of lubrication, and the condition of straps and guylines. All necessary repairs or replacements for safe operation shall be made before the rigging is used.

(c) Rigging equipment, when not in use, shall be stored so as to not present a hazard to employees.

(d) Running lines shall be arranged so workers will not be required to work in the bight. When this is not possible, workers shall move out of the bight of lines before the lines are tightened or moved.

(2) Shackles.

(a) Shackles with screw pins should have either a molle or cotter key when used to fasten guylines to spar trees.

(b) All shackles used to hang blocks, jacks, or rigging on trees or loading booms shall have the pins fastened by a nut secured with a cotter pin or molle. When used, molles shall be as large as the pin hole will accommodate and with the loose ends rolled in.

(c) The size of the opening between the jaws of shackles used to hang blocks, jacks, rigging, and for joining or attaching lines, shall not be more than one inch greater than the size of the rope, swivel, shackle, or similar device to which it is attached.

(d) All shackles used for mainline or skyline extensions shall be of a type designed for that purpose.

(e) Shackles used other than for mainline extension connections, shall be of the screw-pin type or with the pin secured by a nut and cotter pin or molle, except as specified elsewhere for specific purposes.

(f) Shackles, swivels, links and tree plates shall be replaced or repaired when they will not safely support the imposed strains of their intended use.

(g) Shackles shall not be loaded in excess of the working load recommended by the manufacturer.

(h) All shackles must be made of forged steel or material of equivalent strength and one size larger than the line it connects.

(3) Straps.

(a) Safety straps of appropriate size shall be placed on all high lead blocks; also other blocks whenever practicable. Safety straps shall be shackled, with closed end of shackle up, to a guyline which extends as near as possible at right angles with power unit, but shall not be placed on a guyline having 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, safety strap must be attached to another guyline or loosened guyline tightened after change.

(b) All tree straps shall be at least 1/4-inch larger than the pulling line. If impossible to use safety strap, all tree straps shall be 1/2-inch larger than the pulling line.

(c) All straps in back of show must be as large as the running line.

(d) All blocks other than passline and straw line lead blocks shall be hung in both eyes or "D's" of straps. Threading eye through eye is prohibited.

(e) Skyline jack shall not be hung by double strap through shackle and hanging jack in two eyes.

(f) Tree straps shall initially be made of new wire rope when made up. They shall be replaced when there is evidence of damage or broken wires.

(g) A guyline safety strap or equivalent device shall be installed at the top of metal spars to prevent guylines from falling more than five feet in case of structural or mechanical failure of the guyline attachment.

(h) Metal spar guyline safety straps or equivalent devices shall be equal to the strength of the guyline.

(i) Nylon straps may be used in accordance with manufacturer recommendations.

(j) Nylon straps shall be removed from service when the wear reaches the limits prescribed by the manufacturer. The person responsible for inspecting the condition of rigging shall be aware of these limits.

(4) Guylines.

(a) All component parts of the guyline system on head tree shall be of equal or greater strength than the mainline and guylines shall be properly spaced to effectively oppose the pull of the mainline.

(b) Guylines on wood spar trees shall be secured to solid stumps with not less than two and one-half complete wraps with at least six staples or eight railroad spikes driven solidly into sound wood on the first and last wrap. The bark shall be removed and the stump adequately notched or other equivalent means shall be used

to prevent movement of the line on the stump or tree. Guyline stumps shall be inspected periodically. Guylines may be secured to properly installed "deadmen" when suitable stumps are not available. It is permissible, on the tail tree, to secure the guylines by placing three wraps around a tree or stump and securing them properly by use of clamps.

(c) When a mainline of 7/8–inch or less is used, the spar shall be supported by at least five top guylines or other positive means of supporting the spar.

(d) When tail hold on skyline is choked on stump, there shall be no excessive bight against shackle.

(e) In removing guylines and skylines from stumps, etc.:

(i) A reversed safety wrap shall be put on and secured before loosening the last wrap.

(ii) An experienced person shall be in charge loosening guylines or skylines using proper precautions, and giving warning before lines are released.

(iii) Safety holdbacks shall be used when necessary for the safety of workers.

(iv) Powder or power shall be used for releasing the last wrap on skylines.

(f) Guylines shall be used with any logging equipment when required by the equipment manufacturer.

(g) Guying shall not be less than the minimum recommended by the equipment manufacturer.

(h) Top guys on vertical metal and wooden spars which require five or more guylines shall be so arranged that at least three guys oppose the pull of the load, with at least one guyline anchored adjacent to the yarding quarter.

(i) Guylines shall be of plow steel or better material, and shall be maintained in good condition.

(j) When side blocking or lateral yarding, lateral stability to the head spar tree shall be insured by guylines sufficient in number, breaking strength and spacing.

(k) All guylines shall be kept well tightened while the spar, tree, equipment or rigging they support is in use.

(l) All trees that interfere with proper alignment, placement or tightening of guylines shall be felled.

(m) Guylines shall be hung in a manner to prevent a bight or fouling when they are tightened.

(n) All spliced guyline eyes shall be tucked at least three times.

(o) Extensions to guylines shall be:

(i) Equal in strength to the guyline to which they are attached; and

(ii) Connected only by a shackle connecting two spliced eyes or by double–end hooks. Connections shall have at least one and one–half times the strength of the guyline.

(p) Portable metal spars and their appurtenances shall be inspected by a qualified person each time the spar is lowered and at any time its safe condition is in doubt. When damage from over–stress is noted or suspected, the part in question shall be inspected by a suitable method and found to be safe, or the part repaired or replaced before the spar is again used.

(q) No person shall go up a raised metal spar unless suitable passline equipment is provided and used.

(r) Repairs, modifications or additions which affect the capacity or safe operation of metal spars shall be made only under the direction of a registered engineer and within the manufacturer's recommendations.

(i) In no case shall the original safety factor of the equipment be reduced.

(ii) If such modifications or additions are made, the identification plate required by WAC 296–54–553(1) shall reflect such changes.

(s) When using skylines 7/8–inch or smaller, tail trees shall be supported by at least two guylines when the rigging is placed on the tail tree at a height greater than five times the tree diameter (dbh) or higher than ten feet from the highest ground point, whichever is lower.

(t) When using skylines one inch or larger, tail trees shall be supported by at least four guylines when the rigging is placed on the tail tree at a height greater than five times the tree diameter (dbh) or higher than ten feet from the highest ground point whichever is lower.

(u) Tail trees shall be supported by additional guylines if necessary to insure stability of the tree.

(v) Wood head spar trees shall be guyed as follows:

(i) All spar trees one hundred ten feet and over in height shall be provided with a minimum of six top guys and three buckle guys, each of which shall be substantially equal in strength to the strength of the mainline. This requirement, however, shall not be construed as applying where more than three buckle guys are specifically required.

(ii) Spar trees used for loading and yarding at the same time, or for loading and swinging at the same time, or supporting a skyline yarding system, shall have not less than six top and four buckle guylines each of which shall be substantially equal in strength to the strength of the mainline.

(iii) Spar trees under one hundred ten feet high used only for yarding with heavy equipment (over 7/8–inch mainline) shall have not less than six top guys each of which shall be substantially equal in strength to the strength of the mainline.

(iv) Spar trees used for yarding with light equipment (7/8–inch or smaller mainline) shall be guyed in such a manner that strains will be imposed on not less than two guylines. If less than five top guys are used, guylines shall be at least 1/4–inch larger than the mainline.

(v) More guylines shall be added if there is any doubt as to the stability of any spar tree, raised tree, tail trees and lift trees, or other equipment or rigging they support.

(w) Guylines shall alternately be passed around the wood spar in opposite directions to prevent twisting of the spar.

(x) Guylines shall be attached to the upper portion of the wood spar by means of shackles.

(y) A–frames shall be guyed by at least two quarter–guylines and one snap guyline or equivalent means to prevent A–frame from tipping back.

(5) Anchoring.

(a) Stump anchors used for fastening guylines and skylines shall be carefully chosen as to position, height

and strength. When necessary, stump anchors shall be tied back in a manner that will distribute the load.

(b) Stump anchors shall be barked where attachments are to be made, or devices designed to accomplish the same purpose shall be used.

(c) Stump anchors shall be notched to a depth not greater than one and one-half times the diameter of the line to be attached.

(d) Deadman anchors may be used if properly installed. Guylines shall not be directly attached to deadman anchors. Suitable straps or equally effective means shall be used for this purpose.

(e) Rock bolts and other types of imbedded anchors may be used if properly designed and installed.

(f) Stumps, trees and imbedded type guyline anchors shall be regularly inspected while the operation is in progress. Insecure or hazardous anchors shall be immediately corrected.

(g) Workers shall not stand close to the stump, or in the bight of lines as the guyline or wraps are being tightened.

(6) Blocks.

(a) All blocks shall:

(i) Not be used for heavier strains or lines than those for which they are constructed;

(ii) Be fitted with line guards and shall be designed and used in a manner that prevents fouling, with the exception of special line blocks not designed with line guards;

(iii) Be kept in proper alignment when in use;

(iv) Have bearing and yoke pins of a material that will safely withstand the strains imposed and shall be securely fastened;

(v) Have sheaves of a size designed for the size of the wire rope used.

(b) Blocks with cracked or excessively worn sheaves shall not be used.

(c) Lead blocks used for yarding, swinging, loading and unloading used in wood spars shall:

(i) Be of the type and construction designed for this purpose;

(ii) 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

(iii) Mainline blocks shall have a sheave diameter of not less than twenty times the diameter of the mainline.

(d) Block bearing shall be kept well lubricated.

(e) All blocks must be of steel construction or of material of equal or greater strength and so hung that they will not strike or interfere with other blocks or rigging.

(f) All pins in blocks shall be properly secured by "Molle Hogans" or keys of the largest size the pin hole will accommodate. When blocks are hung in trees, threaded pins and nuts shall be used.

(g) Sufficient corner or tail blocks to distribute the stress on anchors and attachments shall be used on all logging systems.

(h) Blocks used to lead lines directly to yarding, loading or unloading machines other than passline or strawline blocks shall be hung by the following method: In both eyes or "D"s of straps; threading eye through eye is prohibited.

(i) Tail, side or corner blocks used in yarding shall be hung in both eyes of straps.

(7) Wire rope.

(a) Wire rope shall be of the same or better grade as originally recommended by the equipment manufacturer.

(b) Wire rope shall be removed from service when any of the following conditions exist:

(i) In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay;

(ii) Wear of one-third the original diameter of outside individual wires. Kinking, crushing, bird-caging, or any other damage resulting in distortion of the rope structure;

(iii) Evidence of any heat damage from any cause;

(iv) 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;

(v) 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;

(vi) In standing ropes, when twelve and one-half percent of the wires are broken within a distance of one wrap (lay); and

(vii) Corroded, damaged or improperly applied end connections.

(c) Wire rope shall be kept lubricated as conditions of use require.

(8) Splicing wire rope.

(a) Marlin spikes or needles in good condition and large enough for the size of the line being spliced, shall be used for splicing.

(b) When available, and practical to use, a patented wire cutter shall be used. If using a wire axe to cut cable, the hammer used to strike the axe shall be made of soft nonspalling type material. Eye and face protection shall be worn in accordance with WAC 296-54-511(2).

(c) Short splices, eye to eye splices, cat's paws, knots, molles and rolled eyes are prohibited except for use in the moving of slack lines. Knots will be permitted for use on single drum tractors and grapple pick-up lines when properly tied.

(d) Wire rope 1/2-inch or less in diameter may be tucked two times provided the rope is used only as straw line.

(e) Splices other than eye splices in lang lay lines are prohibited. Eye splices in lang lay lines shall be tucked at least four times.

(f) Long splices shall be used for permanently joining "regular lay" running lines.

(g) When U-bolt wire rope clips (clamps) are used to form eyes on high strength wire rope, an additional clip (clamp) for each grade of line above improved plow steel shall be used over and above the following table: (See Figure No. 2, following this section, for proper application of wire rope clips.)

Improved Plow Steel Diameter of Rope	Number of Clips Required Drop Forged	Other Material	Minimum Space Between Clips
3/8 to 5/8 inch	3	4	3–3/4 inches
3/4 inch	4	5	4–1/2 inches
7/8 inch	4	5	5–1/4 inches
1 inch	5	6	6 inches
1–1/8 inch	6	6	6–3/4 inches
1–1/4 inch	6	7	7–1/2 inches
1–3/8 inch	7	7	8–1/4 inches
1–1/2 inch	7	8	9 inches

(h) All line eye splices shall be tucked at least three full tucks. D's and knobs are recommended for line ends.

(i) Two lines may be connected by a long splice, or by shackles or patent links of the next size larger than the line being used where practical. Double "Molle Hogans" may be used on drop lines only and single "Molle Hogans" may be used on strawline.

(j) Splicing of two lines together for loading line or pass line is prohibited.

(k) Safe margin of line must be used for making long splices. The following table shows comparative safe lengths as to size of cable in making long splices:

Rope Diameter	To Be Unravelled	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'

(9) Miscellaneous requirements.

(a) All lines, straps, blocks, shackles, swivels, etc., shall be inspected frequently and shall be used only when found to be in good condition. Such items shall be of sufficient size and strength as to safely withstand the stress which can be imposed by the maximum pull of the power unit against such equipment or devices as rigged or used in that particular logging operation.

(b) When used or second-hand cables are purchased, they shall not be used for any purpose until inspection determines they will withstand the maximum imposed strain.

(c) Skyline shall be anchored by placing three full wraps around tail hold and staples or spikes shall be used to securely hold each wrap or choked and secured with a shackle or three wraps and at least three clamps securely tightened.

(d) When using haulback lines greater than 7/8-inch diameter on interlocking drum-type yarders, additional precautions shall be taken to prevent the corner blocks or tail blocks from dislodging the anchors to which the blocks are secured.

(e) Where "dutchman" is used, either for yarding or on skyline, a block of heavy construction must be used. Regular tree shoe or jack may be used for "dutchman" on skyline. Cable must be fastened securely.

(f) Choker drops shall be connected to the butt rigging by knobs or shackles. The use of molles or cold shuts is prohibited in all components of the butt rigging. All butt rigging shall be designed to prevent loss of chokers and defective swivels shall not be used. Open hooks shall not be used to connect lines to the buttrigging.

(g) When heel tackle is fastened near machine, safety line must be placed in such manner that in case of breakage, lines shall not strike power unit and endanger operator.

(h) Only in case of necessity shall any metallic object be driven into a log. The metal must be removed immediately when splice or other work is completed. Stumps shall be used whenever possible for splicing.

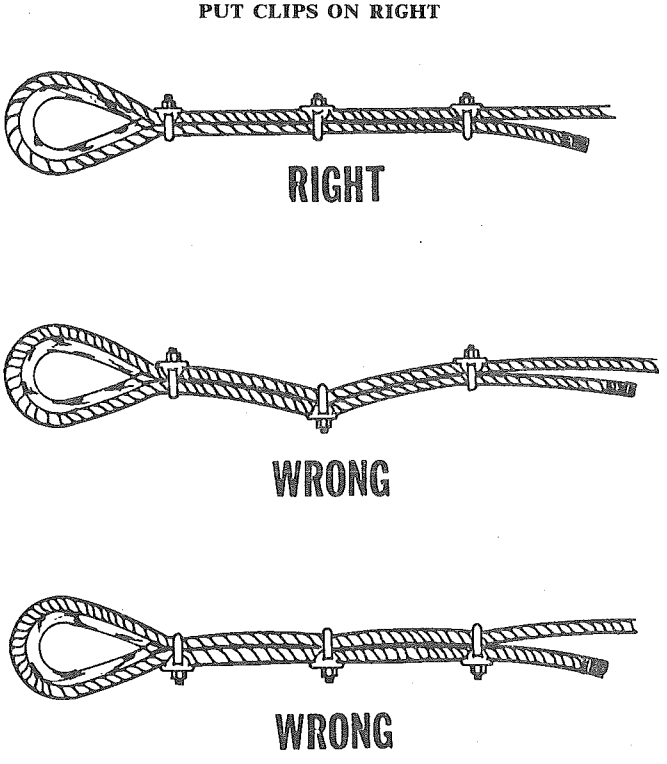


Figure No. 2

Clips should be spaced at least six rope diameters apart to get the maximum holding power and should always be attached with the base or saddle of the clip against the longer or "live" end of the rope. The "U" bolt goes over the dead end. This is the only right way. Do not reverse the clips or stagger them. Otherwise the "U" bolt will cut into the live rope when the load is applied. After the rope has been used and is under tension, the clips should again be tightened to take up any looseness caused by the tension reducing

the rope diameter. Remember that even when properly applied, a clip fastening has only about eighty percent of the strength of the rope and far less than that when on wrong.

[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 Rigging--Wood spar trees. (1) Wood spar trees shall be of sound material of sufficient size and strength to withstand any stresses which may be imposed by any equipment used for that specific operation. The top of the tree shall extend not more than sixteen feet above the top guylines on spar trees over fifty feet in height. Spar trees less than fifty feet in height shall extend no more than eight feet above the top guylines. School marms used as spar trees shall be topped at the forks. Spar trees, except cedar, must be barked where guylines, straps, bull blocks and tree plates are placed.

(2) Spar trees must be topped and limbs must be cut off close so that running lines will not foul or saw on protruding knots.

(3) At least four tree plates shall be placed under top guylines on spar trees over fifty feet in height and at least three tree plates shall be used on spar trees less than fifty feet in height.

(4) Tree plates shall be equipped with lugs or other suitable means of holding them in place.

(5) When spar trees are raised, stumps used for snubbing shall be properly notched. Guylines shall be held by some mechanical means. Snubbing by hand is prohibited.

(6) All rub trees shall be limbed and topped.

(7) Guylines.

(a) Wood spar trees using a line greater than 7/8-inch and used as loading and yarding trees shall have at least six top guys and four buckle guys, providing a sail guy is used.

(b) Wood spar trees using a mainline greater than 7/8-inch and used only as yarding trees shall have at least six top guys and, at least three buckle guys shall be used.

(c) Wood spar trees used for loading only with crotch line, spreader bar or swinging boom shall have at least four top guys and, at least three buckle guys shall be used.

(d) Wood spar trees used for any skyline system of logging shall have additional guylines as are necessary to assure rigidity of tree at skyline jack, skidding block, receding and transfer line blocks, and loading rigging.

(e) Wood spar trees used for transfer shall have at least five top guys and, at least three buckle guys shall be used.

(f) When high lead block is hung below buckle guys, at least three top guys of equal strength to the mainline shall be used to keep the top from swaying.

(g) When buckle guys are required, they shall be installed on the tree where they will provide the maximum effectiveness.

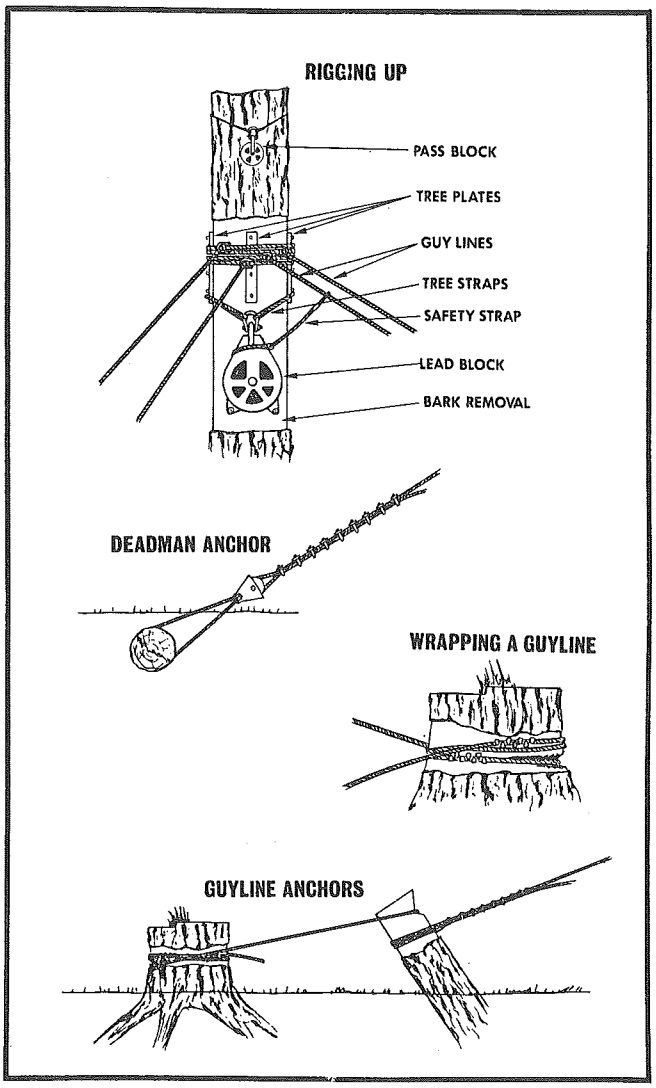
(8) Loose material such as bark, spikes, straps or chains not in use and slabs caused by bumping logs of chafing straps must be removed from the spar tree. Heavy bark shall be removed from trees used for a permanent installation.

[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--Tail tree. (1) No work shall continue on tail tree while the climber is working on the head tree or vice versa, if trees are connected by any line.

(2) Tail trees shall be adequately guyed to withstand any stress to which the tree may be subjected. Live (slackline) or standing skylines may be anchored to the base of standing trees only if no part of the tree will enter the work area (cutting unit) if pulled over. The guyline shall be anchored as low as possible to the base of the tree. If using a live (slackline) standing or running (Grabinski) skyline, the tail tree need not be topped provided the slackline or skyline passes through a jack or block on the tree before being anchored. At least two guylines shall be installed to support the tail tree and may be anchored to the base of standing trees if the above conditions are complied with. Attaching the end of the skyline or slackline to the base of the tail tree is prohibited.

Note: See Figure No. 3 for rigging illustrations.



[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 296-54-549 Lines, straps and guyline attachments--Steel spars. (1) When in use, steel tower guyline safety straps shall have a minimum amount of slack.

(2) A safety strap shall be installed on steel towers at the bight of the guylines to prevent the guylines from falling in the case of failure of guyline attachments, guyline lug rings or collar plates, where such exist. Such devices shall have a breaking strength at least equivalent to that of the guylines.

(3) The use of cable clips or clamps for joining the ends of steel tower guylines safety straps is prohibited, unless used to secure end of rolled eye.

[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 Yarding, loading and skidding machines--General requirements. (1) Yarding, loading and skidding machines shall be operated only by experienced authorized personnel, except that inexperienced personnel may operate machines in accordance with WAC 296-54-515(2).

(2) Overhead protection and other barriers shall be installed to protect the operator from lines, limbs and other moving materials on or over all yarding, loading or skidding machines. Construction shall be so the view of the operator is not impaired. Barriers shall consist of metal screen constructed of 1/4-inch diameter woven wire material with maximum two inch openings or 3/4-inch diameter steel rod with eight inch maximum openings. Such barriers shall be installed no closer than four inches to the glass.

(3) When using a yarder, loader or skidding machine, the location of the machine or position of the yarder shall be such that the operator will not be endangered by incoming logs or debris.

(4) Logging machines and their components shall be securely anchored to their bases.

(5) A safe and adequate means of access and egress to all parts of logging machinery where persons must go shall be provided and maintained in a safe condition.

(6) Any logging equipment having a single cab entrance door, shall be equipped with an alternate means of escape from the cab should the door be blocked in the event of vehicle rollover or fire. Door latches shall be operable from both sides.

(7) Logging machines shall be kept free of flammable waste materials and any materials which might contribute to slipping, tripping or falling.

(8) Logging machine engines shall be stopped during inspection or repairing, except where operation is required for adjustment.

(9) Grab rails shall be provided and maintained in good repair on all walkways of stationary units elevated more than four feet. Walkway surfaces on such units shall be of the slip-proof type.

(10) Standard safeguards shall be provided at every place on a machine where persons may be exposed to contact with revolving parts or pinchpoints during normal operations.

(11) To protect workers from exposure to the hazardous pinchpoint area between the rotating superstructure and the nonrotating undercarriage of any logging machine, signs shall be conspicuously posted on all sides of that type machine warning workers: "DANGER - STAY CLEAR."

(12) Items of personal property, tools or other miscellaneous materials shall not be stored on or near any logging machine if retrieval of such items would expose a worker to the hazardous pinchpoint referred to in subsection (11) of this section.

(13) Workers shall approach the hazardous pinchpoint area referenced in subsection (11) of this section, only after informing the operator of their intent and receiving acknowledgment from the operator that he understands their intention. All such machines shall be stopped while any worker is in the hazardous pinchpoint area.

(14) A minimum distance of thirty–six inch clearance shall be maintained between the counterweight of a loading machine and trees, logs, banks, trucks, etc., while the machine is in operation. If this clearance cannot be maintained, suitable barricades with warning signs attached, similar to a standard guardrail, shall be installed to isolate the hazardous area. "DANGER—36 inch clearance" shall be marked in contrasting colors on sides and face of counterweight on shovels, loaders and other swing–type logging equipment. This requirement shall not apply when:

(a) The distance from the highest point of the undercarriage to the lowest point of the rotating superstructure is greater than 18–inches. This applies only to that portion of the rotating superstructure that swings directly over the undercarriage;

(b) The distance from the ground to the lowest point of the rotating superstructure is greater than five feet six inches. This applies only to that portion of the rotating superstructure that swings directly over the undercarriage; or

(c) On crawler–type track–mounted logging machines only, the rotating superstructure is positioned at a right angle to the tracks, and the distance from the side of the cab to the extreme end of the track is four feet or less. This exemption shall apply to side barricades only; barricades between the tracks at both ends of any crawler–type logging machine are required regardless of the right angle dimension.

(15) Logging machines shall not be operated until all guards have been installed, safety devices activated and maintenance equipment removed.

(16) Stationary logging machines shall be securely anchored to prevent movement of the machine while yarding or skidding.

(17) Ends of drum lines shall be securely fastened to the drum and at least three wraps shall be maintained on the drum at all times. (This rule does not apply to tractor winch lines.)

(18) Such units shall not be tied to any part of the towing unit, when they are being moved on truck and trailer units.

(19) Logs shall not be moved, swung or held over any persons.

(20) Brow logs in the loading or unloading area shall be blocked or secured to prevent movement. Log decks shall be maintained in a safe condition and shall not present a hazard of logs rolling or sliding on workers.

(21) Brakes shall be set and brake locking devices engaged on logging machines when the operator leaves his normal operating position.

(22) Guyline drum controls and outrigger controls shall be separated, color coded or marked in a manner that will prevent engaging of the wrong control.

(23) Exhaust pipes shall be located or insulated to protect workers from accidental contact with the pipes or muffler and shall direct exhaust gases away from the operator and other persons.

(24) Glass on logging machines shall be safety glass or equivalent and shall be free of deposits of oil, mud, or defects that could endanger the operator or other persons.

(25) Broken or defective glass shall be removed and replaced.

(26) Where safety glass or equivalent, does not provide adequate operator protection from flying chokers, chunks, saplings, limbs, etc., an additional metal screen and/or barrier shall be provided over the safety glass. The operator's vision shall not be impaired. Barriers shall consist of 1/4–inch diameter woven wire material with maximum two inch openings, 3/4–inch diameter steel rod with eight inch maximum openings in any direction or barriers so designed and constructed to provide equivalent operator protection. Such barriers shall be installed no closer than four inches to the glass to enable keeping the glass clean.

(27) Except for hydraulic drums, brakes shall be installed on all logging machines and maintained in effective working condition. Brake levers shall be provided with a ratchet or other effective means for securely holding drums. Brakes shall be tested prior to putting the machine in operation. If defective, they shall be repaired immediately.

(28) A stable base shall be provided under outriggers or leveling pads and a means shall be provided to hold outriggers in both the retracted and extended position.

(29) Abrasive contact with hydraulic hose, tubing or fittings shall be eliminated before further use and defective hydraulic hoses, lines and fittings shall be replaced.

(30) When moving logging machines, the driver or operator shall have a clear and unobstructed view of the direction of travel. When this is not possible, a signalperson with a clear and unobstructed view of the direction of travel shall be designated and used to direct movement of the machine.

(31) Where a signalperson is used, the equipment operator shall move the equipment only on signal from the designated signalperson and only when the signal is distinct and clearly understood.

(32) When moving power units, persons other than the operator and the person in charge shall not be permitted to ride thereon.

(33) All obstructions which may reach the operator while moving machines, shall be removed.

(34) Only shackles with threaded pins shall be used for connecting moving rigging.

(35) Anchors used for moving power units shall be carefully chosen and must be stable.

(36) When snubbing a machine down a steep slope, use the mainline for snubbing and pull with the haulback whenever possible.

(37) Self–powered mobile logging machines of the type where towers or spars can be raised, shall not travel on steep road grades unless they are securely snubbed or towed.

(38) When moving, all persons working on the landing shall stay in the clear of the machine and shall inform the operator of their intention to approach or be near the machine.

(39) Service brakes shall be provided on crawler crane–type logging machines that will bring the machine to a complete stop from normal travel speeds.

(40) A traction lock or brake or an equivalent locking and braking system shall be provided on crawler crane–type machines that is capable of holding the machine stationary under normal working conditions, and on any grade the machine is capable of negotiating.

(41) No modifications or additions which affect the capacity or safe operation of the equipment shall be made by the employer without written approval of the manufacturer or a qualified engineer. If such modifications or changes are made, the capacity, operation and maintenance instruction plates, tags, or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

(42) Equipment shall 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 (42) of this section, the size of the rigging shall be increased accordingly so that it will safely withstand the increased strains.

(43) Every tractor, skidder, front–end loader, scraper, grader and dozer shall be equipped with a roll–over protective structure (R.O.P.S.). Such structures shall be installed, tested and maintained in accordance with:

(a) WAC 296–155–950 through 296–155–965 of the safety standards for construction, if manufactured prior to the effective date of this chapter.

(b) The society of automotive engineers SAE 1040a–1975, "performance criteria for roll–over protective structures (ROPS) for earthmoving, construction, logging and industrial vehicles," if manufactured after the effective date of this chapter.

(44) The ROPS shall be of sufficient height and width so that it will not impair the movements of the operator or prevent his immediate escape from the vehicle in emergencies and shall allow as much visibility as possible. Clearance above the deck and the ROPS of the vehicle at points of egress shall not be less than fifty–two inches.

(45) Certified roll–over protective systems shall 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 shall 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.

(46) Roll–over protective structure systems shall be maintained in a manner that will preserve their original strength. Welding shall be performed by qualified welders only. (A qualified welder is defined under "welder qualification" in American Welding Society A.W.S. A3.0–69.)

(47) Every tractor, skidder, front–end loader, log stacker, forklift truck, scraper, grader and dozer shall be equipped with a FOPS. Such structures shall be installed, tested and maintained in accordance with the society of automotive engineers SAE J231–1971, "minimum performance criteria for falling object protective structures (F.O.P.S.)."

(48) Vehicles equipped with ROPS or FOPS as required in subsections (43) and (47) of this section, shall 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."

(49) The opening in the rear of the ROPS on the crawler or rubber–tired tractors (skidders) shall 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. The covering shall be affixed to the structural members so that ample clearance is provided between the screen and the back of the operator. Structural members shall be free from projections which would tend to puncture or tear flesh or clothing. Suitable safeguards or barricades shall 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.

(50) Crawler and rubber–tired tractors (skidders) working in areas where limbs or brush may endanger the operator shall be guarded. Shear or deflector guards shall 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. Open mesh material with openings of a size that will reject the entrance of an object larger than 1–3/4–inches in diameter, shall 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. Deflectors shall also be installed ahead of the operator to deflect whipping saplings and branches. These shall be located so as not to impede ingress or egress from the compartment area. The floor and lower portion of the cab shall 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.

(51) Enclosures for agricultural and industrial tractors manufactured after September 1, 1972, shall be constructed, designed and installed as detailed in the society of automotive engineers technical report J168.

(52) (a) All bidirectional machines, such as rollers, compactors, front–end loaders, log stackers, log loaders, bulldozers, shovels, and similar equipment, 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 an operative condition.

(b) No employer shall permit earthmoving, compacting, or yarding equipment, which has an obstructed view to the rear, to be used in reverse gear unless the equipment has in operation a reverse signal alarm distinguishable from the surrounding noise level or an employee signals that it is safe to do so.

[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 Yarding, loading and skidding machines--Mobile towers and boom-type yarding and loading machines. (1) Portable (mobile) tower specification plate. A specification plate shall be permanently attached to the base of each portable (mobile) tower so it can be easily read by a person standing on the ground or on the base platform. It shall contain the following information:

(a) Name and address of manufacturer and model number;

(b) The maximum diameter of the mainline or skyline for which the unit is designed and size of haulback and mainline to be used together if drums are interlocking or automatic tensioning type;

(c) The number and size of guylines required to stabilize the unit;

(d) The maximum length and capacity of a loading boom or similar equipment which may be attached if the structure is engineered for such;

(e) If the unit is designed for use on any skyline system of logging; and

(f) Maximum degree of inclination from vertical at which the spar (tower) may be used.

(2) The critical parts of portable spars (towers) shall be inspected by a qualified person at reasonable intervals while in service and each time the spar (tower) is lowered. If indication of failure or weakness is noted or suspected, the part shall be inspected by an approved method and found to be safe, or it shall be repaired or replaced before the operation is allowed to proceed.

(3) Blocks and fair leads shall be so located that there will be no chafing or sawing of any line or part of the structure.

(4)(a) Power guylines used for stabilizing any unit may be choked around an adequately notched stump if using a shackle or approved choker attachment. Three full wraps or more must be placed around an adequately notched stump to secure the guyline if clamps are used. Guyline extensions shall be property shackled to the guylines.

(b) When using a deadman anchor to support a guyline, the connection shall be made by properly shackling both eyes of the anchor strap to the guyline.

(c) If guylines on metal spars or towers are not power guylines, they shall be secured to stumps or anchorages in the same manner as guylines on wood spar trees.

(5) Power driven devices shall be securely anchored when used to tighten guylines. Holding of such devices manually is prohibited.

(6)(a) Machines or equipment shall be stabilized by their design or the attachment of guylines or other devices which will prevent the machine from overturning. Machine operators shall be advised of the stability limitations of the equipment.

(b) If stabilization of a machine is dependent upon the use of hydraulic outriggers, a pilot operated hydraulic check valve or other locking device shall be installed to prohibit the outrigger from retracting in case a hydraulic line breaks, except when proper blocking is provided.

(7) A qualified person shall direct each raising or lowering of a portable spar or tower.

(8) All persons not engaged in the actual raising or lowering of portable spars or towers shall stay in the clear during such operations.

(9) Guylines required in rigging spars or towers shall be evenly spooled to prevent fouling.

(10) Portable spars or towers shall be leveled to provide even line spooling and avoid excessive stress on component parts.

(11) The portable spar or tower shall be lowered or supported so the stability of the machine is not impaired during movement of the portable spar or tower.

(12) Guylines of portable spars or towers shall not be anchored to standing trees if the unit is used for yarding as a head tree.

(13) Timbers used for masts or booms shall be straight-grained, solid, and capable of withstanding the working load.

(14) Boom points of timber booms shall 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) All mobile vehicles on which yarding equipment, towers, spars, masts or booms are installed, shall be maintained in a safe operating condition.

(16) A-frames shall be secured against displacement and the tops shall be securely bolted or lashed to prevent displacement.

(17) When any portable-type tower, A-frame or spar is used, the base shall be securely and solidly supported.

(18) All loading, unloading and skidding machines shall be equipped with a horn or whistle which is audible above the surrounding noise level. Such horn or whistle shall be maintained in an operative condition.

[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 Yarding--General requirements. (1) Workers shall be alert and be positioned in the clear where they will not be exposed to the hazards of moving logs, saplings, root wads, chunks, rigging, or any other material which might be put in motion by the rigging or turn, before the "go ahead" signal is given. They shall remain in the clear at all times while the rigging is moving.

(2) No person shall be near rigging which is stopped at a hangup, until the rigging has been slacked to reduce the hazard.

(3) No person shall stand or remain within the bight of any running line, nor in a position where he could be struck by a line were it to break or come loose.

(4) Whenever possible, chokers shall be set from the uphill side of a log. Persons shall not be on the lower side of a log which appears to be unstable or likely to roll.

(5) Wire rope used for chokers shall not exceed seventy-five percent of the breaking strength of the mainline.

(6) Chokers shall be placed near the end of the log whenever possible.

(7) When pulling lines, do not stand close to fair leads or blocks.

(8) Lines shall not be guided on drums with hands or feet. The use of a bar or equivalent means is recommended.

(9) Yarding with more than one unit on any one head spar is prohibited.

(10) The angle between the power unit, the high lead block, and the mainline road shall not exceed a square lead on rigged spars. When using portable spars or towers, the location of the machine or position of the operator shall be such that the operator shall not be endangered by incoming logs.

(11) When there is danger of tail block straps slipping up or off the stump or tree, the stump or tree shall be adequately notched or the line properly wrapped and secured. When the tail tree or stump is not secure, it shall be tied back.

(12) When yarding is being done during the hours of darkness, the area shall be provided with illumination which will allow persons to safely perform their duties. The source of illumination shall be located and directed creating a minimum of shadows and glare. If using a portable tail–hold, lights shall be directed on the equipment to allow the person to visually ascertain that the tail–hold equipment remains stabilized.

(13) No person shall be required or allowed to ride on a turn of logs or rigging excepting the passline. The practice of holding on to moving rigging or chokers to assist a person by being pulled uphill shall be prohibited.

(14) Wire rope shall be wound evenly on the drum and not be allowed to lap one layer on another in an irregular manner. Sheaves shall be smooth and free from defects that could cause rope damage.

(15) Chaser shall be sure that turns are safely landed before approaching to remove the chokers.

(16) Signaling machine operator at landings by throwing bark, chips or other material in the air is prohibited. Whistle or hand signals shall be used at all times.

(17) Logs shall not be landed while loaders or chasers are working in the chutes. Logs shall not be removed from yarder tree by the loader or tractors while the chaser is unhooking a turn from the yarder.

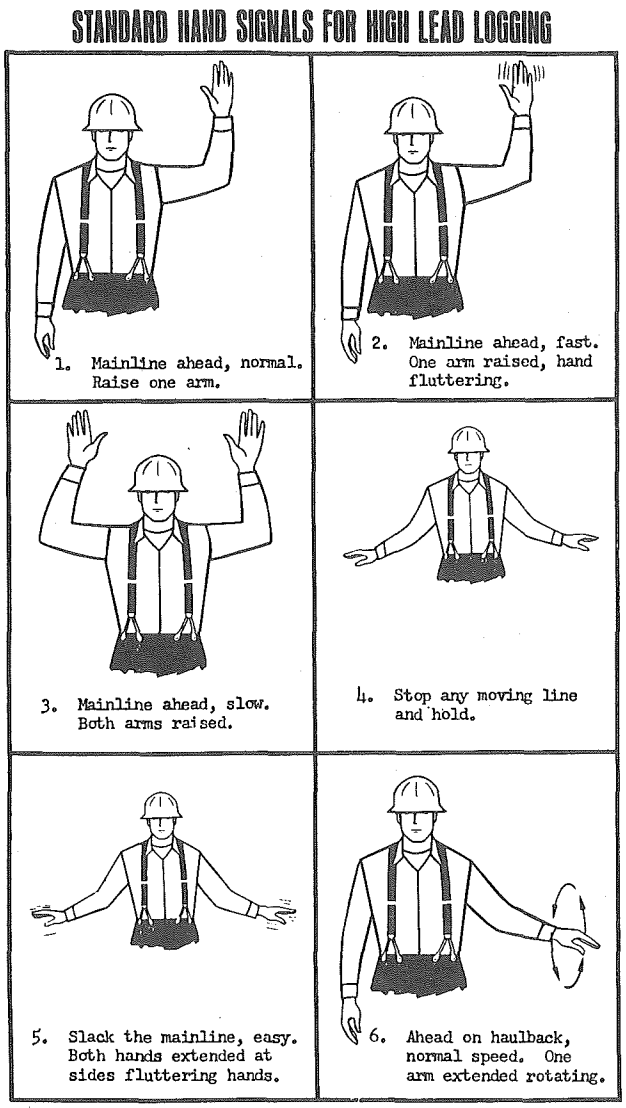
(18) Landings shall be as level as possible and of sufficient size to safely accommodate the majority of type turns to be yarded. At least two–thirds of the log shall rest on the ground or other substantial material when landed. Logs shall be set on the ground or deck and not dropped when being landed. Long sticks shall be safely removed before additional logs are landed.

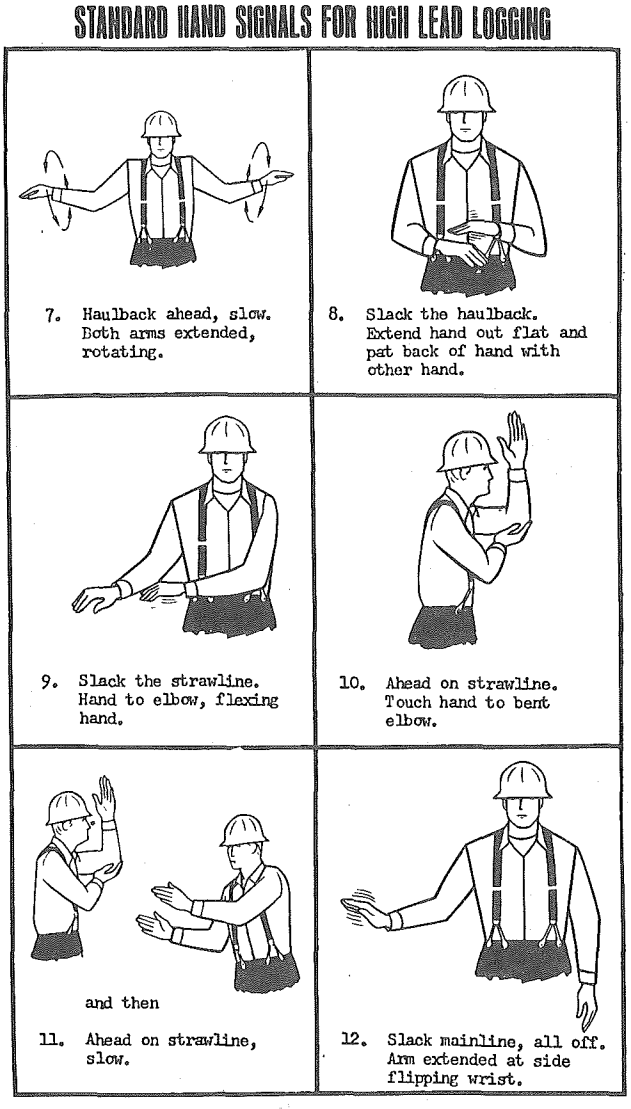
(19) Chokers shall not be used on a grapple system when the yarder operator cannot clearly see the persons setting the choker, unless conventional whistle signals are used.

(20) Landings shall be free of root wads, limbs, tops, etc., that constitute a safety hazard.

(21) When shorter logs are yarded in the same turn with long sticks, the shorter logs shall be landed and chokers released before the long stick choker is released.

Note: See Figures No. 4–A and 4–B for Standard Hand Signals for High Lead Logging.





[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), § 296-54-555, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-555, filed 9/21/79.]

WAC 296-54-557 Yarding--Tractors and skidders. (1) Operators shall ensure that all persons are safely in the clear before initiating or continuing the movement of any mobile equipment.

(2) No person shall ride on any mobile equipment, except where adequate and protected seats, or other safe facilities have been provided.

(3) While in use, tractors and skidders shall be maintained in a safe operable condition, with all guards in proper places.

(4) No person shall be under a tractor or other mobile equipment, or be placed in a hazardous position around the equipment without first making certain it cannot move or be moved by another person.

(5) Prior to working on tractor or skidder blades, arches, or other equipment, the equipment must be blocked up lowered to the ground or otherwise secured against slipping or falling. Prior to working on hydraulic equipment, the pressure shall be relieved.

(6) When making repairs to tractor or skidder equipment, such as blades, arches, etc., the engine shall be stopped. The engine may be run when necessary for making adjustments to the engine or equipment.

(7) Operators shall operate and control their machines in a safe manner and avoid operations in areas where machine stability may not be maintained.

(8) The following safe work procedures shall be adhered to:

(a) When hobo logs are picked up with a log turn, the turn shall be dropped to free the hobo.

(b) No line shall be allowed to trail behind the tractor or skidder where it may hang up and snap forward.

(c) Winching at a severe angle, which could cause a hang-up to upset the machine, shall be avoided.

(d) Grapple skidded log turns shall be evenly bunched with squared butt ends, securely grappled and safely positioned before travel commences.

(e) Before climbing or descending grades, the proper gear shall be selected to allow the engine to govern the tractor speed.

(f) On side hills, an abrupt turn uphill shall be avoided. The tractor or skidder shall be backed downhill first then turned uphill. The turn may be slacked off as necessary to permit this maneuver.

(g) The operator shall, before leaving a tractor or skidder, lower the blade to the ground and apply the parking brake.

(h) Tractor or skidder speed shall be adjusted to the circumstances prevailing. Excessive or uncontrolled speed shall be avoided.

(i) Winch lines on logging tractors or skidders shall be attached to the drum with a break–away device.

(9) When hand signals are required for giving instructions to the tractor or skidder operator, the signals as illustrated in Figure No. 5 shall be used.

(10) Tractor and skidder brakes shall stop and hold the machine on any grade over which the machine is being operated. They shall be effective whether or not the engine is running and regardless of the direction of travel.

(11) Tractors and skidders shall be provided with a brake locking device that will hold the machine indefinitely on any grade on which it is being operated.

(12) Operating a tractor or skidder with defective steering or braking devices is prohibited.

(13) Arches shall be equipped with line guards.

(14) Where tractor and skidder operators or helpers, because of the nature or their work duties, are required to wear calk soled footwear, the decks and operating foot controls shall be covered with a suitable nonslip material.

(15) Glass used in windshields or in cabs shall be of "safety glass." Broken or cracked glass shall be replaced as soon as practical. Barriers shall provided, as needed, to protect the glass from being broken by using screen, bars or other material. The protective material shall be a type that will not create a hazard by undue impairment of the operators' vision.

(16) Barriers shall be constructed of at least 1/4–inch diameter woven wire with two inch maximum openings or other material providing equivalent protection. The barrier shall be installed at least four inches from the glass to provide space to clean the glass.

(17) Enclosed–type cabs installed on mobile equipment shall have two means of exit. One may be deemed as 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 will be acceptable as the emergency exit if it is of adequate size for a person to readily exit through.)

(18) Seat belts shall be installed on tractors and other mobile equipment equipped with a roll–over protective system and shall be worn by the operator and passenger(s) at all times the vehicle is in motion. The seat belts and assemblies shall be designed, constructed and maintained to conform to the requirements specified in the society of automotive engineers technical report J386 or J333a. Seat belts need not be provided for equipment which is designed for stand–up operations.

(19) If the equipment operator and person in charge of the jobsite agree that life safety of the operator is jeopardized by wearing a seat belt, the seat belt need not be worn.

(20) Seat belts required by subsection (18) of this section, shall have buckles of the quick release type, designed to minimize the possibility of accidental release.

(21) Before a tractor or skidder is started or moved, the operator shall be certain nothing is in the way that could be set in motion by the movement of the machine thereby endangering persons.

(22) A log or turn shall not be moved until all persons are in the clear (behind the turn and on the uphill side on sloping ground).

(23) Before the engine is shut–down, the brake locks shall be applied and all elements such as blades, buckets, grapples and shears shall be lowered to the ground.

(24) Tractors or skidders shall not be operated within a radius of two tree heights of trees being felled unless called upon by the cutter or faller to ground lodged trees. All cutters shall be notified of the tractor or skidder entrance into the area and all felling within two tree lengths of the tractor or skidder shall be stopped.

(25) Except where electrical distribution and transmission lines have been de–energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:

(a) For lines rated 50 kV or below, minimum clearance between the lines and any part of the equipment or machine shall be ten feet;

(b) For lines rated over 50 kV, minimum clearance between the lines and any part of the equipment or machine shall be 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;

(c) In transit with no load and boom or extended equipment lowered, the equipment clearance shall be a minimum of four feet for voltages less than 50 kV, and ten feet for voltages over 50 kV up to and including 345 kV, and sixteen feet for voltages up to and including 750 kV;

(d) A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means;

(e) Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate it is not an energized line and it has been visibly grounded.

(26) Log piles and decks shall be located and constructed to provide working areas around them that will accommodate the safe movement of personnel and machinery.

(27) Braking systems required by subsection (10) of this section, shall be capable of stopping the equipment

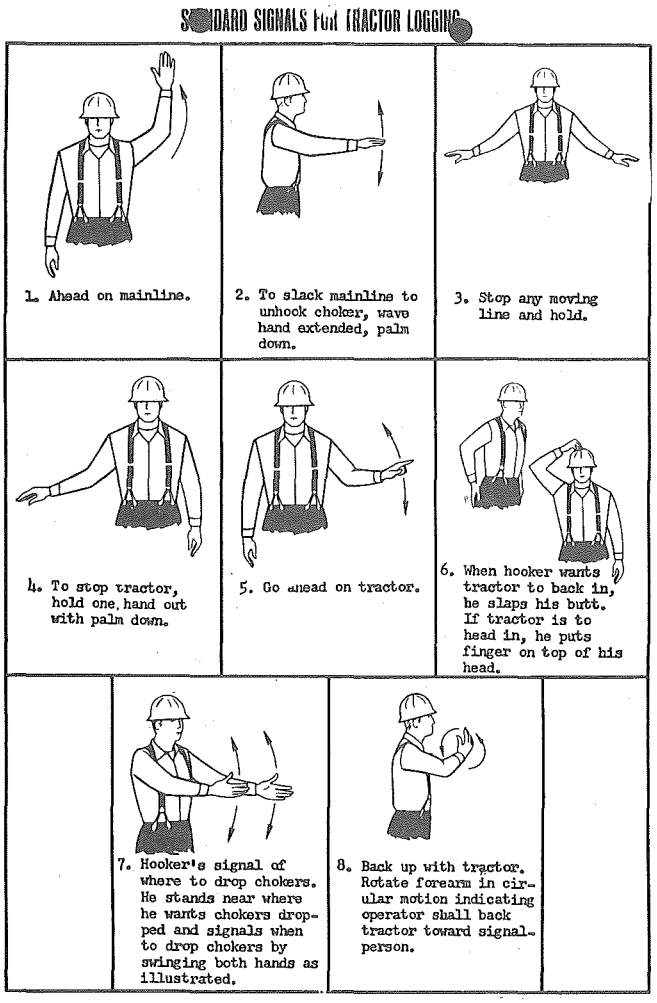
fully loaded as specified in the society of automotive engineers technical reports listed in subdivisions (a), (b), (c) or (d) of this subsection and shall be installed by June 30, 1973. All rubber-tired tractors or other types of mobile equipment listed below, manufactured after the effective date of these standards, shall have braking systems and requirements specified in the applicable technical reports of the society of automotive engineers as follows:

(a) Brake systems for off-highway, rubber-tired, self-propelled scrapers shall meet or exceed the requirements outlined in SAE technical report J319b.

(b) Brake systems for off-highway, rubber-tired, front-end loaders, log stackers and dozers (skidders) shall meet or exceed the requirements outlined in SAE technical report J237.

(c) Brake systems for rubber-tired, self-propelled graders shall meet or exceed the requirements outlined in SAE technical report J236.

(d) Brake systems for off-highway trucks and wagons shall meet or exceed the requirements outlined in SAE technical report J166.



[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.]

WAC 296-54-559 Yarding--Helicopters and helicopter cranes. (1) Helicopters and helicopter cranes shall comply with any applicable regulations of the Federal Aviation Administration.

(2) Prior to each day's operation, a briefing shall be conducted. This briefing shall set forth the plan of operation for the pilot and ground personnel.

(3) A take-off path from the log pickup point shall be established, and shall be made known to all workers in that area before the first turn of logs is moved.

(4) The helicopter flight path to and from the drop zone shall be designated and no equipment or personnel (other than flight personnel necessary to assist landing and take-off) will occupy these areas during helicopter arrival or departure.

(5) The approach to the landing shall be clear and long enough to prevent tree tops from being pulled into the landing.

(6) The helicopter shall not pass over an area in which cutters are working at a height which would cause the rotor wash to inhibit a cutter's ability to safely control a tree or dislodge limbs.

(7) Drop zones shall be twice the nominal length of logs to be landed.

(8) The drop zone shall be no less than one hundred twenty-five feet from the loading or decking area.

(9) Separate areas shall be designated for landing logs and fueling the helicopter(s).

(10) The yarding helicopter shall be equipped with a siren to warn workers of any hazardous situation.

(11) Workers shall remain in the clear as chokers are being delivered, and under no circumstances will workers move under the helicopter that is delivering the chokers or take hold of the chokers before they have been released by the helicopter.

(12) Log pickup shall be arranged in a manner that the hook up crew will not work on slopes below felled and bucked timber.

(13) If the load must be lightened, the hook shall be placed on the ground on the uphill side of the turn before the hooker approaches to release the excess logs.

(14) Landing crew shall be in the clear before logs are dropped.

(15) One end of all the logs in the turn shall be touching the ground and lowered to an angle of not more than 45° from the horizontal before the chokers are released.

(16) Logs shall be laid on the ground and the helicopter will be completely free of the choker(s) before workers approach the logs.

(17) If the load will not release from the hook, the load and the hook shall be on the ground before workers approach to release the hook manually.

(18) Loads shall be properly slung. Tag lines shall be of a length that will not permit their being drawn up into rotors. Pressed sleeve, swaged eyes, or equivalent means shall be used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening.

(19) All electrically operated cargo hooks shall have the electrical activating device so designed and installed

as to prevent inadvertent operation. In addition, these cargo hooks shall be equipped with an emergency mechanical control for releasing the load. The hooks shall be tested prior to each day's operation to determine that the release functions properly, both electrically and mechanically.

(20)(a) Personal protective equipment for employees receiving the load shall consist of complete eye protection and hard hats secured by chinstraps, and high visibility vests or outer garments.

(b) Loose-fitting clothing likely to flap in the downwash, and thus be snagged on hoist line, shall not be worn.

(21) Every practical precaution shall be taken to provide for the protection of employees from flying objects in the rotor downwash. All loose gear within one hundred feet of the place of lifting of the load, depositing the load, and all other areas susceptible to rotor downwash shall be secured or removed.

(22) Good housekeeping shall be maintained in all helicopter loading and unloading areas.

(23) The helicopter operator shall be responsible for size, weight, and manner in which loads are connected to the helicopter. If, for any reason, the helicopter operator believes the lift cannot be made safely, the lift shall not be made.

(24) Employees shall not perform work under hovering craft except for that limited period of time necessary to guide, secure, hook and unhook loads. Regardless of whether the hooking or unhooking of a load takes place on the ground or other location in an elevated work position in structural members, a safe means of access and egress, to include an unprogrammed emergency escape route or routes, shall be provided for the employees hooking or unhooking loads.

(25) Static charge on the suspended load shall be dissipated with a grounding device before ground personnel touch the suspended load, or protective rubber gloves shall be worn by all ground personnel touching the suspended load.

(26) The weight of an external load shall not exceed the manufacturer's rating.

(27) Hoist wires or other gear, except for pulling lines or conductors that are allowed to "pay out" from a container or roll off a reel, shall not be attached to any fixed ground structure, or allowed to foul on any fixed structure.

(28) When visibility is reduced by dust or other conditions, ground personnel shall exercise special caution to keep clear of main and stabilizing rotors. Precautions shall also be taken by the employer to eliminate as far as practical reduced visibility.

(29) Signal systems between aircrew and ground personnel shall be understood and checked in advance of hoisting the load. This applies to either radio or hand signal systems. Hand signals shall be as shown in Figure 6.

(30) No unauthorized person shall be allowed to approach within fifty feet of the helicopter when the rotor blades are turning.

(31) Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position. Employees shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter operator to work there.

(32) Sufficient ground personnel shall be provided, when required, for safe helicopter loading and unloading operations.

(33) There shall be constant reliable communication between the pilot, and a designated employee of the ground crew who acts as a signalperson during the period of loading and unloading. This signalperson shall be distinctly recognizable from other ground personnel.

(34) Open fires shall not be permitted in an area that could result in such fires being spread by the rotor downwash.

(35) 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.

(36) 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 100 degree F. range for an extended period of time, all refueling of helicopters with the engines running shall be

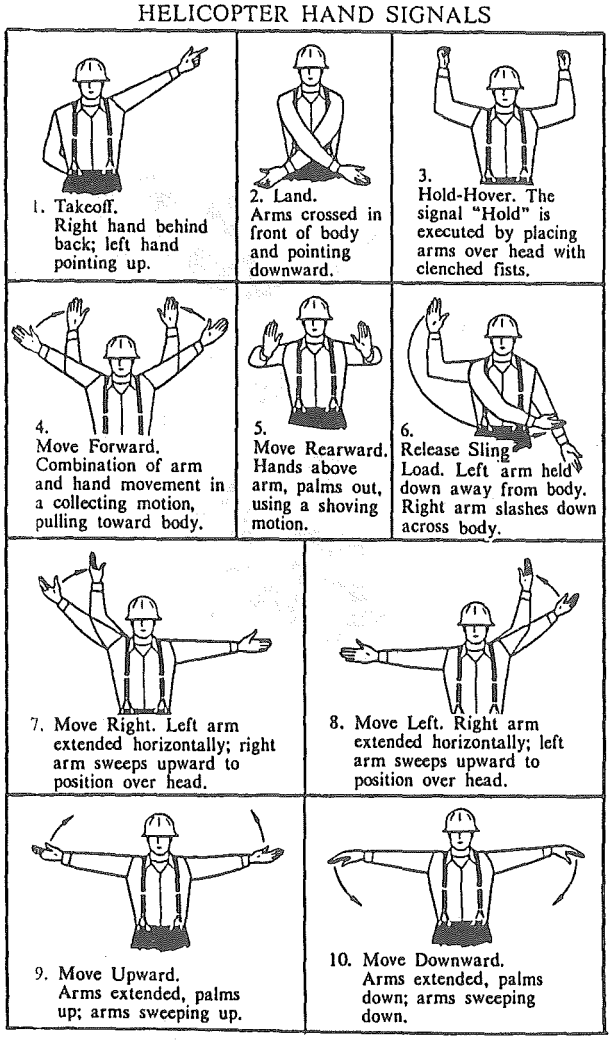
suspended until such time as conditions become suitable to resume refueling with the engines running.

(37) Helicopters with their engines stopped being refueled with aviation gasoline or Jet B (Turbine) type fuel, shall also comply with subsection (36)(a) through (g) of this section.

(38) Hook on persons in logging operations shall wear contrasting colored hard hats, with chinstraps, and high visibility vests or outer garments to enable the helicopter operator to readily identify their location.

(39) Riding the load or hook of a helicopter is prohibited except in the case of an emergency with the proper safety gear.

HELICOPTER HAND SIGNALS



Note: See Figures No. 7-A through 7-P, for illustrations of various types of cable logging systems.

See Figures No. 7-Q through 7-U, for illustrations of whistle signals used on various cable logging systems.

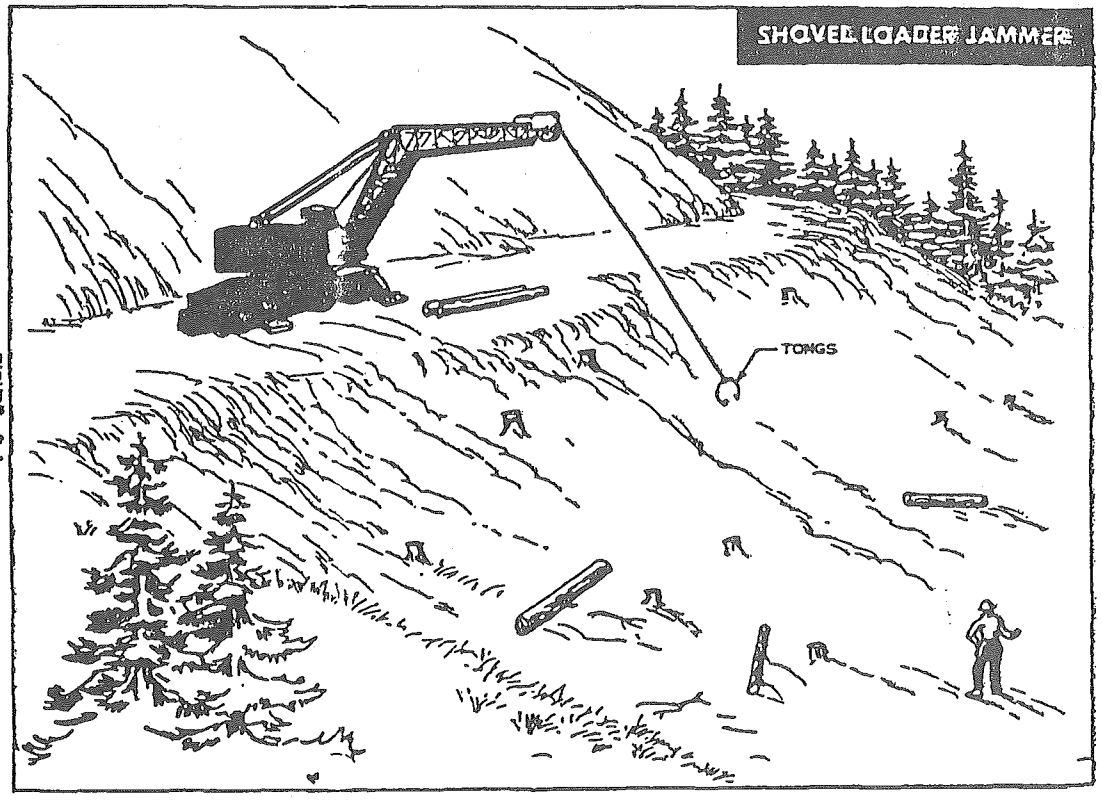


FIGURE 7-A

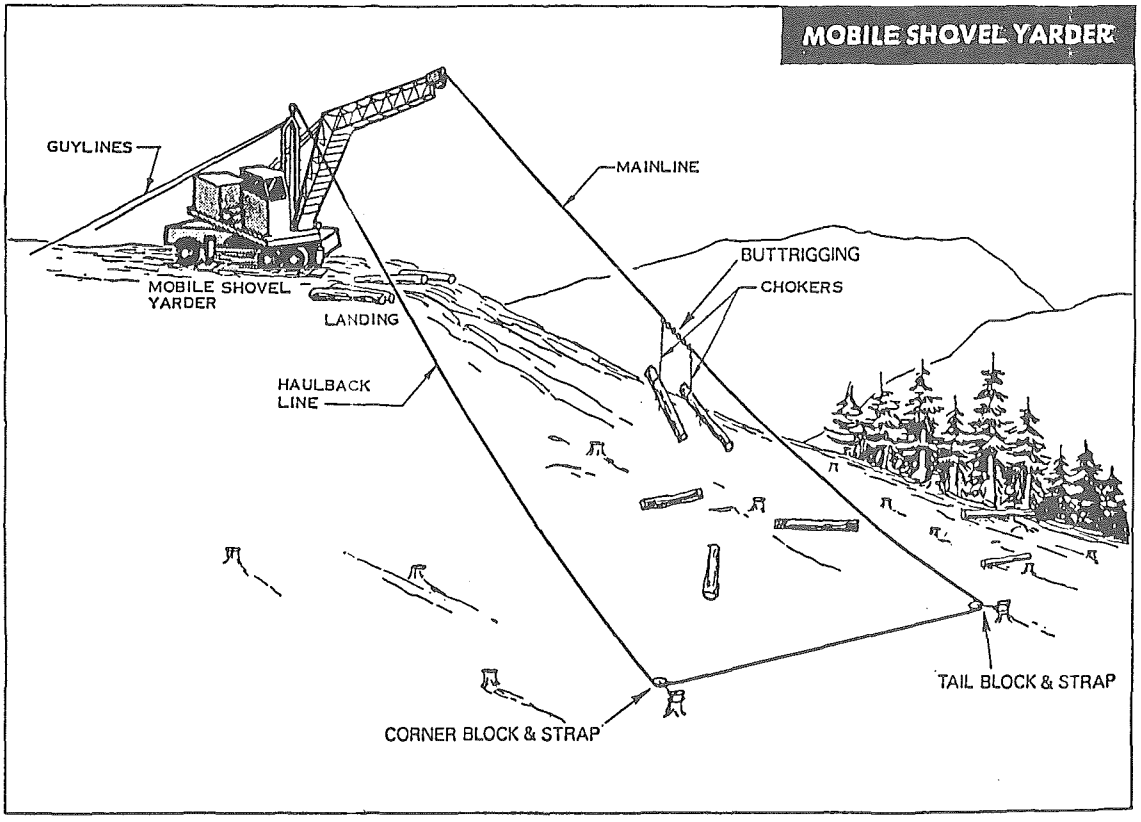


FIGURE 7-B

Figure 7-C

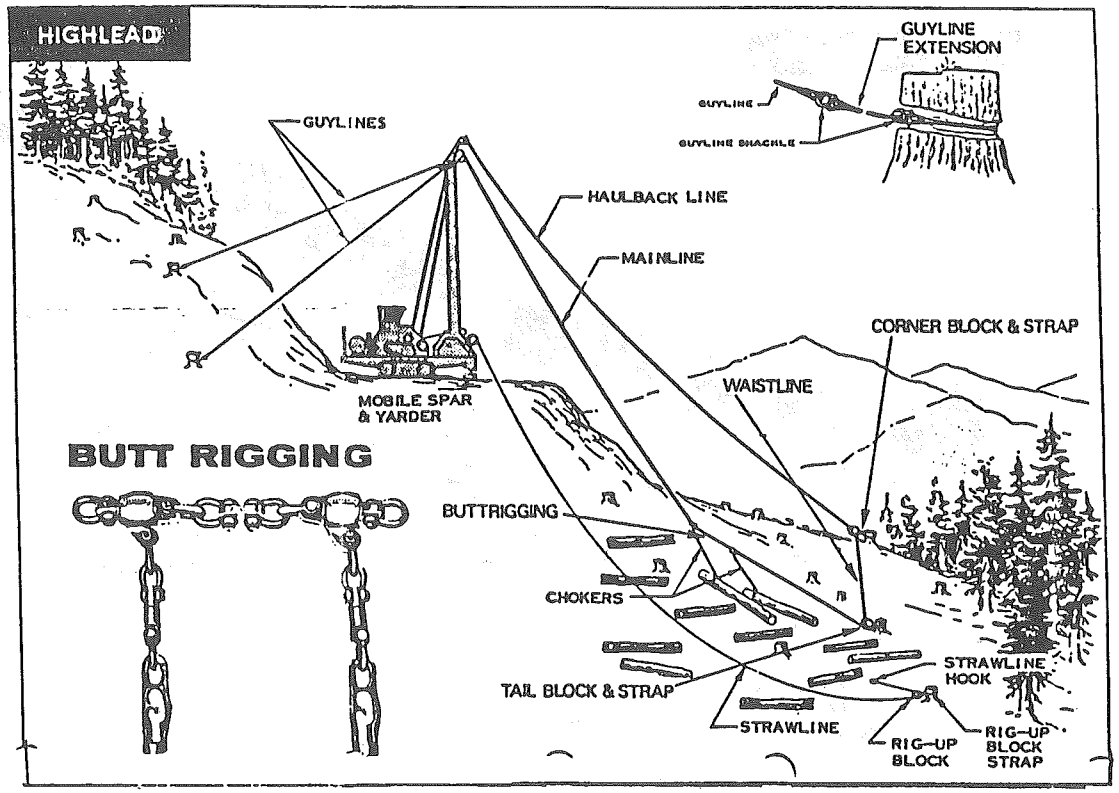
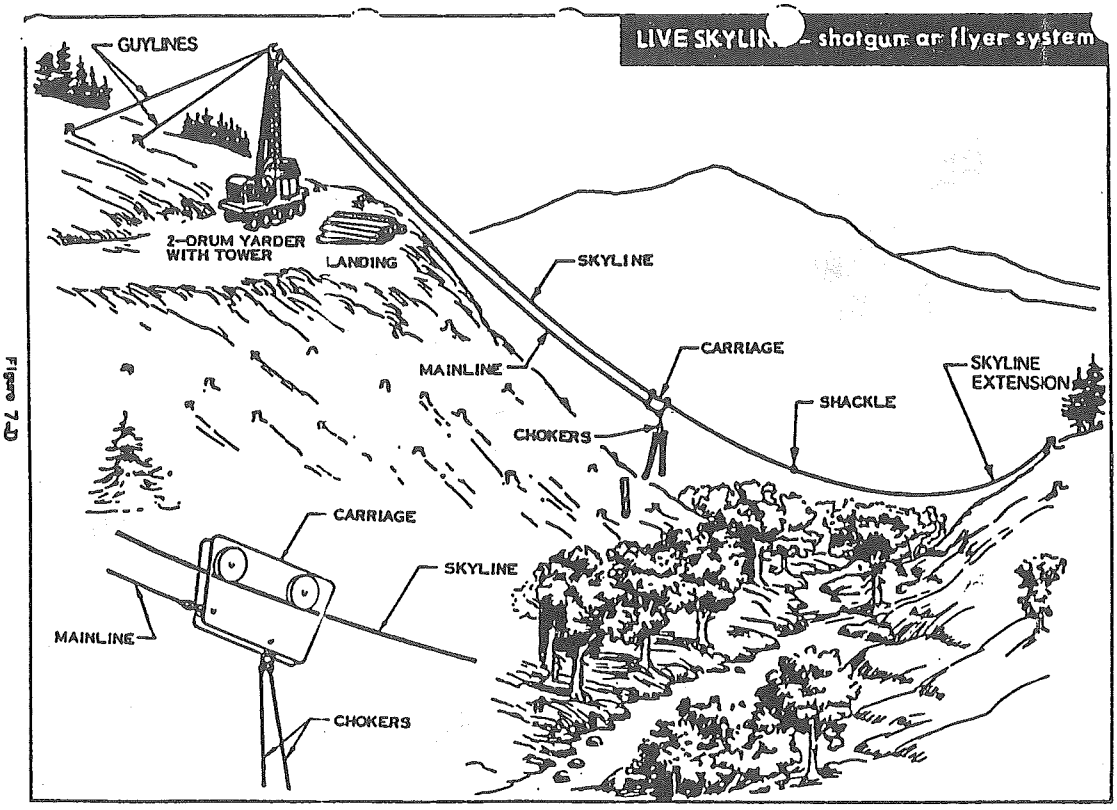


Figure 7-D



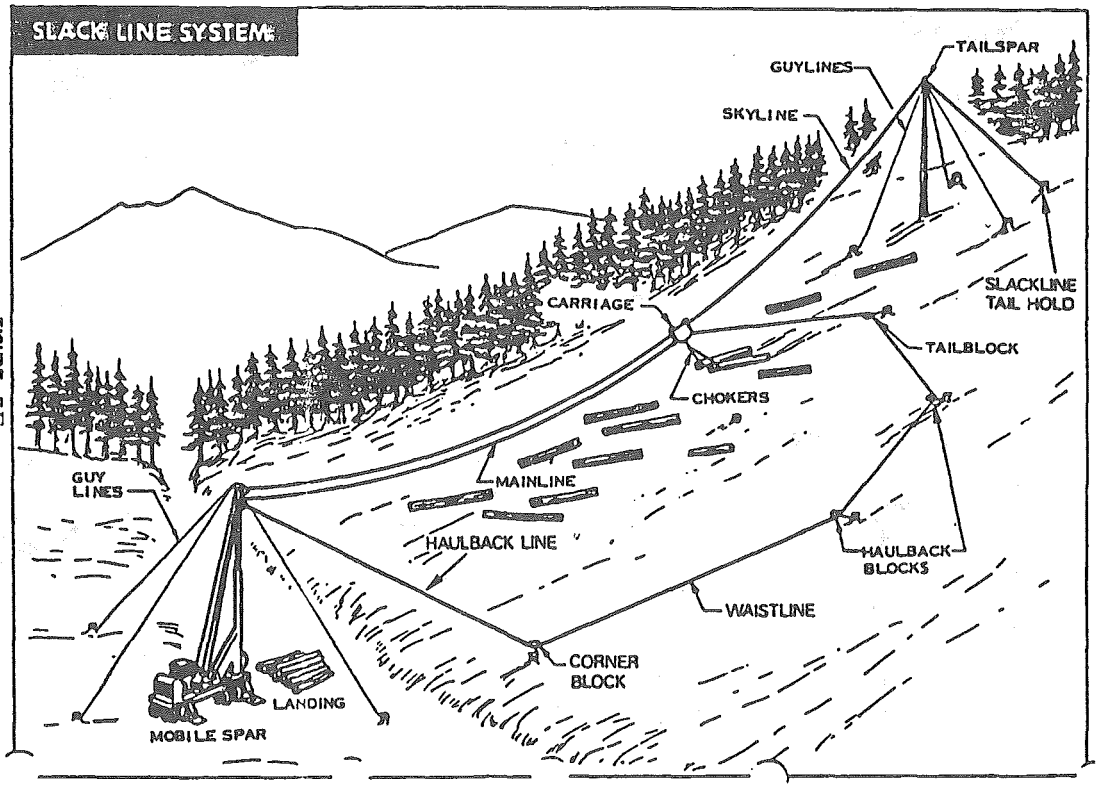


FIGURE 7E

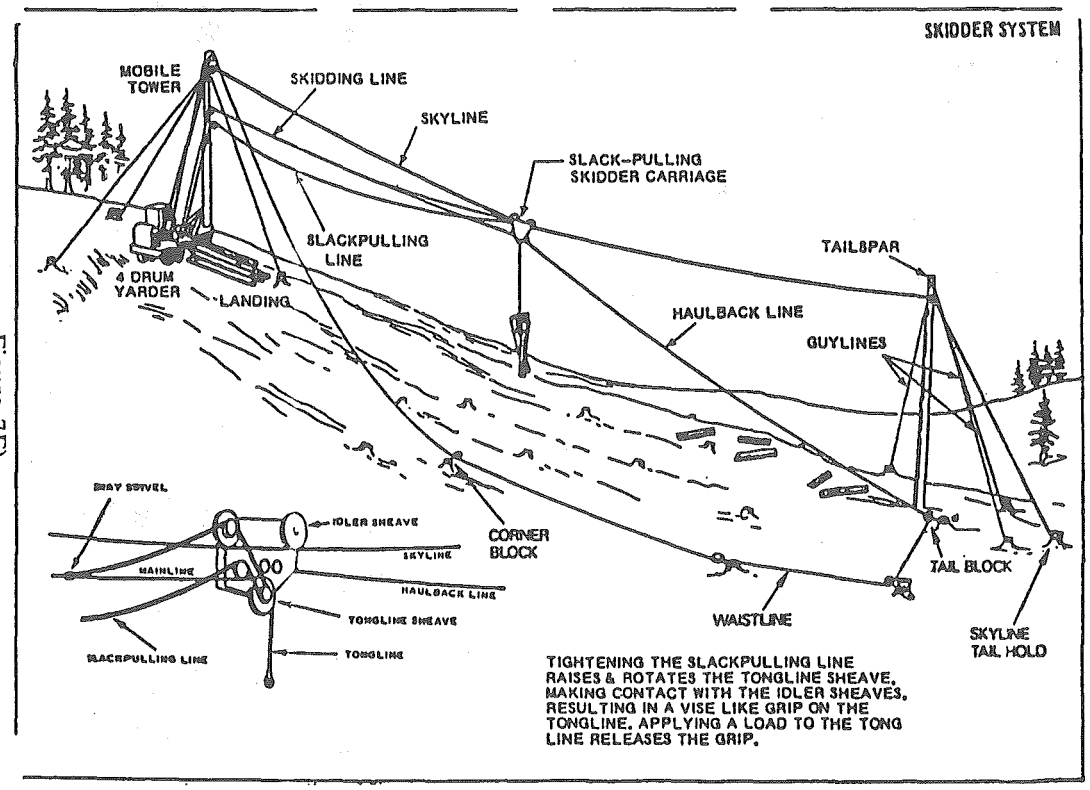


Figure 7F)

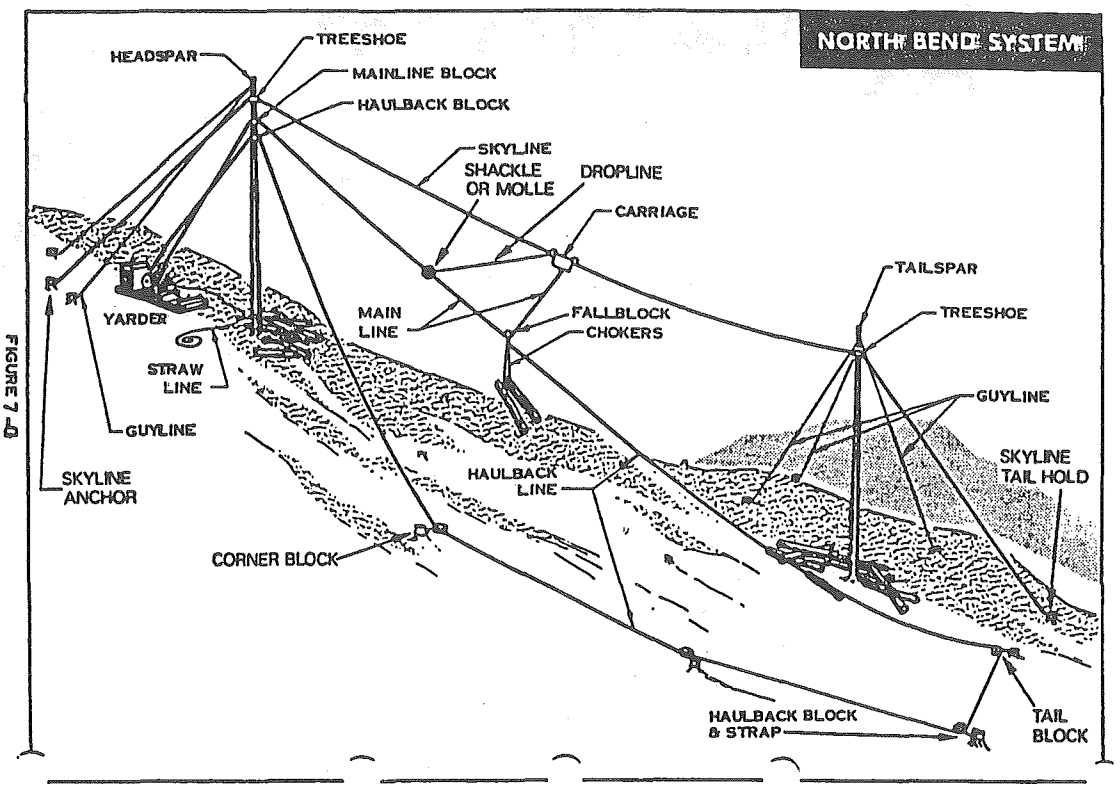


FIGURE 7-D

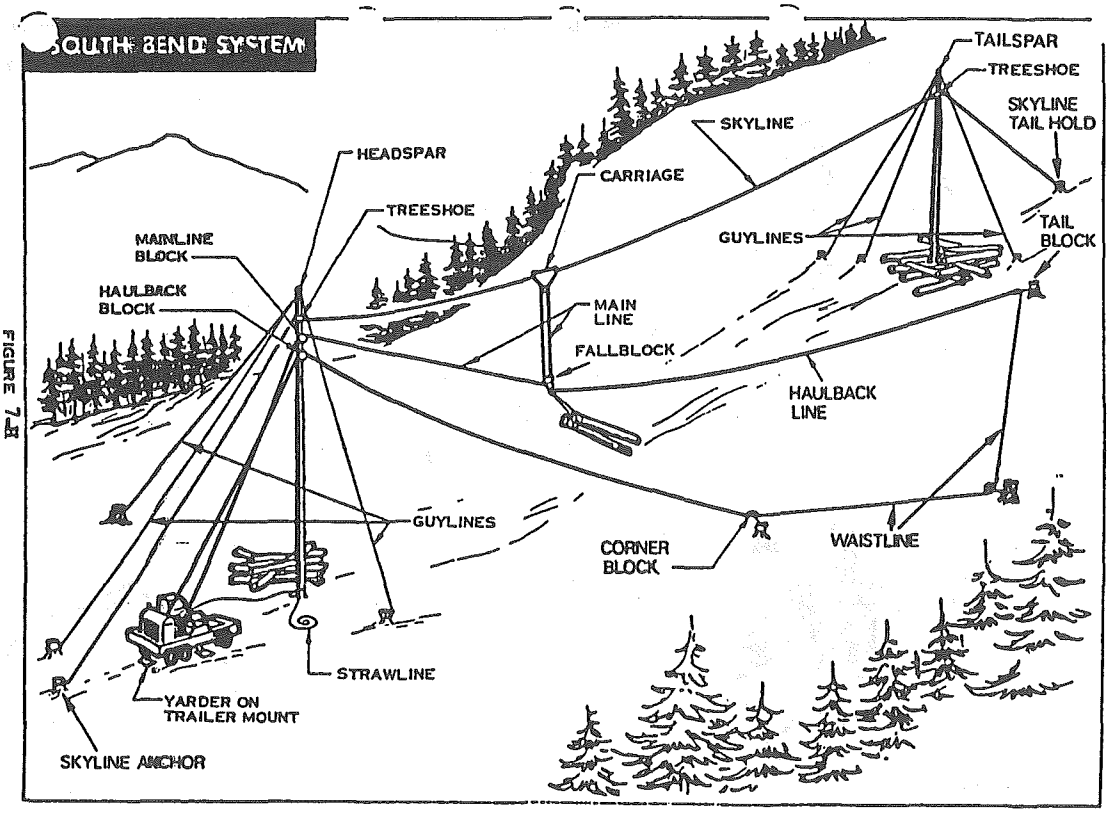


FIGURE 7-E

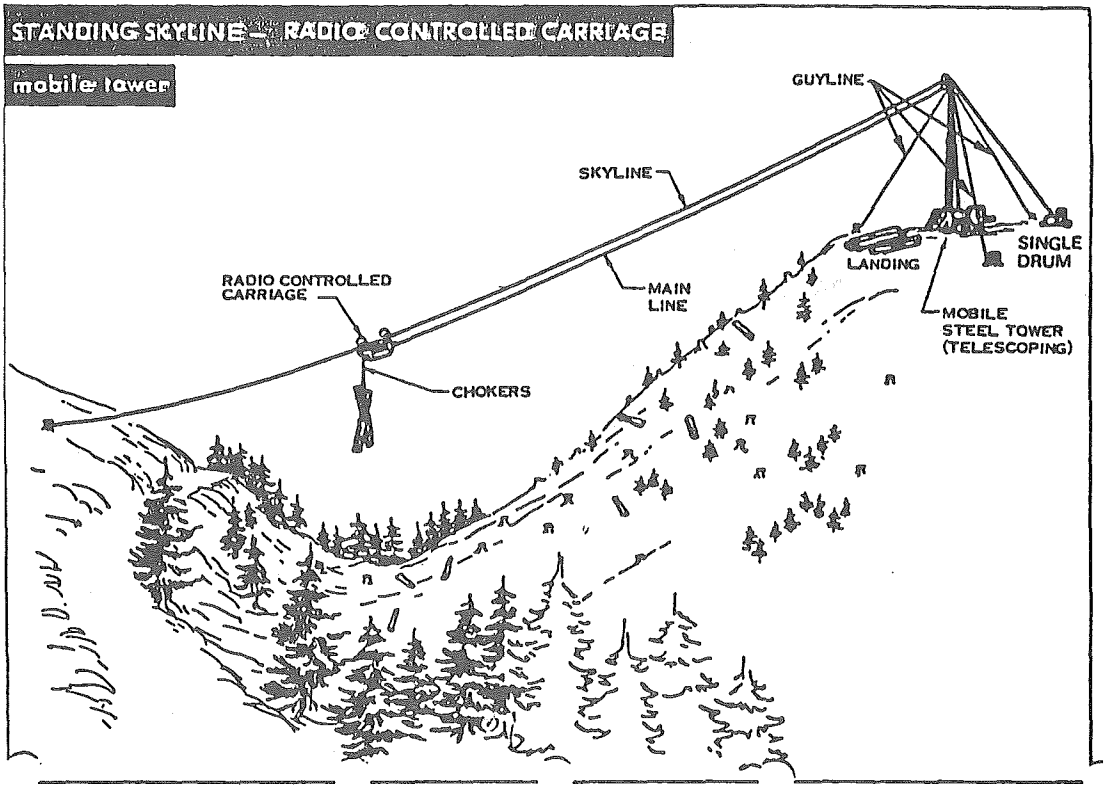


Figure 7I

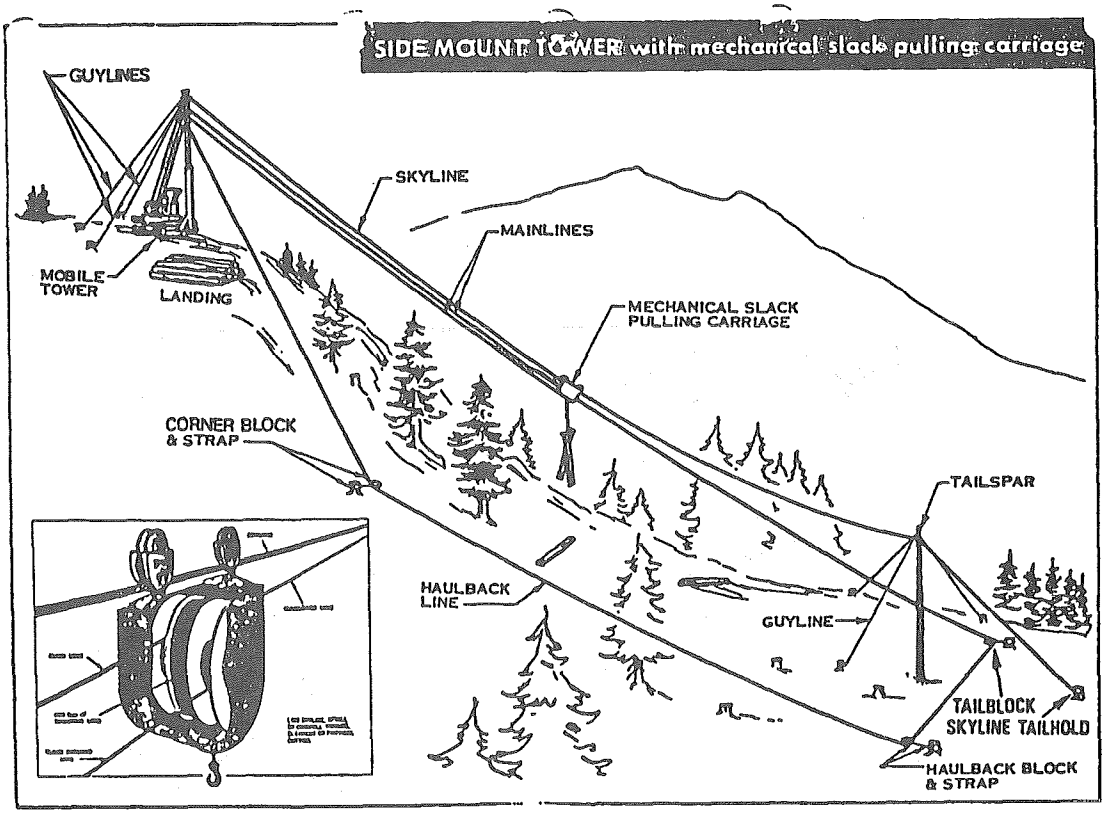


Figure 7J

PARTIAL CUTTING WITH RUNNING SKYLINE

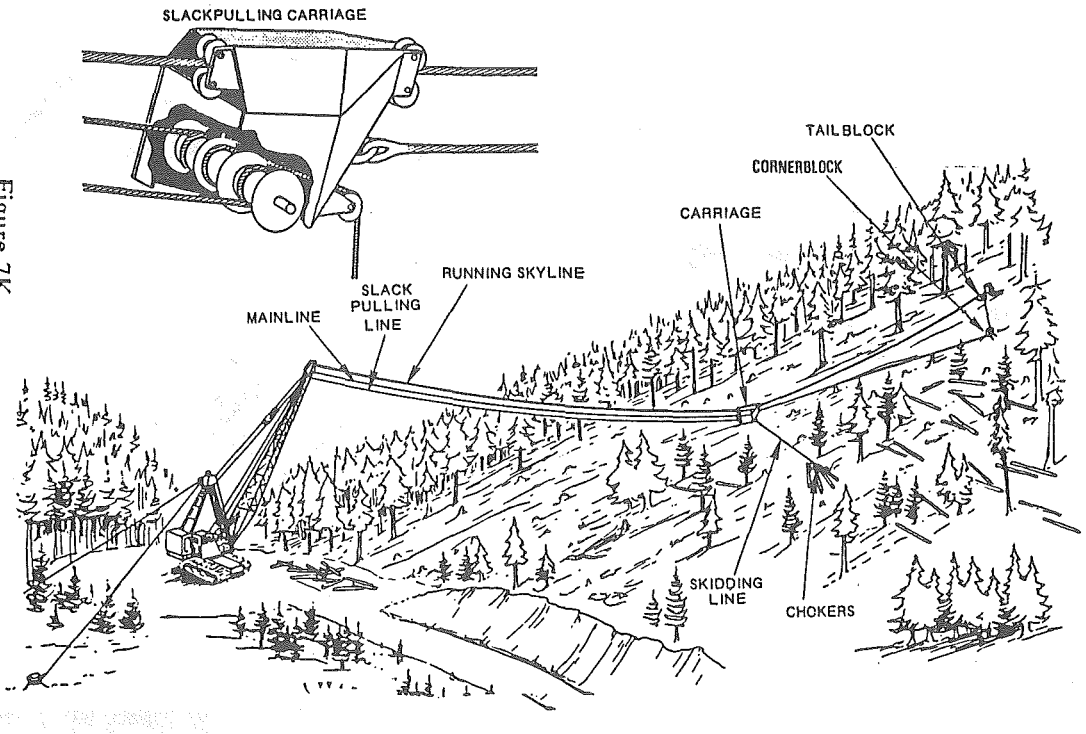


Figure 7K

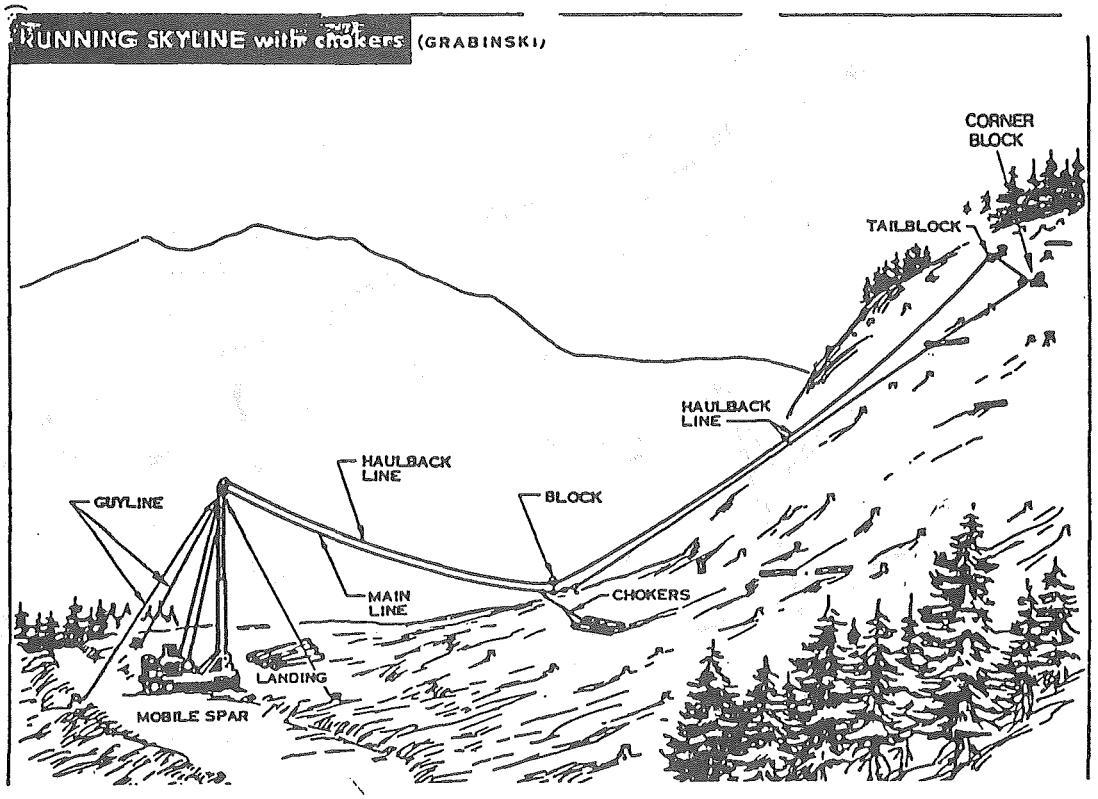


Figure 7L)

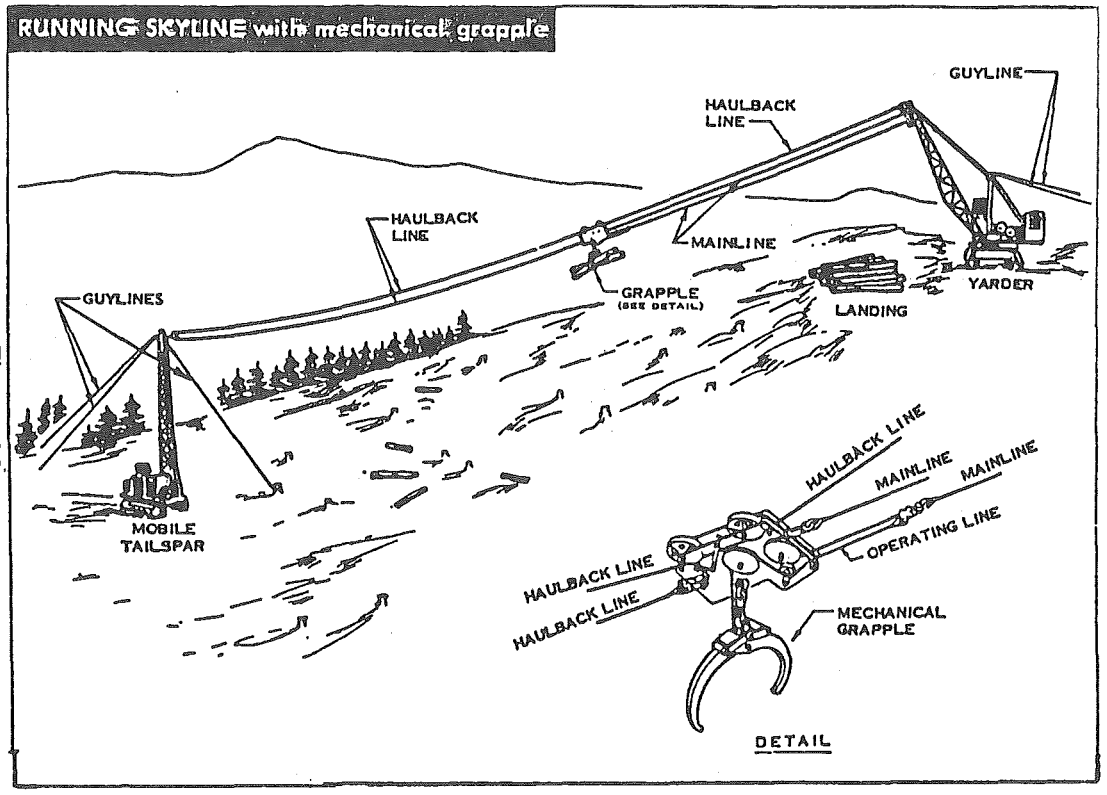


Figure 7M

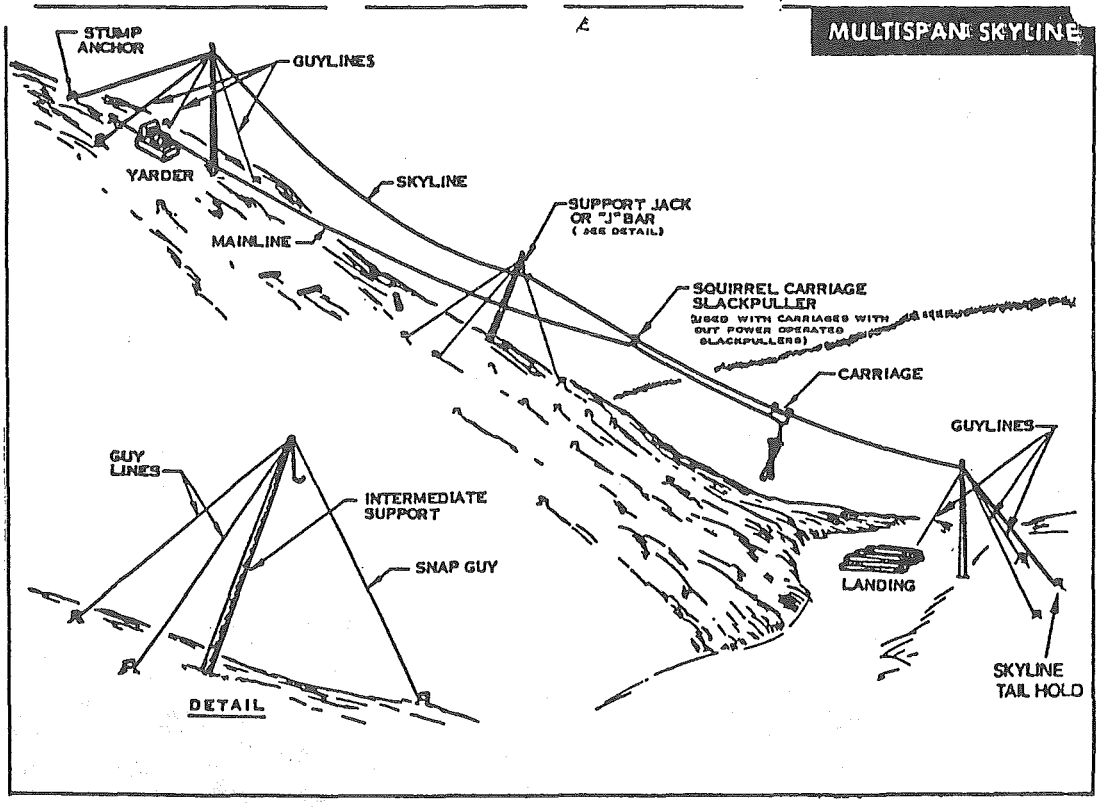


Figure 7N

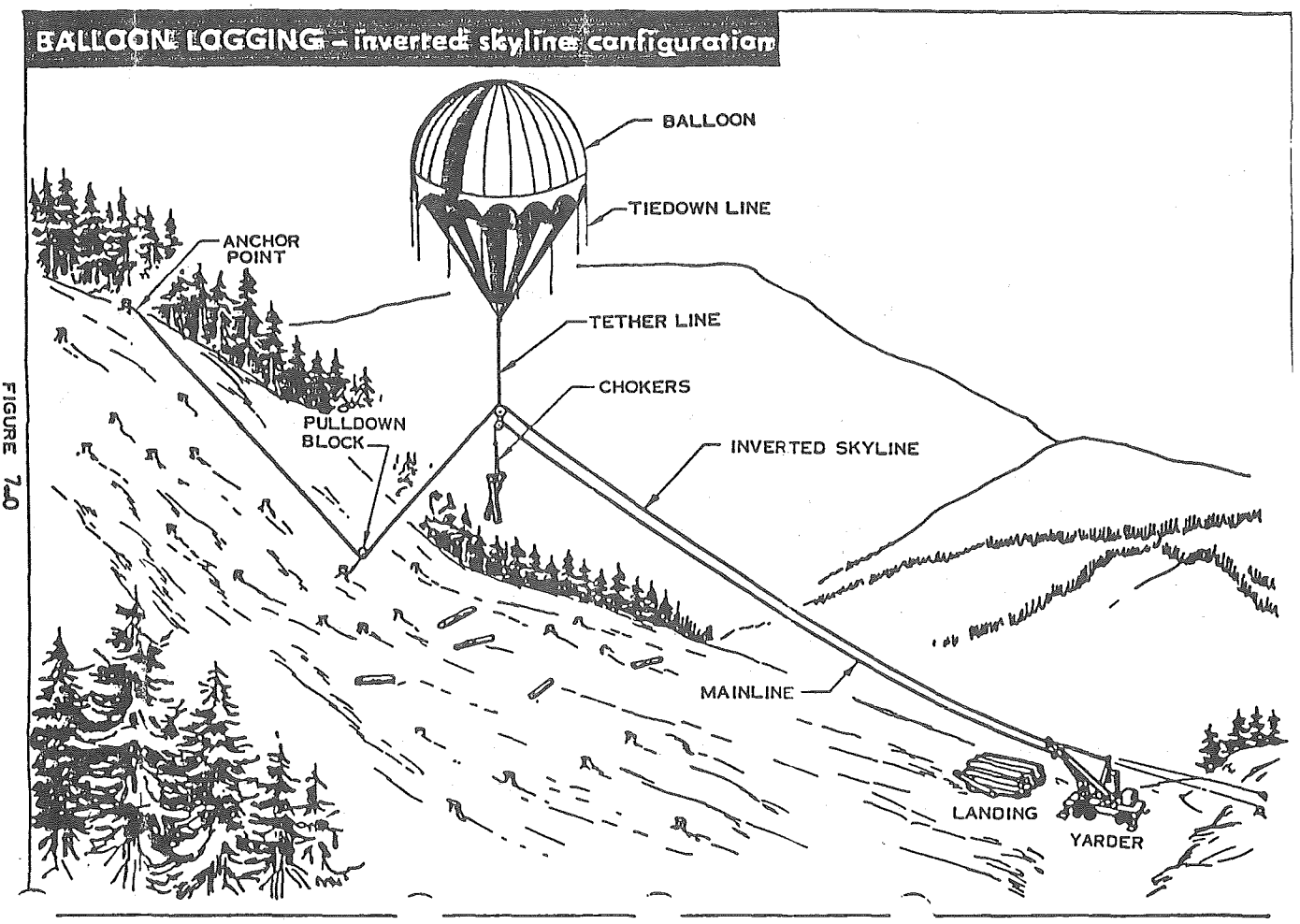


FIGURE 7-O

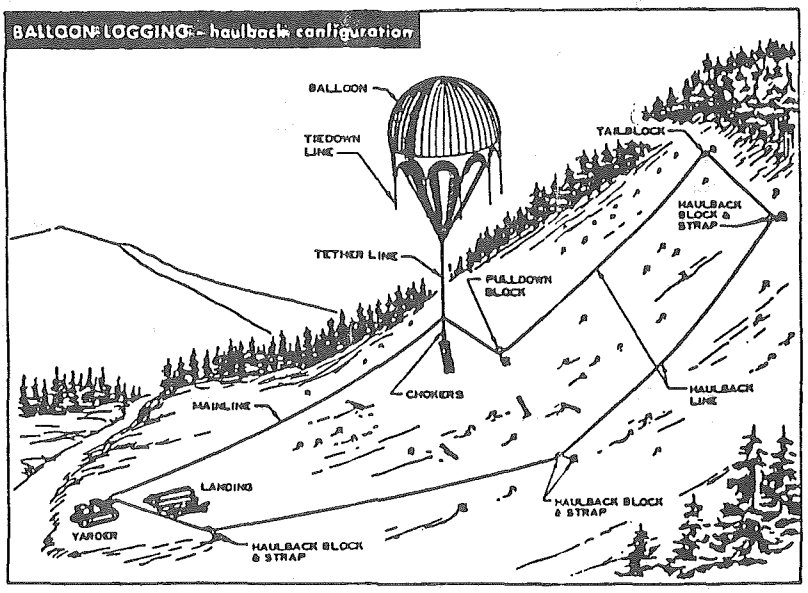


Figure 7-P

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 his crew.
5 long	Climber.
4 long	Foreman.
1 long–1 short	Start or stop work.
7 long–2 short	Man 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.

Figure 7–Q

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.
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 his crew.
2 medium	Skidder head rigger.
3 medium–4 short	Hooker and his 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	Man injured, call transportation and stretcher.
1 long–1 short repeated	Fire.

Figure 7–R

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.
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: Strawline back on haulback.
3 short–1 short–2 short	When carriage is in: Strawline 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 his crew.
3 medium	Head hooker.
3 medium–4 short	Second hooker and his crew.
5 long	Climber.
4 long	Foreman.
1 long–1 short	Start or stop work.
7 long–2 short	Man injured, call transportation and stretcher.
1 long–1 short repeated	Fire.

Figure 7-S

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
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: Strawline
3 short–X short	When carriage is in: Number sections
3 short–1 short–2 short	When carriage is in: Strawline 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 his crew
4 long	Foreman
1 long–1 short	Start or stop work
7 long–2 short	Man injured; call transportation and stretcher
1 long–1 short (repeated)	Fire
3 short–1 long	Acknowledged by engineer to signify hazardous turn

Figure 7-T

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

Figure 7–U

[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.]

WAC 296–54–561 Log loading--General requirements. (1) Loading operators shall have a clear view of the landing and of the cars or trucks being loaded.

(2) Persons shall not ride logs, tongs, grapples or other loading devices.

(3) The use of plain spiked loading hooks without a bell is prohibited for loading logs.

(4) All limbs or knots that would project beyond the stakes or legal height shall be removed before the log is loaded on the car or truck.

(5) When the loading operator is not able to see the loading operation, signals shall be given by a designated person, who shall have a clear view of the operations and shall be visible to the operator. Hand signals used shall be as illustrated in Figure No. 7, following WAC 296–54–565.

(6) Logs shall not be swung or suspended over occupied equipment by loading machines on landings. Persons shall not stand or walk under suspended logs.

(7) No one shall ride loads while cars or trucks are being spotted or dropped, except those whose regular duties require them to do so.

(8) Cars and trucks shall not be moved until the head loader or loading machine operator is positive that all persons are in the clear.

(9) When grapples, trip tongs or similar devices are used in the loading operation, they shall be lowered to the ground whenever the machine is unattended. If the device can tip or fall over, it shall be laid on its side on the ground.

(10) While logs are being loaded, no one shall remain on the load, chain deck or behind the cab protector. Any unattached material shall be removed from the top of the cab protector before the truck is moved from the landing.

(11) To control the movement of a log truck being loaded, a positive audible means of communication shall be established between the truck driver and the loading machine operator. The established means of communication shall be familiar to all employees on the landing and shall include a danger signal to warn employees in case of an emergency. If a movable loader is being used, the loader operator shall sound a warning signal before moving the loader. The signals so used shall be easily distinguishable from other whistle or horn signals used in the landing area.

(12) When signals are used at a landing, reload or deck to control the movement of logging trucks in accordance with subsection (11) of this section, the following signals shall be used:

1 short	Stop
1 short	Ahead
2 shorts	Back
2 shorts then 2 shorts ...	Wrapper
3 shorts	Check scales
1 long–repeated	Danger
1 long	Loader moving

(13) No person shall be permitted alongside or underneath trucks being loaded or on the load until communication has been established with the loading machine operator and truck driver and assurance has been received that it is safe to be there.

(14) Power saws shall not be operated on top of loaded logging trucks.

(15) Standing underneath a suspended trailer or its reach is prohibited.

(16) The outside bunklogs (bottom tier) shall be loaded tight against the stakes.

(17) Logs shall be loaded in a manner to prevent undue strain on wrappers, binders, bunk stakes and chains or straps.

Note: Logs shall be considered to be "within the stakes" when one–half the log diameter is below the top of the stakes.

(18) Logs in any tier or layer unsecured by stakes or chalk blocks shall be well saddled and have their diameter centers inside the diameter centers of the outer logs of the next lower tier or layer.

(19) Bunk and wing logs shall extend not less than twelve inches beyond the front and rear bunks or stakes. On rigid type bunks, they shall extend not less than six inches beyond the front and rear bunks or stakes.

(20) Double ended logs, above the stakes, shall not be loaded on the side of the load from which the binders or wrappers are intended to be released from.

(21) Logs shall be loaded in a manner that will not impair full and free movement of the truck and trailer.

(22) Each log not contained within the stakes shall be secured with at least two wrappers before the truck leaves the immediate landing area.

(23) Loads or logs shall not be moved or shifted while wrappers and binders are being applied or adjusted.

(24) Stable loads. Loads shall be built up or loaded in a manner to be stable without the use of wrappers. Wrappers shall be considered only as precautionary measures to ensure stability of the load.

(25) Loading equipment maintained. All loading machines and equipment shall be maintained in a safe condition. The critical parts of such equipment, such as bolts in base plates, etc., that cannot be inspected while in operation, shall be inspected at reasonable intervals by a qualified person when the machine is shutdown. If indications of failure or weakness is noted or suspected, the parts in question shall be examined by an approved method and if found to be defective, shall be repaired or

replaced before the equipment is put back into operation.

(26) Tongs pulling out. Where there is a danger of tongs or hooks pulling out of the log, straps shall be used. Tongs may be used on extra-large logs provided the logs are barked and notched to provide a secure hold.

[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 Log loading--Special requirements. (1)(a) Loading machines shall be equipped with an effective parking braking system which is not dependent on the air or hydraulic pressure which is used to stop the machine while traveling.

(b) A braking system shall be installed on the load line and boom supporting equipment which shall be capable of stopping and holding, in any position, the maximum load for which the loading machine is designed. The equipment shall be of such design as to lower the boom with power. Booms not having power down shall be dogged before workers enter the hazardous area around the boom. Workers shall not be under any boom while it is being held by the brake.

(2) A minimum distance of thirty-six-inch clearance shall be maintained between the counterweight of a loading machine and trees, logs, banks, trucks, etc., while the machine is in operation. If this clearance cannot be maintained, suitable barricades with warning signs attached, similar to a standard guardrail, shall be installed to isolate the hazardous area. "DANGER - 36-inch clearance" shall be marked in contrasting colors on sides and face of counterweight on shovels, loaders and other swing-type logging equipment.

(3) Persons shall not work under a slack puller. A warning line, of sufficient length to reach the ground at all positions, shall be hung from any slack puller.

(4) Where a backstop of a loading machine is so constructed that it could crush the operator's cab should the heel boom be pulled or pushed too far backward, positive boom stops shall be installed.

(5) All mobile fork-lift type log handling machines shall be equipped with a means or mechanism to prevent the logs from leaving or rolling off the forks, and shall be used at all times while moving logs.

[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 Log loading--Self-loading log trucks. (1) A safe means of access and egress shall be provided to the operator's loading work station.

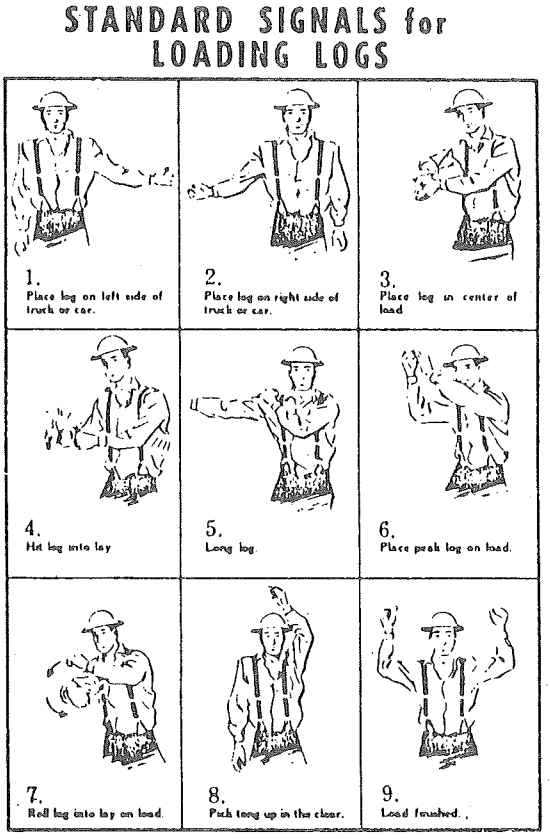
(2) Self-loading log truck operators shall not unload their own load unless a positive means of securing the logs has been provided when binders and wrappers are removed.

(3) New self-loading log trucks purchased and put in operation after January 1, 1980, shall 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 shall rotate concurrently.

(4) The operator of a self-loading log truck shall not heel the log over his head.



[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 Motor truck log transportation--General requirements. (1) Prior to use, the operator shall 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, and hitches (couplings). The brakes shall be tested before and after movement of the vehicle. The operator shall 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, shall be replaced or repaired before the vehicle is placed in service.

(3) All motor vehicles operated on public roads shall comply with the rules of the regulatory body having jurisdiction. Motor vehicles used on roads not under the control of the state department of transportation, counties or cities shall be equipped with accessories necessary for a safe operation including operable head lamps and at least two tail lamps and brake lamps which shall emit a red light plainly visible from a distance of one thousand feet to the rear and shall also have two reflectors

visible at night from three hundred fifty feet when directly in front of properly adjusted motor vehicle head lamps.

(4) Truck tires worn beyond a point of safety or not meeting the safety requirements of the jurisdiction having authority as to tread wear and tire conditions, shall not be used.

(5) The driver shall do everything reasonably possible to keep his truck under control at all times and shall not operate in excess of a speed at which he can stop the truck in one-half the distance between him and the range of unobstructed vision.

(6) The area between the truck frame members, extending from the cab rearward as far as necessary to provide a safe work area, shall be covered with suitable nonslip type material. Log trucks which have logs scaled at stations shall be provided with a platform on each side extending outward from the frame members at least eighteen inches, and shall be eighteen inches long or as near this dimension as the design of the truck will permit. The treading surface of the platforms shall be of nonslip type material and the platform shall be capable of safely supporting a five hundred pound load.

(7) To protect the operator of vehicles from loads, a substantial bulkhead shall be provided behind the cab which shall extend up to the height of the cab.

(8) If logs must be scaled or branded while the loading operation is being carried on, the loading operation shall cease while the scaling or branding is being done so that the scaler or person doing the branding is not subjected to any hazards created by the loading operation.

(9) When at the dump or reload or where logs are scaled or branded on the truck, the logs shall be scaled or branded before the binders are released.

(10) All vehicles, where vision of the operator in the direction of travel is impaired by the load or vehicle, shall be moved only on a signal from a worker who shall have a clear view in the direction in which the vehicle is to be moved.

(11) 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 structure.

(12) Persons shall be allowed to ride only when in the cab of the log truck.

(13) All trucks shall keep to the right side of the road except where the road is plainly and adequately posted for left side travel.

(14) A method shall be provided to assure that the trailer will remain mounted on the truck while driving on highways or logging roads.

(15) When trucks are towed on any road, the person guiding the vehicle being towed shall, by prearranged signals, govern the speed of travel. The towing of vehicles shall be done at a reasonable speed and in a prudent manner. A tow cable or chain over fifteen feet in length shall have a white flag affixed at the approximate center, however, it is recommended that a rigid tow bar be used for this purpose.

(16) All air lines, air chambers and systems shall be free of leaks and be able to maintain air pressure on constant brake application with the motor shut-off for one minute, or air pressure does not drop more than 4 p.s.i. in one minute with the engine running at idling speed and the service brake applied.

(17) All rubber-tired motor vehicles shall be equipped with fenders. Mud flaps may be used in lieu of fenders whenever the motor vehicle is not designed for fenders.

(18) Seat belts and anchorages meeting the requirements of 49 CFR Part 571 (D.O.T. Federal Motor Vehicle Safety Standards) shall be installed and used in all motor vehicles.

(19) All trucks shall be equipped with doors with operable latches, or a safety bar or strap shall be provided in lieu of the door.

(20) All trucks shall be equipped with a means to protect the operator from inclement weather.

(21) Log trucks shall not approach a landing while there is danger from incoming logs.

(22) Log truck drivers shall stop their vehicle, dismount, check and tighten loose load wrappers and binders, either just before or immediately after leaving a private road to enter a public road.

[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 Motor truck log transportation—Brake requirements. (1) Motor logging trucks and trailers shall be equipped with brakes or other control methods which will safely stop and hold the maximum load on the maximum grade. When unattended trucks are parked on a grade, in addition to setting the brakes, the wheels shall be chocked or blocked.

(2) All trucks equipped with air brakes shall be also equipped with a readily visual or audible low air pressure warning device in good working order.

(3) Engine-type brakes shall be considered as auxiliary controls, not a substitute for the requirement for a service brake system.

(4) Brake drums shall be maintained free of cracks, breaks or defects. Defective brake drums, cans, shoes or air lines shall be immediately repaired or replaced.

[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 Motor truck log transportation—Trailer hitches and safety chains. (1) All log truck and trailer combinations shall be equipped with approved hitches (couplings) which shall:

(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 shall be locked securely and positively;

(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 p.s.i. material or better) 3/4-

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; and

(d) Hitches (couplings) or parts that are broken, cracked, excessively worn, or otherwise defective hitches shall be repaired before use.

(2) Each log truck and trailer combination or log truck and independent trailer combination shall be provided with two or more safety chains or cables with a rated breaking strength of not less than the gross weight of the towed vehicle, be capable of holding the trailer in line in case of failure of the hitch assembly, and be as follows:

(a) Be permanently attached to the frame of the truck or an extension of the truck frame;

(b) Form a separate continuous connection between the truck frame or extension of the truck frame and the reach or trailer;

(c) Be attached not more than twelve inches from the eye of the reach or trailer;

(d) Be of a length short enough to prevent the trailer reach or tongue from contacting the ground in the event of disengagement from the truck;

(e) Be of a design to provide a positive connection that cannot be rendered inoperative by any condition of use or exposure.

(3) Safety chains and cables shall be replaced immediately if they contain cut, cracked, or excessively worn links, or frayed, stranded, or otherwise defective wire rope.

(4) Butt welding of safety chain links to reach truck frame, or extension of truck frame is prohibited.

(5) Cold-shuts may be used in safety chains provided they are welded shut and one size larger than the chain being used.

(6) There shall be no welding or hole drilling in frames on which the manufacturer recommends this not be done.

[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 Motor truck log transportation---Reaches and bunks. (1) Log trailers shall be connected to tractors by reaches of a size and strength to withstand all normal imposed stresses. Spliced wooden reaches shall not be used. Proper repair of metal reaches by welding will be permitted if done by a qualified welder.

(2) Hand-holds or other facilities shall be installed on trailer tongues or trailer reaches if workers are required to manually assist in coupling them to their tractors or trucks.

(3) A positive means, other than clamp and in addition to the clamp, shall be installed on the reach of log truck trailers when the trailers are being towed without a load.

(4) Persons shall never enter the area below a suspended load of logs. At dumps where the load must remain suspended above the bunks until the truck is moved away, and when the trailer is the type with a compensating pin in the reach, a method shall be utilized which will allow the trailer to be towed away from the danger area.

(5) The reaches of unloaded trailers being towed shall be provided with and use a minimum one-inch pin near the end or an equally effective means to prevent pulling or stripping through the tunnel.

(6) Reach locks, clamps, or tighteners shall be of the type that will securely lock the reach in the tunnel.

(7) No reach of less than the maximum size usable in the tunnel of a trailer shall be permitted.

(8) Alteration of trailer tunnel to permit reduction of reach size is prohibited.

(9) Every truck or truck and trailer engaged in the transportation of logs loaded lengthwise, shall be equipped with bunks and chock blocks or stakes.

(10) Log bunks or any part of bunk assembly bent enough to cause bunks to bind, shall be straightened. Bunks shall be sufficiently sharp to prevent logs from slipping. Trip type stakes shall be properly secured and locked in a manner which will prevent them from accidentally tripping or falling.

(11) All trucks with swivel type bunks shall have bunk locks or an equivalent system of holding the bunks in place while loading logs.

(12) The bunks or bolsters of any truck or trailer shall be either curved upward or straight. Bunks with ends lower than their centers are prohibited.

(13) Sufficient clearance between the bunk and bunk rider shall be maintained to prevent bunk binding.

(14) Trailer bunks shall be provided with a false or tilt bunk. The channel of the bunk shall be kept reasonably free of debris.

(15) Stakes and stake extensions shall be installed and maintained so that the angle between bunks and stakes (and extensions if used) shall not exceed ninety degrees when loaded.

(16) Frames, reaches, bunks and running gear of log trucks shall be maintained free of cracks, breaks and defects. If defects are found, they shall be immediately repaired or the part replaced.

[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 296-54-575 Motor truck log transportation---Stakes, stake extensions and chock blocks. (1) Trucks and trailers shall be equipped with bunk stakes or chock blocks of strength and sized material to perform their intended function.

(2) Stake extensions shall not be used unless all component parts of the bunking system are of sufficient size and strength to support the added stresses involved. Stake extensions shall be secured by safety chains or other devices to prevent their accidental displacement.

(3) 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.

(4) Stake chains or cables shall be equal to or better than "high test" steel chain or "plow steel" wire rope, and shall be of a size necessary to meet the requirements

of a safe working load of not less than 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 6 x 19 and 6 x 37 construction meet this requirement.)

(5) Bunk chains containing cut, cracked, excessively worn, or otherwise defective links, shall be immediately removed from service. Molles, cold–shuts (welded or otherwise), or bolts are not permitted in bunk chains.

(6) The use of frayed, stranded, or otherwise defective wire rope for chock block cable or stake straps is prohibited.

(7) Only chain links approved for welding (and properly welded) or approved repair links which will develop a strength equivalent to the chain, are permissible for repairs or attachments to stake chains or binder chains.

(8) Chains or cables used to secure stakes or chock blocks shall be secured in a manner which will not necessitate hammering directly on them to release the stakes or blocks. Keyhole slots and similar methods of securing chains are prohibited.

(9) Deformed or defective stakes, stake securing or stake locking devices, or bunks shall be immediately repaired or removed from service.

[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 Motor truck log transportation—Wrappers and binders. (1) On log trucks equipped with stakes, the following requirements shall apply:

(a) In the hauling of a one log load, one wrapper chain or cable shall be required and secured to the rear bunk. The log shall 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 shall be used to secure the load. The logs shall 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 shall be secured by not less than two properly spaced wrapper chains or cables. Ends of short logs not secured by such wrappers shall be secured with extra wrappers. If any log is over forty–four feet in length, the load shall 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, shall 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, shall be secured by not less than three properly spaced wrappers.

(2) On log trucks equipped with chock blocks, the following requirements shall 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 shall 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 subdivisions (1)(c) and (d) of this section.

(3) In the case of short logs loaded crosswise, the following method of securing the load shall 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 shall be used at each open end of the vehicle and the load shall be held with at least two wrapper chains or cables. The wrappers shall 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 shall be either rigidly connected to the bed of the truck or trailer or shall be placed in a tight–fitting socket at least 12 inches in depth. Other means furnishing equivalent security may be acceptable.

(4) When two wrappers are required, they shall be applied within six feet of the front and rear bunks. When more than two wrappers are required, the front and back binder shall be applied within six feet of the front and rear bunks.

(5) To properly secure short logs, binders shall be placed near the end, not less than twelve inches from the end of the log.

(6) No log loaded on top or in outside saddles of a load shall be transported unless secured by not less than two wrapper chains or cables, one of which shall be placed near each end of such log.

(7) All wrappers and binders shall 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 loads, shall entirely surround the load. This does not apply to gut–wrappers.

(9) Gut–wrappers, when used, shall be adjusted so as to be tightened by, but not carry the weight of the logs above them.

(10) A warning shall be given before throwing wrappers over the load and care shall be taken to avoid striking other persons with the wrapper.

(11) Wrappers and binders shall be placed and tightened around the completed load before the truck leaves the immediate 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 shall 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, shall have a minimum breaking strength of not less than fifteen thousand pounds and shall 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.)

(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 shall 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 shall be fitted with hooks of proper size and design for the wrapper chain being used.

(18) Wrappers shall 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;

(d) Frayed, stranded, knotted, or otherwise defective wire rope.

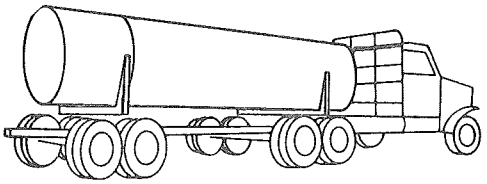
(19) Pipe extension handles (swedes) for tightening or securing binders shall be limited to not longer than thirty-six inches. Care shall be taken that a sufficient amount of the pipe extends over the binder handle.

(20) Defective binders shall be immediately removed from service.

Note: See Figures 9-A and 9-B for illustrations of placement and number of wrappers.

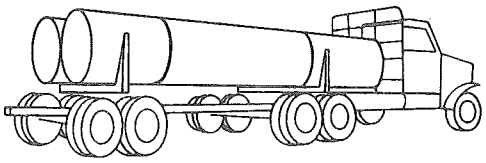
PLACEMENT AND NUMBER OF WRAPPERS

One Log Load



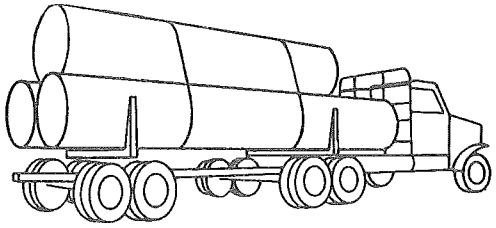
One wrapper required which shall be secured to the rear bunk. The log shall be blocked or secured in a manner to prevent it from rolling or shifting. An additional wrapper secured to the front bunk is optional.

Two Log Load



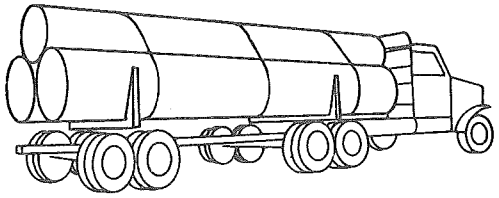
A minimum of two wrappers required. Logs shall be blocked to prevent them from rolling or shifting. If all logs are not contained by the stakes, additional wrappers required.

Three Or Four Log Load 44 Ft. Or Less



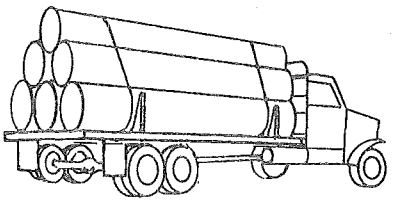
A minimum of two wrappers required. If all logs are not contained by the stakes, additional wrappers required.

Three Or Four Log Loads More Than 44 Feet



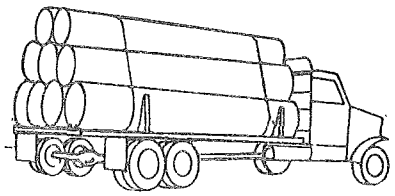
A minimum of three wrappers required. If all logs are not contained by the stakes, additional wrappers required.

Five Or Six Log Load
All Logs 17 Feet Or Less



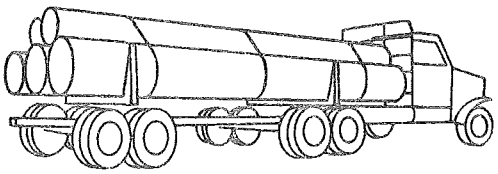
A minimum of two wrappers required. If all logs are not contained by the stakes, additional wrappers required.

Seven Or More Log Load
All Logs 17 Feet Or Less



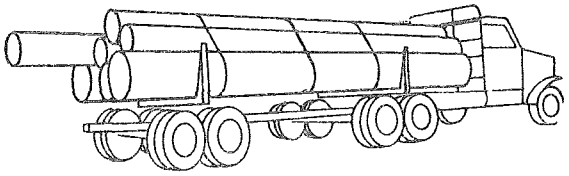
A minimum of two wrappers required. If all logs are not contained by the stakes, additional wrappers required.

Five Or More Log Load
If Any Logs Are More Than 17 Feet



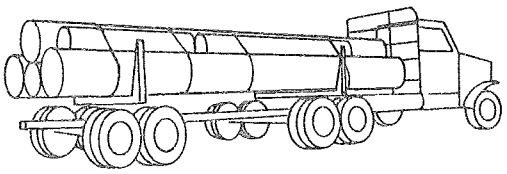
A minimum of three wrappers are required. If all logs are not contained by the stakes, additional wrappers required.

Proper Support For Logs



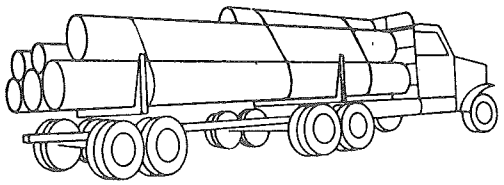
Not more than approximately one-third the weight of any log shall extend beyond the end of the logs or bunk supporting it.

Outside Logs Or Top Logs



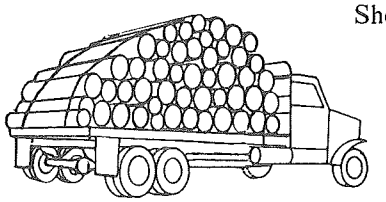
All outside (wing) or top logs shall be secured by a wrapper near but not within 12 inches of each end.

A Wrapper Shall Be Near Each Bunk



Each load shall be secured by having a wrapper within 6 feet of each bunk except on one log loads.

Short Logs Loaded Crosswise



A minimum of two wrappers are required and two chocks or stakes shall be used on the open end of the truck.

Note: All loads of logs on logging trucks equipped with chock blocks instead of stakes, shall have at least one additional wrapper over and above the requirements for trucks equipped with stakes, excepting on one and two log loads and trucks with short logs loaded crosswise.

[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 Motor truck log transportation--Miscellaneous requirements. (1) No truck wheel shall have more than twenty-five percent of the lugs missing or defective.

(2) All truck wheels shall be maintained free of cracks, breaks, or defects.

(3) Windshields on all equipment shall be provided with windshield wipers in good working condition.

(4) Mule train trailers shall have a platform on the trailer tongue at least twelve inches by twenty-four inches made of nonslip material and capable of supporting at least three hundred pounds. The platform shall be of the self-cleaning type.

(5) Logs shall be loaded so that not more than approximately one-third of the weight of any log shall extend beyond the end of the logs or bunk supporting it.

(6) Trailer loading and unloading straps, links, or chains shall be fastened securely to the trailer frame and used in hoisting the trailer. The connections shall be maintained in good condition and shall not be attached to the trailer bunk. The use of molles for this purpose is prohibited.

(7) In unloading trailers from trucks, trailers shall 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.

(8) Trailer hoisting or unloading straps shall be constructed and installed in a manner enabling the loading or unloading machine to engage the strap without manual personal contact.

(9) All motor vehicles shall be equipped with a horn that is audible above the surrounding noise level. The horn shall be sounded before operating the vehicle in reverse gear and sounded intermittently during the entire backing operation. The horn shall be maintained in an operative condition.

[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 Motor truck log transportation--Steered trailers. Steered trailers, not controlled from the truck cab, shall be designed, constructed, and operated as follows:

(1) A secure seat with substantial foot rest shall 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 shall be so arranged that he has an unobstructed exit from both sides and the rear.

(3) The bunk support shall be so constructed that the operator has a clear view ahead at all times.

(4) Adequate means of communication shall be provided between the operator and the truck driver.

(5) Eye protection and respirator shall be provided for the operator.

(6) The trailer shall 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 shall be equipped with head, tail, turn and stop lights.

[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 296-54-583 Stationary log truck trailer loading. (1) All loading devices shall be designed, constructed, and maintained in such a manner as to have a five to one safety factor for its rated load capacity.

(2) Loaders shall be constructed of such height and width that they can be safely used to load the maximum-sized trailers they will be expected to handle without hanging up or striking the equipment.

(3) Electric-powered trailer loading devices shall be equipped with a switch or device which will govern the upper direction of travel of the load line to a safe limit.

(4) Electric motors used for hoisting purposes shall be equipped with approved overload switches or breakers.

(5) All electrical switch controls shall not exceed twenty-four volts. All control switches shall be of the momentary contact type which require continuous manual pressure for hoist to operate.

(6) Pendent-type control switches shall be suspended by a chain or other suitable device which will prevent placing a strain on the electrical cable.

(7) Pendents shall be so installed that when retracted the control switch shall not touch the ground.

(8) All electrical equipment shall be weatherproof-type or adequately protected from the weather, and shall 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-frame type or bridge crane, shall be equipped with reach guides or devices which will keep reach in proper alignment. A tag rope or other safe guidance device shall be used to guide trailers being loaded by use of an A-frame type loader.

(10) Access roads and the area around the trailer loading devices shall be kept free of standing water and debris and maintained in good repair.

(11) The maximum capacity load to be lifted shall be posted in a conspicuous location where it can be easily seen by any person operating the hoist.

(12) Trailer loading equipment shall be periodically inspected at least every thirty days and shall be maintained in good repair. A written report shall be made and signed by the person making the inspection and kept on file by the company for twelve months.

(13) A lifting test shall be conducted annually on each loading device and a written record showing the date, name of person conducting the test, amount of weight lifted and results shall be kept in the office of the employer or at the site. The test weight shall be at least one hundred twenty-five percent of the maximum rated load but not more than one hundred thirty percent of the maximum rated load.

(14) Each drum shall 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 shall be installed which shall have the capability of safely braking and holding one and one-half times weight of the full rated load.

(16) When trailers are to be loaded after dark, sufficient lights shall be provided for a safe operation.

[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 296-54-585 Log unloading, booms, and rafting grounds--Storage and sorting areas--General requirements. (1) At no time shall one person be permitted to work alone.

(2) (a) Employees working on over or along water, where the danger of drowning exists, shall be provided with and shall wear approved personal flotation devices.

(b) Employees are not considered exposed to the danger of drowning when:

(i) The water depth is known to be less than chest deep on the exposed individual;

(ii) When working behind standard height and strength guardrails;

(iii) When working inside operating cabs or stations which eliminate the possibility of accidentally falling into the water;

(iv) When wearing approved safety belts with lifeline attached so as to preclude the possibility of falling into the water.

(c) 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.

(d) To meet the approved criteria required by subdivision (a), 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.

(3) In operations where regular logging machinery, rigging, etc., is used, the applicable sections of these rules shall apply.

(4) Artificial lights shall be provided and used where work is to be done between the hours of sunset and sunrise. Such lights shall be located in a manner that will be reasonably free of glare and provide uniform distribution of illumination and avoid sharply defined shadows.

(5) On all log dumps, adequate power for the method used for unloading shall be provided. All machines used for hoisting, reloading or lowering purposes shall be of approved design and sufficient power to control or hold the maximum load imposed in mid-air.

(6) Binders shall not be released from any load until an effective safeguard is provided.

(7) All mobile log handling machines shall be equipped with a means or mechanism which will prevent the logs from accidentally leaving the forks, and shall be used.

(8) The operator of the unloading machine shall have an unobstructed view of the unloading area or shall make certain no one is in the area where the logs are to be unloaded. Rearview mirrors shall be installed on mobile log handling equipment to assist the operator in ascertaining that the area behind the machine is clear before backing up.

(9) Unloading lines shall be so arranged that it is not necessary for the workman to attach them on the pond or dump side of the load.

(10) Life rings with a minimum of ninety feet of one-fourth-inch line with a minimum breaking strength of five hundred pounds attached, shall be provided at convenient points adjacent to water which is five feet or

more in depth. Life rings shall 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 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-585, filed 9/21/79.]

WAC 296-54-587 Water dumps. (1) All water dumps shall have brow logs except when logs are lifted from the load. If portable equipment is used, adequate stops shall be provided to prevent equipment from running off the dump.

(2) Where necessary for persons to walk alongside loads and equipment on trestles or fills, a minimum twenty-two inch wide walkway shall 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 shall 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 shall be barked on upper side.

(5) Electric powered hoists using hand-held cord remote controls in grounded locations, shall be actuated by circuits operating at no more than twenty-four volts. All control switches shall be of the momentary contact type which requires continuous manual pressure for the hoist to operate.

(6) Roadbeds at log dumps shall be hard packed gravel, heavy planking, or equivalent material, and shall be of sufficient width and even surface to insure safe operation of equipment.

(7) Where logs are unloaded on to rollways, sufficient space shall 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 shall be provided to prevent logs from leaving the loads on the side opposite the dump. Unloading lines, crotch lines or equally effective means shall be arranged and used in a manner to prevent any log from swinging or rolling back.

(10) All persons shall remain in the clear until all moving equipment has come to a complete stop.

(11) Logs shall 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 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-587, filed 9/21/79.]

WAC 296-54-589 Boom and rafting grounds. (1) Breaking of log jams by peavy method is prohibited, except in river drive or when jam occurs away from mechanical means or the dump.

(2) Wooden pike poles shall be of continuous, straight-grained No. 1 material. Defective poles, blunt or dull pikes shall not be used. Conductive pike poles shall not be used where there is a possibility of coming in contact with energized electrical conductors.

(3) Stiff booms shall be made by fastening not less than two boom sticks together. The width of a stiff boom shall be not less than thirty-six inches measured outside to outside of the logs. The boom sticks shall be fastened together with not less than 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 shall be kept free of loose bark and shall be maintained in good repair.

(4) A walkway thirty-six inches wide with standard hand railing shall be provided from the shore end of stiff boom to shore.

(5) All sorting gaps shall have a substantial stiff boom on each side of gaps. Such stiff booms or walkways shall be planked over.

(6)(a) Boom sticks shall be reasonably straight with no protruding knots or loose bark. They shall be capable of supporting above the water line at either end the weight of one worker and equipment or two hundred fifty pounds.

(b) Foot logs shall be reasonably straight with no protruding knots or loose bark and shall be of sufficient size to support above the water line at either end the weight of two workers and equipment or five hundred pounds.

(7) Boom sticks which have been condemned as unsafe shall be marked by three chopped crosses ten feet from the butt end, and such sticks shall not be used as boom sticks.

(8) Gaps between boom sticks shall not exceed twenty-four inches. All wire shall be removed from boom sticks and boom chains before they are re-used or hung in rafting stalls.

(9) When permanent cable swifters are used they shall be arranged so that they are within easy reach of rafter without rolling boom sticks on which they are fastened. When cables become hazardous to use because of jaggers, they shall be discarded.

(10) When floating donkeys or other power-driven machinery is used on boom, it shall be placed on a raft or float with enough buoyancy to keep the deck of such raft or float well above water. Wherever persons walk, the deck of the raft or float shall be planked over with not less than two inch planking, and kept in good repair.

(11) When doglines used in rafting, brailing or stowing logs become hazardous to use because of jaggers, they shall be discarded.

(12) Storing, sorting or any boom work, other than boom boat operations, shall require a minimum of two persons.

(13) Sufficient walkways and floats shall be installed and securely anchored, to provide safe passage for workers.

(14) Walkways alongside sorting gaps shall not be less than four feet wide. Other walkways shall be not less than twenty-two inches wide.

[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 296-54-591 Boats and mechanical devices on waters. (1) 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) 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, 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)(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) Where work is assigned over water where the vertical drop from an 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 installations 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.

(9) Log broncs, boomscooters, and boomboats shall not be loaded with personnel or equipment so as to adversely affect their stability or seaworthiness.

(10) Boats shall not be operated at an excessive speed or handled recklessly.

[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 Dry land sorting and storage. (1) Unauthorized foot and vehicle traffic shall not be permitted in the sorting or storage area.

(2) Logs shall be stored in a safe and orderly manner. Roadways and traffic lanes shall be kept clear of protruding ends of logs and debris.

(3) Dry deck log storage areas shall be kept orderly and maintained in a condition conducive to safe operation of mobile equipment. Roadways and walkways shall have a smooth hard-packed surface wide enough to permit a safe operation. Bark, mud, and other debris shall not be allowed to accumulate to the extent it constitutes a hazard to the operation.

(4) At log dumps, sorting and storage areas, an effective means shall be provided and used to control dust.

(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 shall be used at all times.

(7) Unnecessary talking to operator while engaged in operating controls of log stacker or log unloader is forbidden.

(8) Lift forks and arms of unloading machines shall be lowered to their lowest position, and all equipment brakes set prior to the operator leaving his machine unattended.

(9) Log unloaders or stackers shall not be moved about the premises for distances greater than absolutely necessary with the lift extended above the drivers head or with loads lifted higher than is necessary for vision.

(10) When truck drivers are out of the cab, they shall 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 means of unloading lines, a mechanism shall be used which is self-releasing. Employees shall be prohibited from ascending dry decks to release unloading lines.

(12) Persons shall not position themselves in the hazardous area near or under loads of logs being lifted, moved or suspended.

(13) Jackets or vests of fluorescent or other high visibility material shall be worn by persons working on dry land log storages. Hard hats shall be of a contrasting color or shall have high visibility tape affixed thereon.

(14) Log unloaders and log stackers designed in a manner whereby logs being handled may jeopardize the safety of the operator shall be provided with overhead protection and any other safeguards needed to afford adequate protection.

(15) Log unloaders and log stackers shall be equipped with a horn or other audible warning device. If vision is impaired or restricted to the rear, the warning device shall be sounded before operating the vehicle in reverse gear and sounded intermittently during the entire backing operation. The warning device shall be maintained in an operative condition.

(16) Each log–handling machine shall be equipped with a braking system which is capable of stopping and holding the machine with maximum load on any grade on which it may be required to work.

(17) A limit stop, which will prevent the lift arms from over–traveling, shall be installed on electric powered log unloaders.

(18) Shear guards shall be installed on unloading machines and similar types of equipment on which the arms pivot and move alongside the operator creating a pinch point at that location.

(19) All forklift type machines shall be equipped with grapple arms and the arms shall be used whenever logs are being moved.

(20) When log trucks are loaded by the use of a log stacker and the lay of any log is higher than the stakes, the log stacker shall 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.

(21) All binders and wrappers shall 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, shall 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 and wrappers. At least one binder shall remain secured while relocating or tightening other binders. Crotch lines, forklifts, log stackers, log unloaders, or other effective means shall be used for this purpose.

(22) An extra wrapper or metal band of equal strength shall be placed to hold the logs when it is necessary to remove a wrapper to prevent it from being fouled by the unloading machine.

(23) Machines of the type having arms which block the regular exit when in the up position, shall have an emergency exit installed.

(24) Seat provided. Riding on any part of a log handling machine except under the canopy guard is prohibited.

(25) Identification tags shall not be applied or pulled unless logs are resting in a stationary place, such as bunks, cradles, skids, or sorting tables.

(26) No person shall approach the immediate vicinity of a forklift–type log handling machine without first notifying the operator of his intention and receiving an acknowledgement from the operator.

(27) When forklift–type machines are used to load, unload, or handle trailers, a positive means of holding the lifting attachment to the fork shall be installed and used.

(28) When dry land log dumps use unloading methods similar to those of water dumps, the safety standards for water dumps shall apply to dry land dumps.

(29) When logs are handled between the hours of sunset and sunrise or other periods of poor visibility, illumination shall be provided consistent with chapter 296–62 WAC, general occupational health standards, pertaining to illumination.

(30) Air operated stake releases shall be in conformity with the following requirements:

(a) The air supply shall 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 shall be located in the cab, positioned so that it is accessible only from the operator's position.

(c) The control valve shall be fitted with a spring loaded cover or be otherwise guarded against inadvertent operation.

(d) A separate air line shall extend from the control valve to the tractor and trailer stake release chambers. The air line shall be clearly identified or installed in such a manner as to preclude it from being mistaken for the service or emergency air line.

[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 296–54–595 Railroad operations. (1) All persons employed in any service on trains or rail operations, which are not engaged in interstate commerce, are subject to and shall be conversant with all rules and special instructions.

(2) Employees must render every assistance in their power in carrying out these rules and special instructions and must report to the proper official any violation thereof.

(3) Accidents, detention of trains or speeders, failure in supply of fuel or water, defects in track, bridges, or signals, must be properly reported to the supervisor by the quickest possible method.

(4) Any logging railroad may maintain a special set of operating rules applicable to their operation, provided that said rules are acceptable to the division of industrial safety and health, department of labor and industries.

(5) Each logging railroad operation which has more than one piece of railroad equipment in operation, must have a dispatcher on duty. All equipment must receive clearance from dispatcher.

(6) Train crew size shall be dependent upon the number of persons needed to safely operate the train under all prevailing conditions; however, when necessary to set hand brakes, two or more persons shall be assigned to set the brakes and give signals.

(7) All locomotives shall be equipped with sanding devices for both rails, front and rear, in proper working order. Clean, dry sand should be used.

(8) Locomotives shall be equipped with power brakes (air or steam) on all driving wheels. Tenders also shall have power brakes.

(9) All locomotives and speeders, operating between sunset and sunrise or other periods of reduced visibility, shall be equipped with and use head lights which shine in the direction of travel. The lights shall be of sufficient candlepower so the train can be stopped within range of the light beam. Cab lights shall be provided and maintained so the operators can see from their required positions the gauges and equipment necessary for operation.

(10) All locomotives shall be equipped with proper grab irons, hand holds, steps, and running boards.

(11) All locomotives shall be equipped with automatic couplers, suitable for low or high draw-bars.

(12) On all rolling stock, wheels which have sharp or badly worn flanges, shall be replaced. Avoid the use of flat wheels.

(13) All locomotives with tender shall have an apron of proper length and width to insure safety and which shall be roughened to insure secure footing.

(14) Handholds and footboards shall be provided on locomotive cranes, except where cab overhangs end of car.

(15) Trains and speeders shall not exceed a safe speed.

(16) A terminal test of air brakes shall be made by trainmen before leaving the terminal. Enginemen shall not proceed until they are satisfied by brake action that brakes are able to control the train.

(17) All of the cars in a train shall have their brakes in good operating condition.

(18) On railroads where joint operations of two or more firms are necessary, trains shall not be dispatched less than fifteen minutes apart. Red lights shall be displayed on the rear of such trains at night or when visibility is poor.

(19) Whenever cars are left on grades, derailers shall be provided. Derail signs shall be placed near derailers. In setting out equipment, care shall be used in seeing that proper clearance is provided.

(20) 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 insure quick releasing of brakes and recharging of auxiliaries. Engineer shall see that his 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 shall 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.

(21) When it is necessary to leave loads on pass while switching a side, loads must be left close to derailer, air set and sufficient hand brakes set up, before cutting engine from train.

(22) Enginemen must see car or signalman when making couplings, giving trainmen ample time to align drawheads and open knuckles of coupler, especially on curves, except when using radios.

(23) Drawbars should not be aligned with the foot while cars or engines are in motion. Trainmen shall not climb between cars while in motion. Enginemen shall not drift too close to switches which are to be thrown. Position of switch points should always be observed after throwing switch. Switch lever should be pushed firmly into the notch before leaving the switch. No persons except trainmen, unless authorized, shall ride on engine foot-boards. No object shall be thrown from train or engine while in motion. Bell shall be rung or whistle blown, before moving locomotive.

(24) No equipment shall be pushed ahead of locomotive unless a brakeman is on head car in constant view of engineer or second brakeman in position to intercept and pass signal to engineer.

(25) In addition to air brakes, hand brakes must be provided on all cars and maintained in good working order.

(26) Hand brakes must be easily accessible to brakemen 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 brakemen shall be on the hand brake side.

(27) All brake hickeys shall 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 brakeman's hand.

(28) All railroad trucks and cars, where brakes are set by hand while in motion, shall have good footboards and toeboards on the brake end.

(29) A ten inch bunk block is recommended on all trucks to prevent logs from slipping over block.

(30) All cars other than logging trucks must have hand hold and foot steps to permit persons to get on and off easily and safely.

(31) All cars and trucks regularly operated must have automatic couplers.

(32) Locomotives and cabooses shall carry the following equipment:

1 red light (lantern type)
3 red flags
At least 3 fuses

(33) 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.

(34) Whistle sign board shall be placed one thousand two hundred feet from each side of highway crossings.

(35) A rail clamp shall be placed to hold cars left on a grade on main line or spurs.

(36) All cars and trucks shall be legibly numbered so that those with defects may be reported and taken out of service. Each locomotive, speeder, or other self-propelled

vehicles shall be numbered, or otherwise made readily identifiable.

(37) All cars used for hauling logs shall be equipped with patent stake bunks, or bunks with chock blocks and/or chains, so constructed that block can be released from opposite end of bunk unless solid stakes are used.

(38) All main line trains of more than ten loaded cars shall have a caboose at the rear of the train.

(39) All operations having both truck roads and railroads, shall post signs at intersections same as public crossings.

Engine whistle signals. 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 shall be sounded when approaching camps, junctions, grade crossings and other prescribed places in conformity with 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 derailers. When standing, air leak.
Six long	(––––––) Repeated at intervals, call for section men, train derailed.
One long, three short	(–ooo) Flagman to go back and protect rear of train.
Four long	(––––) Foreman.
Five long	(–––––) Flagman to return from any direction.
Long, short	(–o–o–o) Repeated four or more times, fire alarm.
Seven long, two short	(–––––––oo) Repeated, man 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 49.17.040, 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 296-54-597 Railroad maintenance--Loading or unloading. (1) Track gangs, bridge crews, etc., when working on railroads in use shall place a yellow caution flag by day and a yellow lantern by night a sufficient distance both directions from the crew to protect them against approaching equipment. The operator of said equipment shall acknowledge the signal by two short blasts of the whistle or horn and proceed with caution.

When said crews are removing or replacing a rail or are performing any other work that would make it necessary for approaching equipment to come to a stop, they shall place a red flag by day and a red lantern by night in the center of the track a sufficient distance in both directions from the crew to protect them against said equipment. The operator of approaching equipment shall acknowledge the signal by one short blast of the whistle or horn and shall come to a dead stop and remain standing until the signal is removed by the person who placed it, or until investigation proves that the track is safe for passage. If a flagman is used, the above provision need not apply.

(2) Where clearance is scant, warning signs or signals shall be posted.

(3) Switch throws should be kept well oiled and targets and signs in good legible condition.

(4) Standard clearances shall be maintained at all points on the right of way except where necessarily restricted where loading or unloading operations are performed or at water tanks, fuel tanks, etc. Warning signs shall be posted at all such locations.

(5) Whenever workmen are repairing, 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; proper means, methods or safeguards shall be used to protect such workmen. A derail shall be used to prevent other rail equipment from contacting such cars or equipment or endangering the workmen. After cars are spotted, blue flags shall be placed in the center of the tracks at least fifty feet from the end car during the day and blue lights shall be installed at such locations at night. Flags, lanterns and derails shall 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 shall be responsible to ascertain that they are in place and he shall not remove such safeguards until he investigates to make certain all persons are in the clear. Operators of approaching equipment shall not pass or remove a flag or lantern which is properly posted. Cars or other equipment shall not be placed where it will obscure the signal from an operator controlling approaching equipment.

[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 296-54-599 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 the 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 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-599, filed 9/21/79.]

WAC 296-54-601 Signals and signal systems. (1) Standard hand or whistle signals as described or illustrated herein, shall 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 Figure 4.

(2) Voice communications may be used for 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, providing no person 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, providing the grapple is on the ground prior to the setting of the choker and that no lines are moved by the operator until the person setting the choker has returned to a safe location away from any running lines. At no time shall chokers be used on the grapple system during the hours of darkness or during periods of reduced visibility to such extent that the yarder operator cannot clearly see the workmen setting the choker. When a number of logs are required to be yarded by using chokers instead of the grapple, the requirements specified for high lead type of logging shall apply.

(c) Voice communications by use of radio frequencies may be used to transmit instructions and directions to the yarder operator when using a balloon system for yarding. The person operating the radio shall ascertain that all crew members are in the clear before transmitting instructions which would cause any line or turn to move. The person giving such instructions shall keep the crew members informed as to which movements will commence. The whistle shall be blown before moving any running line.

(d) The Federal Communications Commission rules require that assigned call letters be used in conjunction with voice communications.

(3) Voice communications on the same radio frequencies used to transmit skyline, highlead, slackline, or skidder whistle signals (154.57 and 154.60 MHz channels), shall be prohibited.

Note: If voice is received on 154.57 or 154.60 MHz channels, it is recommended the Assistant Director, Department of Labor and Industries, Division of Industrial Safety and Health, P.O. Box 207, Olympia, Washington 98504, (Phone 206/753-6500) be contacted as soon as possible to enable the department to ascertain the source of the voice transmission.

(4) 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 so developed shall be understood by all persons required to work in the area which may be affected by their use.

(5) A copy of the standard hand and whistle signals shall be posted on the yarder and at places where crews congregate. For tractor logging operations, hand signals shall be posted at places frequented by the crew members such as in crew buses, etc.

(6) Only one workman in any crew shall give signals at the point where chokers are being set. Any person is authorized to give a stop signal when a workman is in danger or other emergency condition is apparent.

(7) Hand signals are permitted only when the signal person is in plain sight of the machine operator and when visibility is such that the signals are discernible. Hand signals may be used at any time as an emergency stop signal.

(8) Throwing of any type of material as a signal is prohibited.

(9) The use of a jerk wire signal system for any type of yarding operation is prohibited.

(10) All persons shall be in the clear before any signal is given to move the rigging, logs, or turns, and movement of rigging, logs, or turns shall not commence until after the proper signals have been given.

(11) Machine operators shall not move any line unless the signal received is clear and distinct. If in doubt, the operator shall repeat the signal as understood and wait for confirmation.

(12) A horn or whistle which is automatically activated by the radio or electric signaling system shall be used on each yarder used for skyline, high lead, skidder or slackline system of yarding, except where hand signals are permissible. The horn or whistle shall emit a sound which will be clearly audible to all persons in the affected area. Such a horn or whistle shall also be 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) Each unit of the signal or control system in use, shall be tested daily before operations begin. Audible signals used for test purposes shall not include signals used for the movement of lines or materials.

(14) Citizen band (CB) radios shall not be used to activate any signal, machine, or process, either automatically or by voice. This shall not prohibit the use of CB radios for communication between sides, vehicles, work units, or for emergency situations.

(15) 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 shall be so differentiated as to distinctively identify any intended work movement of either machine.

[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 wire and attachments shall be of the weatherproof type and all connections shall be weatherproof.

(2) Electric signal systems shall be properly installed and adjusted. They shall be protected against accidental signaling and shall be maintained in good operating condition at all times. Sufficient signal wire shall be provided to enable good voice contact between the whistle punk and rigging crew at all times.

[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 296-54-605 Radio systems used for voice communication, activation of audible signals, or equipment. (1) Every employer who uses a radio signaling or control system (voice or functions) shall comply with or exceed the minimum requirements specified in this section.

(2) A valid operating permit shall be obtained by the owner from the division of industrial safety and health, department of labor and industries, prior to putting into use any radio signaling or control system (voice or functions) intended to be used in conjunction with any type of cable logging operation. Permits will be issued only for systems licensed for such use and using those carrier frequencies as authorized by the Federal Communications Commission. In addition, 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 contained in this safety standard.

(3) The division of industrial safety and health reserves the right to designate the use of radio frequencies for certain purposes or functions, for example, certain frequencies may be used for voice transmission of instruction, others for tone coded functions, or activation of signaling devices. No single tone sets shall be permitted for logging purposes. The division 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.

(4) A list of tone frequencies which may be used with any Federal Communications Commission assigned carrier frequencies will be made available by the division of industrial safety and health to any interested person, firm, or corporation upon request.

(5) The division of industrial safety and health shall assign the area or areas in which a radio signaling system may be used and shall so mark on the permit. Radio signaling systems shall not be used in any area other than indicated on the permit. (See Figure 10 for map of areas.)

(6) The person or firm name on the permit shall 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 shall be responsible for the radio signal system as if they were the owner of the set. The application for a permit to use a radio signaling system shall contain the following information:

(a) Name and address of applicant.

(b) The radio frequencies of the radio signaling device in MHz.

(c) The tone frequency or frequencies of the radio signaling system used to activate a horn, whistle, or control equipment in Hz. The security gate, or pulse tone, shall 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) Indicate 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 system.

(7) The permit granted by the department shall be attached to the case of the receiver of the radio signaling system for which it is granted.

(8) Each radio receiver shall have its radio carrier frequency in MHz and tone frequency(s) in Hz indicated on the outside case of the receiver. The manufacturer's name and serial number shall also be permanently indicated on the outside of the case. When the duration or width of the tone frequencies performs a function, the one duration/width shall also be permanently indicated on the outside of the receiver case. Each transmitter shall be identified with its receiver. Two or more receivers in operation simultaneously on the same tone frequency shall be prohibited.

(9) It shall be the responsibility of the owner of any radio signaling system to notify the division of industrial safety and health, 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).

(d) Stolen (date).

(10) Two operable transmitters shall be carried by separate individuals at the point where chokers are being set at all times when transmitters are being used for tone signaling by persons around the live rigging in the choker setting area. Only one radio transmitter shall be required if in the possession of a signalperson who has no other duties and remains in an area where there are no hazards created by the moving rigging or logs. If the total crew consists of a yarder operator and one person in the rigging, only one transmitter is required provided a positive system is instituted and used to check on the well-being of the person in the rigging.

(11) When interference, overlap, fadeout, or blackout of radio signals is encountered, the use of the device shall be discontinued immediately. The use of the device shall not be resumed until the source of trouble has been detected and corrected.

(12) 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.

(13) At least one make and model of each signaling system shall be tested and certified that it meets or exceeds the minimum requirements for performance as specified in WAC 296-54-607. A copy of such performance report shall be signed by the person or persons who tested the unit or components and shall be sent to the Division of Industrial Safety and Health, Department of Labor and Industries, P.O. Box 207, Olympia, Washington 98504.

(14) Radio equipment shall not be used without displaying a permit as required by this standard. The permit shall be prominently displayed on the outside case of the receiver of the unit or, for radio controlled carriages, on the transmitter in the yarder.

(15) Adjustments, repairs, or alterations of radio signaling devices shall be done only by or under the immediate supervision and responsibility of a person holding a first-class or second-class commercial radio operator's license, either radio-telephone or radio-telegraph, issued by the Federal Communications Commission. Persons who do not possess the technical ability or do not have the proper equipment to cause the signaling systems to function within required tolerances shall not attempt to repair, alter, or adjust such systems.

(16) Radio frequencies assigned to systems for which voice communications may be used to give signals to the yarder operator, shall not be the same frequencies as those assigned for whistle signals used in skyline, highlead, slackline, or cable skidder systems.

(17) 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 shall be immediately discontinued until the problem of interference has been corrected.

(18) Before moving any unit from one assigned geographical area to another (see area map, Figure 10 following this section), a new permit shall be applied for and secured from the Division of Industrial Safety and Health, Department of Labor and Industries, P.O. Box 207, Olympia, Washington 98504.

Form No. 157. 3-71

STATE OF WASHINGTON

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

3

Figure No. 10

STATE OF WASHINGTON
DEPT. OF LABOR & INDUSTRIES DIV. OF SAFETY

PERMIT #

TO OPERATE MULTI-TONE RADIO SIGNAL SYSTEM IN DESIGNATED AREA.

Model . . Serial ....

Carrier Frequency .... MHz

Tones . . . . Hz

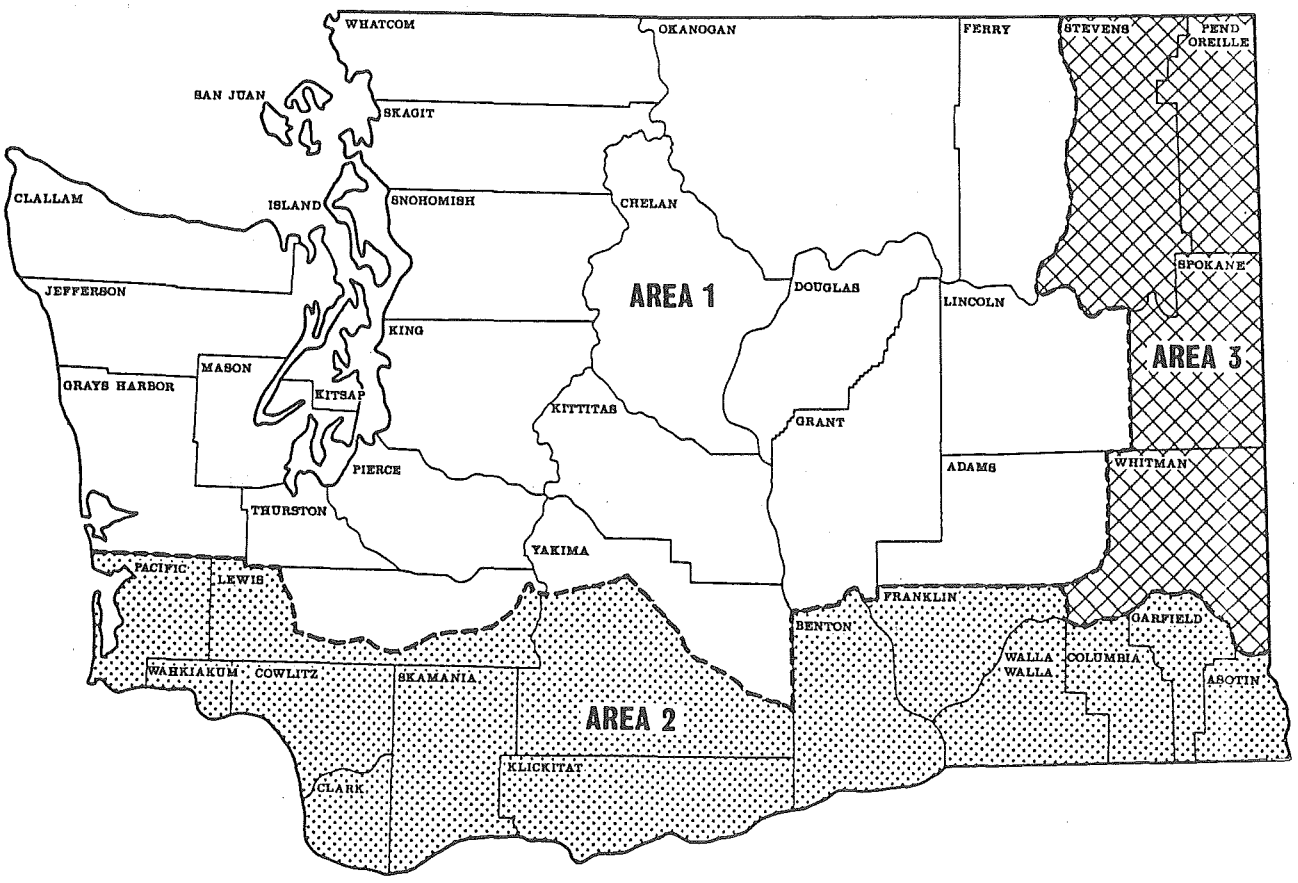
AREA

Firm Name . . ..

Issued by ....

S. F. No. 158—12-71—25C. 38416.

AREAS FOR USE OF RADIO SIGNALING SYSTEMS FOR LOGGING OPERATIONS



State of Washington
Department of Labor and Industries
Division of Industrial Safety and Health

A permit issued by the division of industrial safety and health 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: Chapter 49.17 RCW. 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 for the first time after the effective date of these rules shall meet or exceed the following requirements, specifications, tolerance, and tests and such systems, when altered or repaired, shall meet the same minimum requirements.

(1) Radio-signaling systems used to transmit whistle signals or control functions of equipment associated with skyline, highlead, slackline, or cable skidder systems of logging shall transmit and decode only by the use of authorized multi-tone frequencies. Only sequential tones may be used to transmit signals or control equipment when utilizing carrier frequencies of 154.57 or 154.60 MHz.

(2) The receiver sensitivity shall be capable of attaining .6 microvolt, or greater, for 12 db SINAD ratio for VHF frequencies and .7 microvolt, or greater, for UHF frequencies. Effective January 1, 1984, all radio systems receiver sensitivity shall be capable of attaining .4 microvolt, or greater, for 12 db SINAD ratio for VHF frequencies and .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 in accordance with WAC 296-54-605(15).

(3) The receiver spurious attenuation shall be at least 40 db when measured by the 20 db quieting method. On all new radio systems put into service after the effective date of these standards, the receiver spurious attenuation shall be at least 60 db when measured by the 20 db quieting method. Effective January 1, 1984, all new radio signal systems shall be required to have receiver spurious attenuation of at least 70 db when measured by the 20 db quieting method and shall have image response attenuation of 60 db when measured by the 20 db quieting method. Effective January 1, 1989, all radio signal systems shall be required to have receiver spurious attenuation of at least 70 db when measured by the 20 db quieting method and image response attenuation of 60 db when measured by the 20 db quieting method.

Note: 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.

(4) The receiver selectivity shall be more than 40 db plus or minus 30 KHz. All new radio signal systems put into service after the effective date of these standards, the receiver selectivity shall be at least 60 db plus or minus 30 KHz. Effective January 1, 1984, all new radio signal systems purchased and used shall have receiver selectivity of at least 80 db plus or minus 30 KHz. Effective January 1, 1989, all radio signal systems shall have receiver selectivity of at least 80 db plus or minus 30 KHz, when measured by the E.*I.A. SINAD method.

(5) The receiver-decoder tone frequency stability shall not exceed .006 (.6%) above or below the assigned tone frequency.

(6) The drift of a transmitter-encoder tone shall not exceed .006 (.6%) above or below the assigned tone frequency.

(7) Parts of the radio-signaling system affected by moisture, which may be subjected to the entrance of moisture during use, shall be weatherproofed. Transmitters shall be tested within fifteen minutes after being subjected to the following conditions and shall have the ability to continue functioning properly. The transmitter and receiver shall 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°C. temperature has been maintained.

(8) Radio-signaling system units shall operate within tolerances specified at any temperature within the range of -30°C. to +60°C.

(9) Switches of transmitters used to send whistle signals or activate equipment associated with high lead, slackline, or cable skidder systems of logging shall be designed in such a manner whereby two buttons, motions or a combination of these shall be required simultaneously to cause activation of the system. Arrangement of the activating switches shall be such that the operator can transmit signals easily but cannot easily activate a control or command function accidentally.

(10) All receivers intended to be mounted on or in the yarder or similar equipment, and all portable transmitters, shall continue to maintain specified mechanical and electrical performance during and after being subjected to vibration of the magnitude and amplitude as follows:

The equipment shall 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. The entire cycle of frequencies for each group (i.e., 10 to 30 cycles and 30 to 60 cycles) shall be accomplished in five minutes and repeated three times. The above motion shall be applied for a total period of thirty minutes in each direction, namely, the directions parallel to both axes of the base and perpendicular to the plane of the base.

(11) All portable transmitters shall continue to maintain specified mechanical and electrical performance after being subjected to a shock test as follows:

The equipment shall be dropped once on each of five surfaces from a height of four feet onto a smooth concrete floor.

(12) Transmitters operating on carrier frequencies of 154.57 MHz and on 154.60 MHz shall be limited on maximum power output not to exceed 500 mW measured at the antenna terminals.

(13) 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 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-607, filed 9/21/79.]

WAC 296-54-99002 Appendix I--Figure 2--High lead yarding system.

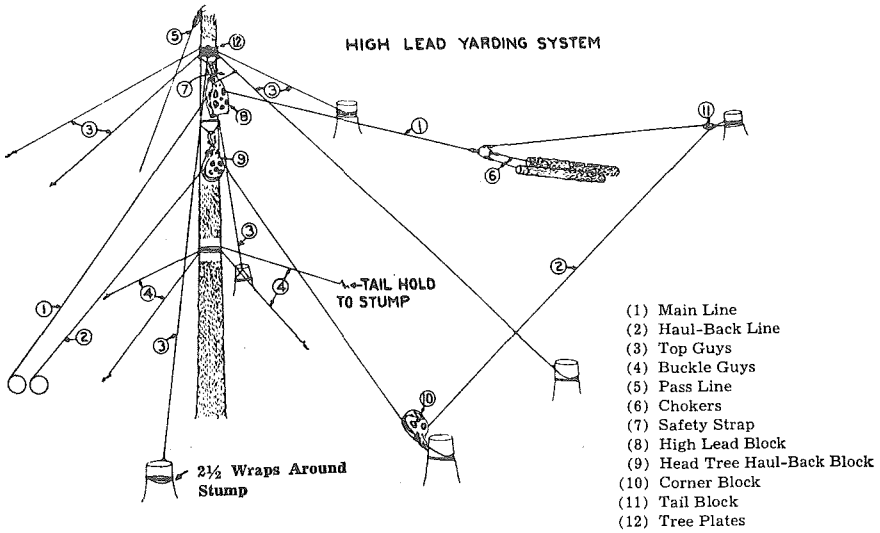


Figure 2.

[Order 72-14, Figure 2 (codified as WAC 296-54-99002), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99003 Appendix I--Figure 3--North Bend yarding system.

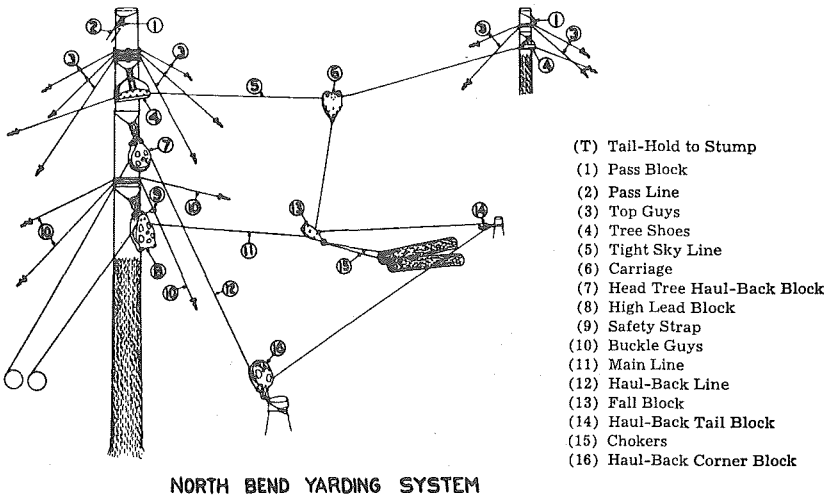


Figure 3.

[Order 72-14, Figure 3 (codified as WAC 296-54-99003), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99004 Appendix I--Figure 4--Slack skyline yarding system.

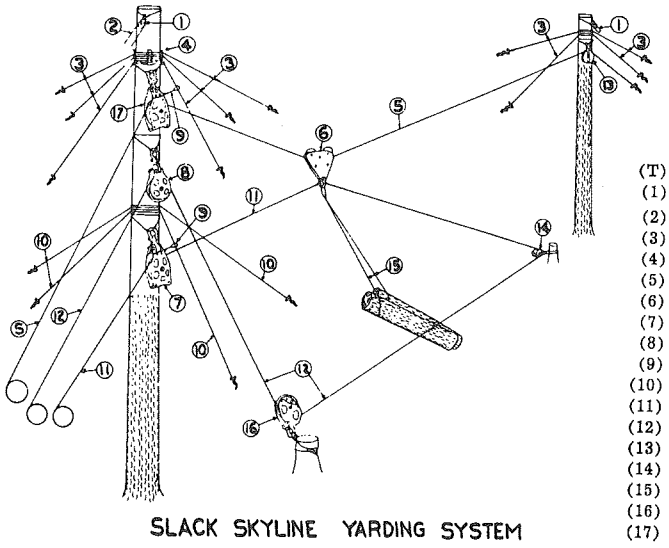


Figure 4.

[Order 72-14, Figure 4 (codified as WAC 296-54-99004), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99007 Appendix I--Figure 7--Heel boom loading.

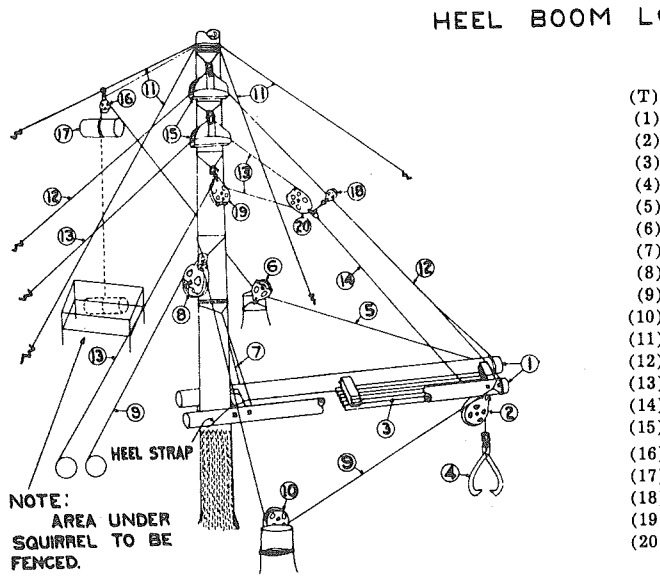


Figure 7.

[Order 72-14, Figure 7 (codified as WAC 296-54-99007), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99008 Appendix I--Figure 8--Guyline loading.

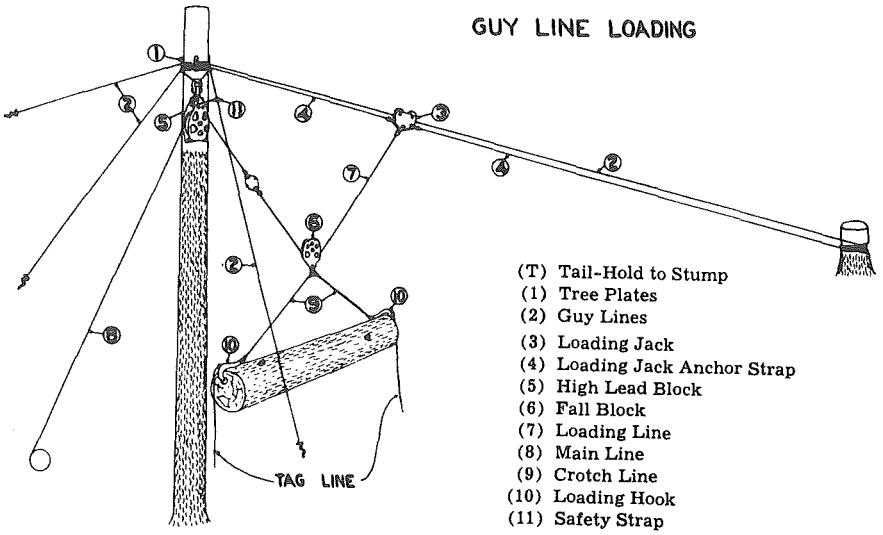


Figure 8.

[Order 72-14, Figure 8 (codified as WAC 296-54-99008), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99009 Appendix I--Figure 9--Hayrack boom loading.

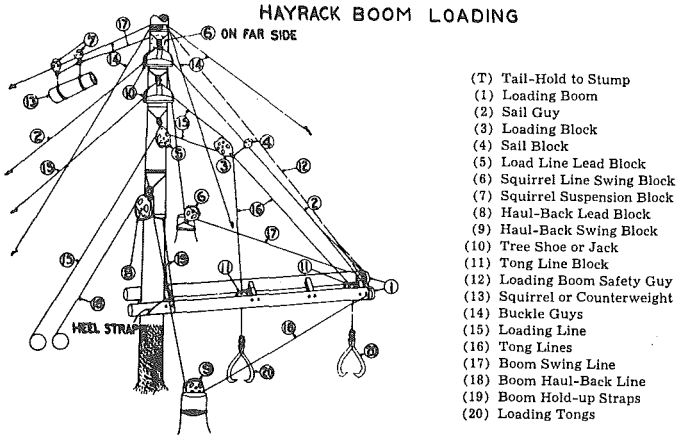


Figure 9.

[Order 72-14, Figure 9 (codified as WAC 296-54-99009), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99010 Appendix I--Figure 10--Spreader bar loading.

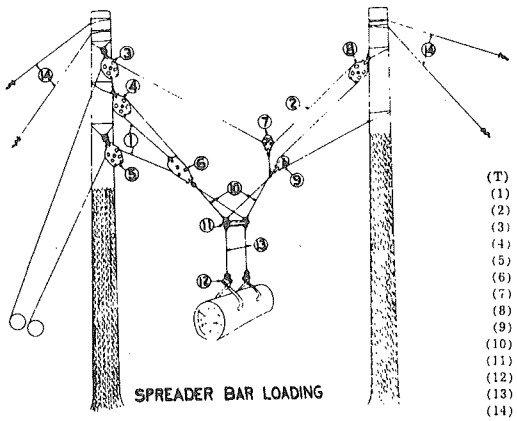


Figure 10.

[Order 72-14, Figure 10 (codified as WAC 296-54-99010), filed 7/31/72, effective 9/1/72.]

Chapter 296-56 WAC

SAFETY STANDARDS--LONGSHORE, STEVEDORE AND RELATED WATERFRONT OPERATIONS

WAC

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.

296-56-401 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.

296-56-405 Practical application. [Order 74-14, § 296-56-405, 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.

296-56-410 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.

296-56-412 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.

296-56-415 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.

296-56-420 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.

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.

296-56-432 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.

296-56-435 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.

296-56-436 General safety requirements. [Order 76-7, § 296-56-436, filed 3/1/76; Order 74-14, § 296-56-436, 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.

296-56-43801 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.

296-56-43803 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.

296-56-43805 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.

296-56-43807 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.

296-56-43809 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.

296-56-43811 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.

296-56-43813 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.

296-56-43815 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.

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.

296-56-442 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.

296-56-44201 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.

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.

296-56-47517 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.

296-56-47519 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.

296-56-47521 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.

296-56-47523 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.

296-56-47525 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.

296-56-47527 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.

296-56-47529 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.

296-56-47531 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.

296-56-480 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.

296-56-48001 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.

296-56-48003 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.

296-56-48005 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.

296-56-490 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.

296-56-495 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.

296-56-500 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.

296-56-50001 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.

296-56-50003 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.

296-56-50005 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.

296-56-50007 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 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.

296-56-50010 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.

296-56-50011 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.

296-56-50013 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.

296-56-50015 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.

296-56-50017 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.

296-56-50019 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.

296-56-50021 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.

296-56-50023 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.

296-56-50025 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.

296-56-50027 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.

296-56-510 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.

296-56-520 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.

296-56-530 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.

296-56-535 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.

296-56-53501 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.

296-56-53503 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.

296-56-540 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.

296-56-550 Practical application. [Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74.

296-56-560 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.

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, division of industrial safety and health.

(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—WAC 296-24-956 through 296-24-960.

(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—WAC 296-62-09015 through 296-62-09055.

(d) Standards for commercial diving operations—Chapter 296-37 WAC.

(e) Safety requirements for scaffolding—WAC 296-24-825 through 296-24-82545.

(f) Safe practices of abrasive blasting operations—WAC 296-24-675 through 296-24-67519.

(g) Access to employee exposure and medical records—WAC 296-62-052 through 296-62-05221.

(h) Respiratory protection—WAC 296-62-071 through 296-62-07121.

(i) Safety rules for grain elevator operators—Chapter 296-99 WAC.

(j) Hazard communication purpose—WAC 296-62-054 through 296-62-05427.

(k) Asbestos—WAC 296-62-07517.

(l) Confined space—WAC 296-62-145 through 296-62-14529.

(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.

[Statutory Authority: Chapter 49.17 RCW. 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. Realizing that conditions may exist under which certain state standards will not have practical application, the director of the department of labor and industries has made provisions for the issuance of variances. The director or his 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: 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. (1) "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.

(2) "Assistant director for the division of industrial safety and health" means the assistant director of industrial safety and health, department of labor and industries or his authorized representative.

(3) "Authorized," in reference to an employee's assignment, means selected by the employer for that purpose.

(4) "Cargo door" (transit shed door) means a door designed to permit transfer of cargo to and from a marine terminal structure.

(5) "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.

(6) "Confined space" means any space having a limited means of egress which is subject to the accumulation of toxic or flammable contaminants or an oxygen deficient atmosphere. Confined spaces include, but are not limited to, intermodal tank containers, brailwater tanks, bins, storage tanks, boilers, ventilation or exhaust ducts, tunnels, and portable tanks.

(7) "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.

(8) "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.

(9) "Designated person" means a person who possesses specialized abilities in a specific capacity and is assigned by the employer to perform a specific task in that area.

(10) "Dock" means a wharf or pier forming all or part of a waterfront facility, including marginal or quayside berthing facilities.

(11) "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.

(12) "Dockboard" (bridge plate or car plate) means a device utilized to span the gap between railroad cars, or between railroad cars or highway vehicles and the loading dock or platform. A car plate may be fixed, adjustable, portable, powered, or unpowered.

(13) "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 include trailers, railcars, and storage rooms.

(14) "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.

(15) "Flammable atmosphere" means an atmosphere containing more than ten percent of the lower explosive limit (LEL) of a flammable or combustible vapor or dust mixed with air. Such atmospheres are usually toxic as well as flammable.

(16) "Front-end attachments."

(a) As applied to power-operated industrial trucks, means the various devices, such as roll clamps, rotating and sideshifting 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.

(b) As applied to cranes, means various attachments applied to the basic machine for the performance of functions such as lifting, clamshell or magnet services.

(17) "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.

(18) "Hazardous cargo, material, substance or atmosphere" means:

(a) Any substance listed in chapter 296-62 WAC;

(b) Any material in the hazardous materials table and hazardous materials communications regulations of the Department of Transportation, 49 CFR Part 172;

(c) 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;

(d) Atmospheres having concentrations of airborne chemicals in excess of permissible exposure limits as defined in chapter 296-62 WAC; or

(e) Any atmosphere with an oxygen content of less than nineteen and one-half percent by volume.

(19) "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.

(20) "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.

(21) "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, demounted or with attached wheels. It does not include cylinders, drums, crates, cases, cartons, packages, sacks, unitized loads or any other form of packaging.

(22) "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.

(23) "Marina" means a small harbor or boat basin providing dockage, supplies, and services for small craft.

(24) "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.

[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 296-56-60007 Housekeeping. (1) 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: 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

industrial safety and health 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 available, 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.

[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) 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.

(9) 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.

(10) 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 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.

(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 overhanging 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 retained to prevent rolling 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: 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 designed for the purpose.

[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 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.

(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 equipment meeting the requirements of WAC 296-62-071 through 296-62-07121;

(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 49.17.040 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. (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 equipment meeting the requirements of WAC 296-62-071 through 296-62-07121; 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.

[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 D--FIRST AID, OPERATOR QUALIFICATIONS

WAC 296-56-60059 First aid and lifesaving facilities. (1) Employers shall instruct employees to report every injury, regardless of severity, to the employer.

(2) A first-aid kit shall be available at the worksite, and at least one person holding a valid first-aid certificate shall be at the worksite when work is in progress.

(3) First-aid kits shall be weatherproof and contain individual sealed packages for each item that must be kept sterile. Each kit shall include at least the following items: Gauze roller bandages, 1 inch and 2 inch (25.4 mm and 50.8 mm); gauze compress bandages, 4 inch (101.6 mm); adhesive bandages, 1 inch (25.4 mm); triangular bandage, 40 inch (101.6 cm); ammonia inhalants and ampules; antiseptic applicators or swabs; eye dressing; wire or thin board splints; forceps and tourniquet; and first-aid dressing.

(4) Stretchers permanently equipped with bridles for hoisting shall be readily accessible. A blanket or other suitable covering shall be available.

(5) Telephone or equivalent means of communication shall be readily available.

(6) 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.

(7) 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.

(8) Life rings. On all docks there shall be life rings of an approved standard type, spaced at intervals not to exceed two hundred feet and so located as to be readily available in case of emergency, with ninety feet of line attached.

[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.]

WAC 296-56-60060 First-aid training and certification. This section is designed to assure that all employees of this state are afforded quick and effective first–aid attention in the event of an on the job injury. To achieve this purpose the presence of personnel trained in first–aid procedures at or near those places where employees are working is required. Compliance with the provisions of this section may require the presence of more than one first–aid trained person.

(1) There shall be available at all worksites, at all times, a person or persons holding a valid certificate of first–aid training from the department of labor and industries, United States Bureau of Mines, the American Red Cross, or equivalent training that can be varified by documentary evidence. A valid first–aid certificate is one which is less than three years old. All foremen, supervisors, or persons in direct charge of crews shall have a valid first–aid certificate. If the duties or work of the foreman, supervisor or person in direct charge of the crew require an absence from the crew, another person holding a valid first–aid certificate shall be present. For the purposes of this section, a crew shall mean a group of two or more employees working at any worksite. If there is no foreman, supervisor or person in direct charge assigned to the crew, at least one employee shall have a valid first–aid certificate.

Note: In emergencies, foremen will be permitted to work up to thirty days without having the required certificate, providing an employee in the crew or another foreman in the immediate work area has the necessary certificate.

(2) Employers may be exempted from the requirements of this section, provided:

(a) They have previously submitted written evidence to the department that the worksite of their employees is within a two minute response time of an aid car, medic unit or established ambulance service with first–aid trained attendants.

(b) There is a back–up aid car, medic unit or established ambulance service within the two minute response time, or a first–aid trained person with readily available transportation is on the site of the posted emergency phone number for immediate dispatch in the event that the primary unit is not available.

(c) There are no traffic impediments, such as drawbridges, railroad tracks or similar traffic obstructions along the normal route of travel of the aid car, medic unit or established ambulance service that would delay arrival beyond the two minute response time.

(d) Emergency telephone numbers are posted on all first–aid kits and at all telephones at the worksite.

(e) The above services are available or exist at all times when more than one employee is at the worksite.

Note: Doctors' offices and clinics are not considered alternates to the exceptions enumerated in this subsection.

(3) Valid certification shall be achieved by passing a course of first–aid instruction and participation in practical application of the following subject matter:

Bleeding control and bandaging.
Practical methods of artificial respiration, including mouth to mouth and mouth to nose resuscitation.
Closed chest heart massage.
Poisons.
Shock, unconsciousness, stroke.
Burns, scalds.
Sunstroke, heat exhaustion.
Frostbite, freezing, hypothermia.
Strains, sprains, hernias.
Fractures, dislocation.
Proper transportation of the injured.
Bites, stings.
Subjects covering specific health hazards likely to be encountered by co–workers of first–aid students enrolled in the course.

[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.]

WAC 296-56-60062 First-aid kit. (1) All employers who employ men and women covered by the Washington Industrial Safety and Health Act, chapter 49.17 RCW, shall furnish first–aid kits as required by the division of industrial safety and health, department of labor and industries, (RCW 51.36.030).

(2) First–aid supplies shall be readily accessible when required.

(3) In the absence of readily accessible first–aid supplies such as first–aid kits, first–aid stations, first–aid rooms or their equivalent, all crew trucks, power shovels, cranes, locomotives, loaders, dozers, logging trucks, speeders, freight trucks, and similar equipment shall be equipped with not less than a ten package first–aid kit.

(4) All crew vehicles used for transporting workmen shall be equipped with not less than a ten package first-aid kit. When more than five employees are being transported on any one trip, the kit shall be increased in size to a 16, 24, or 36-package kit depending upon the number of personnel normally being transported.

(5) At least one first-aid kit shall be available on construction jobs, line crews, and other transient or short duration jobs. The size and quantity of first-aid kits required to be located at any site shall be determined by the number of personnel normally dependent upon each kit as outlined in the following table:

NUMBER OF PERSONNEL NORMALLY ASSIGNED TO WORKSITE	MINIMUM FIRST-AID SUPPLIES REQUIRED AT WORKSITE
1 - 50 PERSONS	FIRST-AID KIT
1 - 5	10 package kit
6 - 15	16 package kit
16 - 30	24 package kit
31 - 50	36 package kit
51 - 200 PERSONS	FIRST-AID STATION
51 - 75	One 36 and one 10 package kit
76 - 100	One 36 and one 16 package kit
101 - 150	One 36 and one 24 package kit
151 - 200	Two 36 package kits
OVER 200 PERSONS	FIRST-AID ROOM Refer to WAC 296-56-60067

(6) Employers shall establish a procedure to assure that first-aid kits and required contents are maintained in a serviceable condition.

(7) First-aid kits shall contain at least the following items:

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. of consulting physician's choice**

16 Package Kit

1 Pkg. Absorbent gauze, 24" x 72" (1 per pkg.)
1 Pkg. Adhesive bandages, 1" (16 per pkg.)
2 Pkgs. Bandage compresses, 4" (1 per pkg.)
1 Pkg. Eye dressing (1 per pkg.)
1 Pkg. Scissors* and tweezers (1 each per pkg.)
2 Pkgs. Triangular bandages, 40" (1 per pkg.)
1 Pkg. Antiseptic soap or pads (3 per pkg.)
7 Pkgs. of consulting physician's choice**

24 Package Kit

2 Pkgs. Absorbent gauze, 24" x 72" (1 per pkg.)
2 Pkgs. Adhesive bandages, 1" (16 per pkg.)
2 Pkgs. Bandage compresses, 4" (1 per pkg.)
1 Pkg. Eye dressing (1 per pkg.)
1 Pkg. Scissors* and tweezers (1 each per pkg.)
6 Pkgs. Triangular bandages (1 per pkg.)
1 Pkg. Antiseptic soap or pads (3 per pkg.)
9 Pkgs. of consulting physician's choice**

36 Package Kit

4 Pkgs. Absorbent gauze, 24" x 72" (1 per pkg.)
2 Pkgs. Adhesive bandages, 1" (16 per pkg.)
5 Pkgs. Bandage compresses, 4" (1 per pkg.)
2 Pkgs. Eye dressing (1 per pkg.)
1 Pkg. Scissors* and tweezers (1 each per pkg.)
8 Pkgs. Triangular bandages, 40" (1 per pkg.)
1 Pkg. Antiseptic soap or pads (3 per pkg.)
13 Pkgs. of consulting physician's choice**

*Scissors shall be capable of cutting two layers of fifteen ounce cotton cloth or its equivalent.

**First-aid kits shall be maintained at the ten, sixteen, twenty-four or thirty-six package level. In the event the consulting physician chooses not to recommend items, the department of labor and industries shall be contacted for recommended items to complete the kit.

(8) Where the eyes or body of any person may be exposed to injurious chemicals or materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

(9) When practical, a poster shall be fastened and maintained either on or in the cover of each first-aid kit and at or near all phones plainly stating the phone numbers of available doctors, hospitals, and ambulance services within the district of the worksite.

[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.]

WAC 296-56-60065 First-aid station. (1) First-aid stations shall be located as close as practical to the highest concentration of personnel.

(2) First-aid stations shall be well marked and available to personnel during all working hours.

(3) A person holding a valid first-aid certificate shall be responsible for the proper use and maintenance of the first-aid station.

(4) First-aid stations shall be equipped with a minimum of two first-aid kits, the size of which shall be dependent upon the number of personnel normally employed at the worksite. One first-aid kit may be a permanent wall-mounted kit, but in all cases the station shall be equipped with at least one portable first-aid kit.

(5) A roster, denoting the telephone numbers and addresses of doctors, hospitals and ambulance services available to the worksite, shall be posted at each 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.]

WAC 296-56-60067 First-aid room. (1) There shall be a first-aid room meeting the requirements of this section when:

(a) A fixed establishment employs more than two hundred employees at one time at one location.

(b) A construction site is a fixed establishment if it remains a construction site for six months or more.

(2) First-aid rooms shall be located as close as possible to the heaviest concentrated work area. They shall be identified in such a manner as to be easily recognizable as first-aid rooms.

(3) The first-aid room shall be well lighted and ventilated, kept clean and orderly, provided with hot and cold running water, and maintained in a fully-equipped condition.

(4) The first-aid room shall be manned and maintained by:

(a) A licensed physician,

(b) A licensed or registered nurse, or

(c) An employee who:

(i) Holds a valid advanced first-aid certificate recognized by the department,

(ii) Works in the vicinity of the first-aid room, and

(iii) Does not perform other work of a nature that is likely to adversely affect the ability to administer first aid.

(5) First-aid rooms shall be equipped with items recommended by the consulting physician or plant medical officer and, at a minimum, shall contain a supply of the following:

Antiseptic soap
3/4" or 1" adhesive compresses
Adhesive knuckle bands
2" Bandage compresses
4" Bandage compresses
3" x 3" gauze pads
Assorted sizes of large gauze pads
2" roller bandages
3" roller bandages
4" roller bandages
Assorted adhesive tape rolls
Eye dressings
Ammonia inhalants
Burn ointment
Triangular bandages
Scissors, forceps, razor and blades, medicine droppers
Safety pins
Drinking cups
Rubbing alcohol
Absorbent cotton
Arm and leg splints
Antidotes for specific industrial poisons
Pressure points chart
Stretcher
Wool blankets and clean linen
Hot water bottles
Quick colds or ice bag
Emergency first-aid kit
A method of sterilizing instruments

(6) A poster shall be maintained on, or in the cover of, each first-aid cabinet and near each first-aid room phone. The poster shall state phone numbers of available doctors, hospitals, and ambulance services within the employer's district.

[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.]

WAC 296-56-60069 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 paragraph 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: 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.]

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.

(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 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 industrial safety and health 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 B30.9. 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) 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 blunt ends shall not damage the wire.

(d) 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	Minimum number of clips		Minimum spacing
inches/(cm)	Drop forged	Other material	inches/(cm)
½ or less(1.3)	3	4	3(7.6)
⅝(1.6)	3	4	3¾(9.5)
¾(1.9)	4	5	4½(11.4)
⅞(2.2)	4	5	5¼(13.3)
1(2.5)	5	7	6(15.2)
1⅛(2.7)	6	7	6¾(17.1)
1¼(3.2)	6	8	7½(18.1)
1⅜(3.5)	7	8	8¼(21.0)
1½(3.8)	7	9	9(22.9)

(e) Wire rope shall not be secured by knots.

(f) 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.

(g) 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.

(h) 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. 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; or

(v) Distortion or damage to fittings.

(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 alloy steel chains and chain slings 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	(cm)	Inches	(cm)
¼(5/32)	(0.6)	5/64	(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)	9/32	(0.4)
7/8	(2.2)	1 1/64	(0.4)
1	(2.5)	5/16	(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) 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. 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		Pin diameter		Safe working load in 2,000 lb tons
Inches	(cm)	Inches	(cm)	
½	(1.3)	⅝	(1.6)	1.4
⅝	(1.6)	¾	(1.9)	2.2
¾	(1.9)	⅞	(2.2)	3.2
⅞	(2.2)	1	(2.5)	4.3
1	(2.5)	1⅛	(2.9)	5.6
1⅛	(2.9)	1¼	(3.2)	6.7
1¼	(3.2)	1⅜	(3.5)	8.2
1⅜	(3.5)	1½	(3.8)	10.0
1½	(3.8)	1⅝	(4.1)	11.9
1¾	(4.4)	2	(5.0)	16.2
2	(5.0)	2¼	(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 2000 pounds)

Circumference	Diameter in Inches	Single Leg	60°	45°	30°
3/4	1/4	120 lbs.	204 lbs.	170 lbs.	120 lbs.
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
3-1/4	1-1/16	1.0 Tons	1.7 Tons	1.4 Tons	1.0 Tons
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

In making such a substitution it should be ascertained that the inherent characteristics of the synthetic fiber are suitable for the intended service of the rope.

TABLE G-2
RATED CAPACITIES FOR IMPROVED PLOW STEEL, INDEPENDENT WIRE ROPE CORE, WIRE ROPE AND WIRE ROPE SLINGS
(In tons of 2000 pounds)

Rope Dia. Inches	SINGLE LEG					
	Vertical			Choker		
	A	B	C	A	B	C
6x19 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
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
6x37 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 SLINGS
(In tons of 2000 pounds)

Rope Dia. Inches	TWO - LEG BRIDLE OR BASKET HITCH											
	Vertical			60°			45°			30°		
	A	B	C	A	B	C	A	B	C	A	B	C
6x19 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
6x37 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 2000 pounds)

Rope Dia. Inches	SINGLE LEG					
	Vertical			Choker		
	A	B	C	A	B	C
6x19 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
6x37 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 2000 pounds)

Rope Dia. Inches	Vertical			60°			45°			30°		
	A	B	C	A	B	C	A	B	C	A	B	C
6x19 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
1-1/8	21.	19.	17.	18.	16.	14.	15.	13.	12.	10.	9.5	8.4
6x37 CLASSIFICATION												
1-1/4	25.	23.	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 2000 pounds)

Nominal Size Chain Stock Inch.	Single Leg	60°	45°	30°
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, or 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 (76.2 mm). 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 49.17.040 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. 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 (7.6 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 (15.2 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) 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.

(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 (2.6 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 49.17.040 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.

(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.

(9) A distance of not less than twenty feet (4.5 m) shall be maintained between the first two vehicles in a check-in or check-out line, or vessel loading or discharging line. This distance shall be maintained between any vehicles behind which employees 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 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 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 (outreach) 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 (outreach) 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 signalman, 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) 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 made available upon request.

(g) Outriggers. Outriggers shall be used according to the manufacturer's specifications or design data, which shall be made available upon request. 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.

(h) Exhaust gases. Engine exhaust gases shall be discharged away from the normal position of crane operating personnel.

(i) Electrical equipment shall be so located or enclosed that live parts will not be exposed to accidental contact. Designated persons may work on energized equipment only if necessary during inspection, maintenance, or repair.

(j) 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.

(k) 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.

(l) 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.

(m) 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.

(n) 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.

(o) 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.

(p) Electronic devices may be installed to prevent collision subject to approval of the accredited certification agency.

(q) 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.

(r) 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.

(s) 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 (0.9 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 travel, audible and visible, 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) Cranes and crane operations—Scope and application. The sections of this chapter, WAC 296–56–60083 through 296–56–60099, apply to cranes and crane operations.

(l) Signalmen. A signalman shall be required when a crane operator's visibility is obstructed. When a signalman is required to transmit hand signals, he shall be in such a position that the operator can plainly see the signals.

(m) Signals. All operators and signalmen shall use standard signals as illustrated for longshore crane operations. (See Appendices C and D, at the end of this chapter.)

(n) Signalman 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 signalman associated with the operation.

(ii) Loads requiring continuous manual guidance while in motion shall be provided with tag lines.

(o) 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 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 m) plus 0.4 inch (10 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 (1.2 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 signalman.

(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 (7.6 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.

(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 49.17.040 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 marking 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 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 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 at the first reasonable opportunity.

[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)(k) apply to winches.

[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) Whenever employees are exposed to the hazard of falling objects, chutes shall be equipped with sideboards.

(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:

(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 the eye bolts, wires, and sheaves.

(b) Power shovels and associated equipment with defects 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, tagged, the belt stopped, and the hopper closed.

[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 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 industrial safety and health, 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 representatives of the division of industrial safety and health; or individuals who have received a "certificate of competency" from the supervisor of industrial safety and health 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 industrial safety and health. Copies shall be delivered to the owner of the equipment and the division of industrial safety and health at the Olympia 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 industrial safety and health, 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 industrial safety and health or his 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 certificated 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 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 for industrial safety and health 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 for industrial safety and health in his duties under this chapter. The panel shall consist 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 chairman of the panel. He shall be the assistant director of industrial safety and health or his 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: 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 industrial safety and health or his 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 industrial safety and health 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) In the event neither manufacturer's data nor design data on safe working loads (including any applicable limitations) are obtainable, the safe working load ratings assigned shall be based on the owner's information and warranty that those so assigned are correct. Unit test certificates shall state the basis for any safe working load assignment.

(4) 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 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.

(5) 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 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 his 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 four 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 re-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 industrial safety and health.

(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.

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) 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.

(iii) Certificates attesting to the required tests shall be available for inspection.

(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. Certificates 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. Equipment certified in accordance with similar provisions of another jurisdiction and moved to a site in this state does not require certification upon initial transfer to this state.

(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.

[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. 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.

(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) Dry, or closed type containers, which are being used to transport vehicles and which contain no other cargo, and have the contents clearly marked on the outside.

(iii) Containers built specifically for the carriage of compressed gases.

(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) Employees working in the immediate area of container handling equipment or in the terminal's traffic lanes shall wear high visibility vests, decals, reflectors or equivalent protection.

(6) Containers shall be handled using lifting fittings or other arrangements suitable and intended for the purposes set forth in (a) and (c) of this subsection, except 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 fittings or by means which will safely lift the container without damage. The lifting fittings provided shall be used.

(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) Means of hoisting other than those required by subsection (2) of this section 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.

(7) 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.

(8)(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.

(9) Containers shall not be hoisted unless all engaged chassis twist locks are released.

[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 brailwater for recirculating into vessel holds in discharging operations shall be opened or ventilated to minimize contamination of water circulated to the vessel. Brailwater tanks shall be thoroughly drained upon completion of each day's operations and shall be left open to the air. Drainage is unnecessary when brailwater 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 (see subsection (3) of this section).

(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 brailwater 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 brailwater from vessels.

[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 Z87.1-1968. The employer shall direct that eye protection is 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 49.17.040 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 Z89.1-1969.

(3) Protective hats previously worn shall be cleaned and disinfected before issuance by the employer to another employee.

[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 direct that employees exposed to impact, falling objects, or puncture hazards wear safety shoes, or equivalent protection.

(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 Z41.1-1983.

(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 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 floatation devices.

(a) The employer shall provide, and shall direct the wearing of personal floatation devices for those employees, such as line handlers, who are engaged in work in which they may fall 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 hinder 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 guardrails;

(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 floatation devices shall be inspected for defects which would reduce their designed effectiveness. Defective personal floatation devices shall not be used.

(iii) To meet the requirement of (b) of this subsection, a personal floatation 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 Floatation Devices). Ski belt or inflatable type personal floatation 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 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.

(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.

[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.

(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.

(a) Vehicle curbs, bull rails, or other effective barriers at least six inches (13.74 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 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.

(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 (15.2 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 lease 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 (220 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 (0.9 m) nor less than thirty-two inches (0.8 m) in 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 49.17.040 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 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 adversely 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: 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 (1120 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 (3.3 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 49.17.040 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, 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.

(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 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 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.]

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 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 (8.8 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 (1120 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 (1120 N) increments for each additional employee, applied to a corresponding number of rungs. The 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 cm, plus or minus 5 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 (10.2 cm), except that in ladders installed after October 3, 1983, the minimum distance shall be seven inches (17.8 cm) unless physical limitations make a lesser distance, not less than four and one-half inches (11.5 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, 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 (46 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 102 inches (25.45.08 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 (0.9 m) above landings; and

(iv) Extend to within eight feet (2.4 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 41 cm) apart, with a minimum width of ten inches (25.4 cm), and projecting at least four and one-half inches (1 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 49.17.040 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 (896 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 cm) for ladders ten feet (3.05 m) or less in overall length, and shall increase at least one-fourth inch (0.6 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 A14.1-1981 Safety Requirements for Portable Wood Ladders

ANSI A14.2-1982 Safety Requirements for Portable Metal Ladders

ANSI A14.5-1981 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 cm), center to center;

(b) Be capable of supporting a two hundred fifty pound (1100 N) load without deformation; and

(c) Have a minimum width between side rails of twelve inches (30 cm) for ladders ten feet (3.05 m) in height. Width between rails shall increase at least one-fourth inch (0.6 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 49.17.040 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 (448 N) and a minimum concentrated load of three hundred pounds (1344 N) at the center of any treadspan. Riser height shall be from six to seven and one–half inches (15.2 to 19.0 cm), stair width a minimum of twenty–two inches (56 cm) between vertical barriers, and tread depth shall be from 8 to 11 inches (20.3 to 27.8 cm). Tread nosing shall be straight leading edges.

(b) Stair landings shall be at least twenty inches (51 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 (45.7 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 plus or minus 7.6 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 (10.2 cm) in depth and eighteen inches (45.7 cm) in width with a uniformly spaced vertical rise between treads of six to nine and one–half inches (15.2 to 24.1 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.

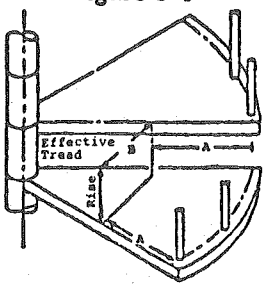
[Statutory Authority: RCW 49.17.040 and 49.17.050. 86–03–064 (Order 86–02), § 296–56–60215, filed 1/17/86; 85–01–022 (Order 84–24), § 296–56–60215, filed 12/11/84.]

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;

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 26.7 cm) in height;

(c) Minimum loading capability shall be one hundred pounds per square foot (448 N), and minimum tread center concentrated loading shall be three hundred pounds (1344 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 (3.3 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 49.17.040 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 (71.1 cm).

(5) All fire exits and aisleways of all docks and warehouses shall be clearly marked and kept clear. All main aisleways 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 49.17.040 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) Definitions.

(a) "Dockboards (car and bridge plates)" mean devices for spanning short distances between rail cars or highway vehicles and loading platforms which do not expose employees to falls greater than four feet (1.2 m).

(b) "Ramps" means other flat-surface devices for passage between levels and across openings not included in "dockboards."

(3) 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.

(4) 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 (1.2 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 49.17.040 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, 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: 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.

(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 ripsaws and hand–fed circular crosscut table saws. Unless fixed or manually adjustable enclosures or guarding provides equivalent protection, hand–fed circular ripsaws 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 (3.2 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 (2.1 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 49.17.040 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). (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 a designated person has tested the atmosphere and determined that it is not hazardous.

(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 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 (10.2 cm of each 30.5 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 WAC 296-62-145 through 296-62-14529, ensure that:

(i) General mechanical or local exhaust ventilations shall be provided; or

(ii) Employees in the space shall wear supplied air respirators in accordance with WAC 296-62-071 et seq. and a standby observer on the outside shall maintain communication with employees inside the space and shall be equipped and prepared to provide emergency aid.

(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;

(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.

(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 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.

(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.

(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 (10.2 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 49.17.040 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 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 thoroughly 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 WAC 296-24-956 through 296-24-960 for Class I, Division 1, Hazardous Locations. Wiring, motors and equipment within twenty feet (6 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 WAC 296-24-956 through 296-24-960 for Class I, Division 2, Hazardous Locations.

(m) Outside electrical lights within ten feet (3 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 three feet (0.91 m) or by fire-retardant partitions or walls.

(c) A space of at least three 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 eighteen 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 49.17.040 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 296-56-60019 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: 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 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 (15.2 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 49.17.040 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.

(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.

(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, 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.]

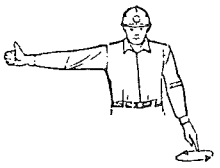
WAC 296-56-99003 Form--Appendix B--Standard signals for longshore crane signals.

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

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 WAC 296-62-054 through 296-62-05427 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. 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.

(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.

(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 footgear 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;

(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 training and certification. The "first-aid training and certification" requirements of the general safety and health standards, WAC 296-24-060, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-035, filed 7/6/88.]

WAC 296-59-040 First-aid kits and supplies. The "first-aid kits and supplies" requirements of the general safety and health standards, WAC 296-24-065, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-040, 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.

(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, general occupational health standards, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-060, 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:

(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 aisleways 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 forklift 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.

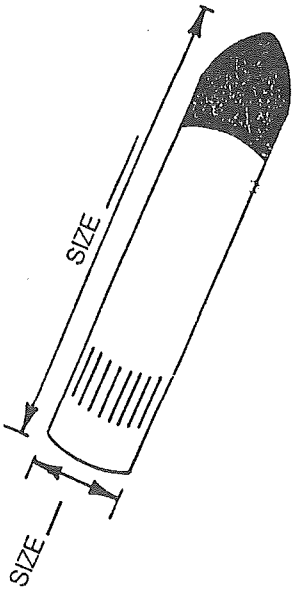
[Statutory Authority: Chapter 49.17 RCW. 88–14–108 (Order 88–11), § 296–59–100, filed 7/6/88.]

WAC 296-59-102 Acceptable warning signs for typical avalanche control explosive device(s) duds.

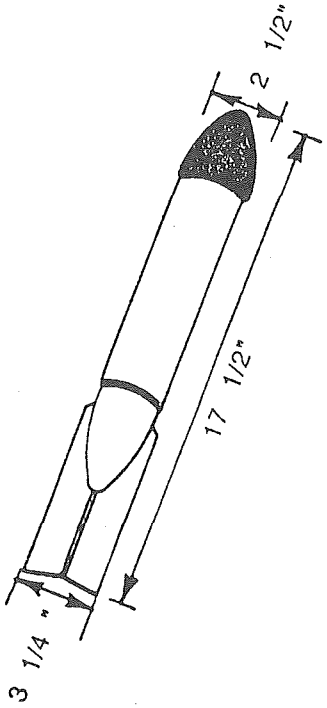
DANGER

EXPLOSIVES ON THE MOUNTAIN

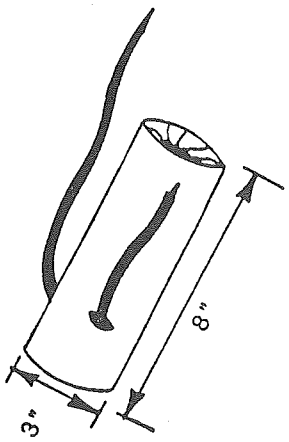
Unexploded warheads, projectiles, or handcharges used in avalanche runout zones.



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 explosives 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 (± 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 handcharge 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 components 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 ignitors 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 anytime 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 nonfunctional 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 avalancher 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 1.

[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 eighteen 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.

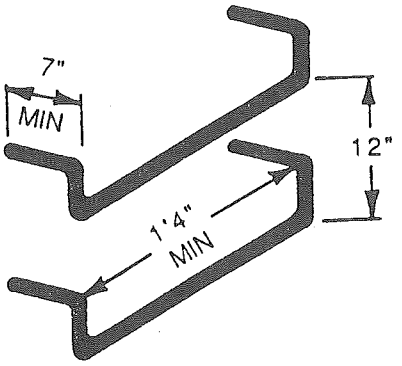


FIGURE D-1

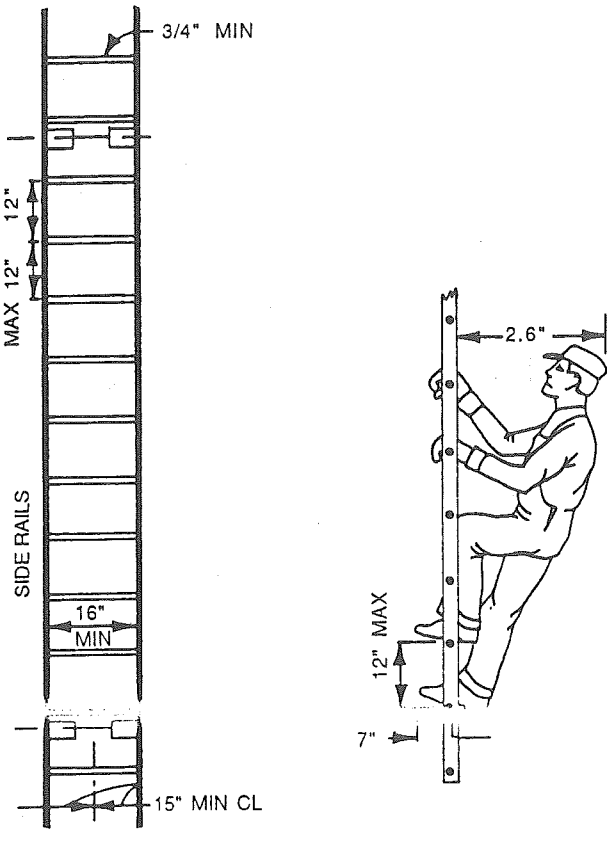


FIGURE D-2
Minimum Ladder Clearance

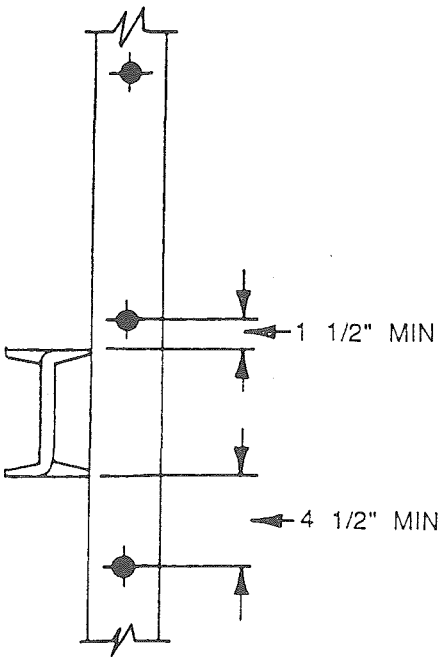


FIGURE D-3
Clearance for Unavoidable Obstruction at Rear of Fixed Ladder.

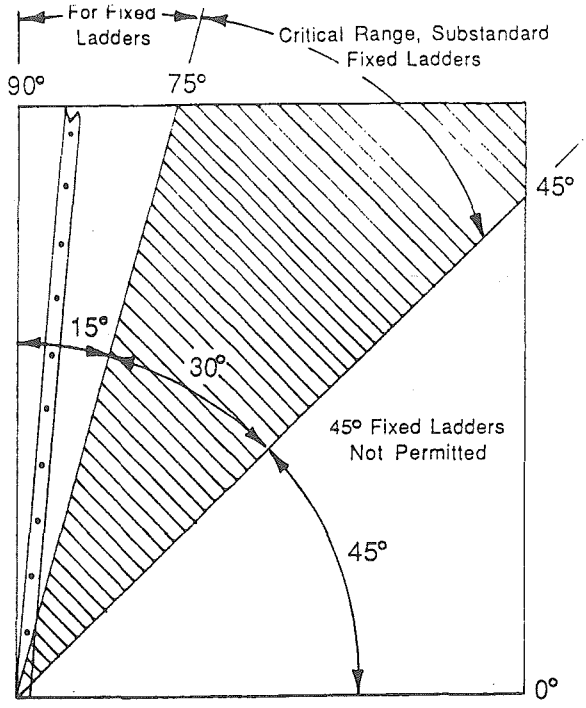


FIGURE D-4
Fixed Ladder Range

[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.

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 toeboard 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 296-61 WAC
SAFETY STANDARDS--METAL AND NONMETALLIC MINES, QUARRIES, PITS, AND CRUSHING OPERATIONS

WAC

WAC 296-61-010 Scope and application. (1) These standards shall be used for above-ground and underground operations where applicable.

(2) These safety standards were promulgated by the department of labor and industries, division of safety, in accordance with the requirements outlined in the Washington State Administrative Procedure Act (chapter 34.04 RCW) and other statutes. Notices were distributed as required and a public hearing was conducted on January 21, 1972 at Olympia, Washington. Copies of these standards have been filed in the office of the code reviser to become effective on April 1, 1972.

(3) When the words "shall" or "must" are used in these standards or a positive action is required by the wording of any rules, such requirement is compulsory. The words, "may" or "should" as used in these standards identify recommendations or suggestions only. Numerals appearing in brackets after a WAC rule number (example: WAC 296-61-030(2) (57.15-1)) indicate that the cited rule has been published in the Code of Federal Regulations and contains essentially the same requirements as the rule herein promulgated.

(4) (57.24) (a) Realizing that conditions may exist in operations under which certain state standards will not have practical application, the supervisor of safety may, upon receipt of application and after adequate investigation by the department, and subject to subparagraph (b), permit a variation from these requirements when other equal means of protection are provided. Any variation granted under the provisions of this paragraph 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 prior to becoming effective and shall remain posted during the life of such waiver. All requests for a variation, modification or waiver shall be make in writing to the supervisor of safety, department of labor and industries at Olympia, Washington.

(b) The Washington state department of labor and industries shall not approve or apply any variation, modification or waiver of any state law, rule, regulation or standard, to any mine or operation falling within the scope of these rules, which includes or incorporates all or any portion of a mandatory standard promulgated by the secretary of the department of interior without first having obtained the consent and approval of such variation, modification or waiver by the secretary of the department of interior or his delegate.

(5) These standards shall be augmented by the Washington state general safety standards, occupational health standards, precautionary labeling of hazardous substances used in places of employment, electrical workers safety rules, safety requirements for explosive-actuated fastening tools, boilers and unfired pressure vessels law, national electric code, regulations for possession and handling of explosives and any other regulations of general application which are or will be made applicable to all industries governed by the Industrial Insurance and Medical Aid acts.

(6) At least five days prior to commencement of a new, intermittent or temporary operation, the firm responsible for employment of the workmen at the site shall notify the supervisor of the division of safety of such intent. The notice shall include the firm name, mailing address, type of work to be done and the location of the workplace. (Section, township, range.)

(7) The system used by the U.S. Bureau of Mines for identification, location, etc., of mines, quarries, pits, mills and crushers shall be used by the division of safety and shall be included on the report of each inspection conducted.

(8) These standards are consolidated with the intent that they will meet or exceed all mandatory requirements included in 30 CFR, Parts 55, 56, and 57.

(9) These safety standards shall apply to all industries and persons working within the following categories: Mines, pits, mills, quarries, and sand, gravel and crushing operations; whether covered by industrial insurance

(Title 51 RCW) or operated on a sole proprietorship or partnership basis.

(10) When standards of other organizations or associations are incorporated by reference, the standards shall be the most recent edition published prior to January 1, 1972. (Example: P 12, WAC 296-61-100 (1)(a), "threshold limit values of airborne contaminants," adopted by the American Conference of Governmental Industrial Hygienists, shall refer to the 1971 edition.)

[Order 72-1, § 296-61-010, filed 2/25/72, effective 4/1/72.]

WAC 296-61-020 Definitions. (1) "Abandoned" means that all work has stopped on the mine premises and that an office with a responsible person in charge is no longer maintained at or in the vicinity of the mine.

(2) "Abandoned workings" means deserted operation areas in which further work is not intended.

(3) "Active workings" means areas at, in or around, an operation where men work or travel.

(4) "Approved" generally means acceptable to the division of safety except when formal written approval would be deemed necessary for use of certain equipment, methods, or means, as determined by the supervisor of safety.

(5) "Auxiliary fan" means a fan used to deliver air to a workplace located off the main air stream supply line.

(6) "Barricaded" means the installation of a suitable safeguard which will prevent the passage of persons, vehicles, flying materials or hazardous radiations.

(7) "Berm" means a pile or mound of material capable of restraining a vehicle of the type generally used in the area.

(8) "Blasting agent" means any material consisting of a mixture of a fuel and oxidizer which:

(a) Is used or intended for use in blasting.

(b) Is not classed as an explosive by the department of transportation.

(c) Contains no ingredient classed as an explosive by the department of transportation.

(d) Cannot be detonated by a number "8" blasting cap.

(9) "Blasting area" means the area near blasting operations in which concussion or flying material can reasonably be expected to cause injury.

(10) "Blasting cap" means a detonator containing a charge of detonating compound, which is ignited by electric current or the spark of a fuse.

(11) "Blasting circuit" means electric circuits used to fire electric detonators.

(12) "Blasting switch" means a switch used to connect a power source to a blasting circuit.

(13) "Booster fan" means a fan installed in a main air stream to maintain or increase the air flow.

(14) "Capped fuse" means a length of safety fuse to which a detonator has been attached.

(15) "Combustible" means capable of being ignited and consumed by fire.

(16) "Company official" means a member of the company supervisory or technical staff.

(17) "Competent person" shall be a qualified person designated by management.

(18) "Detonating cord" or "detonating fuse" means a flexible cord containing a core of high explosives.

(19) "Detonator" means a device used for detonating an explosive.

(20) "Distribution box" means a portable apparatus with an enclosure through which an electric circuit is carried to one or more cables from a single incoming feed line, each cable circuit being connected through individual over-current protective devices.

(21) "Electric blasting cap" means a blasting cap designed for and capable of being ignited by means of an electric current.

(22) "Electrical grounding" means limiting the voltage to the maximum potential for which the circuit is designed, 70-64 N.E.C., by connecting the circuit with earth.

(23) "Employer" means a person or organization which hires one or more persons to work for wages or salary.

(24) "Escapeway" means a passageway by which persons may leave if the ordinary exit is obstructed.

(25) "Explosive" means any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion. Explosives include, but are not limited to: Black powder, dynamite, nitroglycerin, nitroglycerin compounds, fulminate, and ammonium nitrate when mixed with hydrocarbons.

(26) "Face" or "bank" means that part of any operation where excavating is progressing or was last performed.

(27) "Flammable" means capable of being easily ignited and of burning rapidly.

(28) "Flammable liquid" means liquid having a flash point below 140°F. and having a vapor pressure not exceeding 40 psi (absolute) at 100°F.

(29) "Flash point" means the minimum temperature at which sufficient vapor is released by a liquid or solid to form a flammable vapor-air mixture at atmospheric pressure.

(30) "Highway" means any public street, public alley, or public road.

(31) "High potential" means more than 650 volts.

(32) "Hoist" means a power-driven windlass or drum used for raising ore, rock, or other material from an operation and for lowering or raising men and material.

(33) "Igniter cord" means a fuse, cordlike in appearance, which burns progressively along its length with an external flame at the zone of burning and is used for lighting a series of safety fuses in the desired sequence.

(34) "Incline" means an inclined plane, whether above or beneath the surface.

(35) "Inhabited 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 structure where people are accustomed to assemble, except any manufacture, transportation, storage or use of explosives.

(36) "Lay" means the distance parallel to the axis of the rope in which a strand makes one complete turn about the axis of the rope.

(37) "Low potential" means 650 volts or less.

(38) "Main fan" means a fan that controls the entire air flow of the mine or the air flow of one of the major air currents.

(39) "Magazine" means a storage place for explosives or detonators.

(40) "Major electrical installation" means an assemblage of stationary electrical equipment for the generation, transmission, distribution or conversion of electrical power.

(41) "Manlift" means a power-driven vertical belt having regularly spaced steps which can be boarded by men and used to travel from one elevation to another.

(42) "Man trip" means a trip on which men are transported to and from a work area.

(43) "Mill" includes any ore mill, sampling works, concentrator, and any crushing, grinding, or screening plant used at, and in connection with, an excavation or mine.

(44) "Mine" means an excavation made in the earth (either on the surface or by removal of material from beneath the surface) to extract metallic ores or other usable materials.

(45) "Mine opening" means any opening or entrance from the surface into a mine.

(46) "Misfire" means the complete or partial failure of a blasting charge to explode as planned.

(47) "Operation" means any portion of the work relating to or incidental to mining, such as transporting, crushing, excavating, blasting, timbering, processing of materials, or maintenance work, etc.

(48) "Overburden" means material of any nature, consolidated or unconsolidated, that overlies a deposit of useful materials or ores that are to be mined.

(49) "Permissible" means that a machine, material, apparatus, or device has been investigated, tested, and approved for use by the U.S. Bureau of Mines or the division of safety and is continuously maintained in that condition.

(50) "Potable" means fit for drinking.

(51) "Powder chest" (day box) means a substantial, nonconductive, portable container equipped with a lid and used for temporary storage of explosives at blasting site.

(52) "Primer" means a package or cartridge of explosives with a detonator.

(53) "Reverse-current protection" means a method or device used on direct-current circuits or equipment to prevent the flow of current in the reverse direction.

(54) "Roll protection" means a framework safety canopy or similar protection for the operator when equipment overturns.

(55) "Rope" means wire rope unless otherwise specified.

(56) "Safety can" means an approved container of not more than five gallons capacity, having a spring-closing lid and spout cover.

(57) "Safety division" refers to the division of safety of the department of labor and industries of the state of Washington.

(58) "Safety fuse" means a train of powder enclosed in cotton, jute yarn, and water-proofing compounds, which burns at a uniform rate and used for firing a cap containing the detonating compound which in turn sets off the explosive charge.

(59) "Safety switch" means a sectionalizing switch that also provides short circuit protection in blasting circuits between the blasting switch and the shot area.

(60) "Scaling" means removal of insecure material from a face or highwall.

(61) "Secondary safety connection" means a second connection between a conveyance and rope intended to prevent the conveyance from running away or falling in the event the primary connection fails.

(62) "Secondary underground distribution storage magazine" means a place for storage of explosives or detonators on an underground working level which meets the specifications set forth in these standards.

(63) "Semiconductive hose" means hose having an electrical resistance of not less than 5,000 ohms per foot and not more than two megohms for its total length, used in pneumatic placement of blasting agents in bore holes.

(64) "Shaft" means a vertical or inclined shaft, a slope, incline or winze.

(65) "Sprung hole" means a blasting hole chambered or enlarged to take an increased charge of explosives.

(66) "Stemming" means the enert material and the placing of such material on top of a charge of explosives.

(67) "Stray current" means that portion of a total electric current that flows through paths other than the intended circuit.

(68) "Substantial construction" means construction of such strength, material, and workmanship that the object will withstand all reasonable shock, wear, usage and deterioration to which it will be subjected.

(69) "Suitable" means that which fits, and has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstances.

(70) "Threshold limit values" refer to concentrations of airborne substances and/or exposures to physical agents to which it is believed that nearly all workers may be exposed for a specified length of time without adverse effect.

(71) "Travelway" means a passage, walk or way regularly used and designated for persons to go from one place to another.

(72) "Trip light" means a light displayed on the opposite end of a train from the locomotive or engine.

(73) "Wet drilling" means the continuous application of water through the central hole of hollow drill steel to the bottom of the drill hole.

(74) "Working place" means any place in or about a mine where work is being performed.

(75) "Workman" means a person who is engaged in the employment of an employer.

[Order 72-1, § 296-61-020, filed 2/25/72, effective 4/1/72.]

WAC 296-61-030 Safety education and first-aid requirements--General, surface, and underground. (1) The applicable minimum requirements specified in the general safety standards relating to first aid and safety education shall be complied with.

(2) (57.15-1) There shall be adequate first-aid supplies and materials, and adequately trained personnel so stationed that they can administer immediate care to all workmen in any mine or operation in case of injury. Water or neutralizing agents shall be available where corrosive chemicals or other harmful substances are stored, handled, or used.

(3) (57.18-6) All workmen shall be indoctrinated in safety rules and safe work procedures. A competent person shall give special safety training to employees who are not familiar with new work assignments.

(4) (57.18-12) A poster shall be fastened and maintained either on or in the cover of each first aid cabinet and at or near all telephones plainly stating the telephone numbers of available doctors, hospitals, and ambulance services within the district of the workmen.

(5) (57.18-4) Arrangements shall be made in advance for obtaining emergency medical assistance and transportation for injured workmen.

(6) (57.18-20) Working alone (surface). When a workman is assigned to work alone in a remote or isolated area, a system shall be instituted whereby such workman reports by use of radio or telephone to someone periodically or a designated person shall check on his safety at reasonable intervals. All persons involved in working alone shall be advised of the procedures to be followed.

(7) (57.18-25) Working alone (underground). A workman shall not be assigned, allowed or required to work alone in any area where conditions could develop which may endanger his safety, unless he can be seen, his cries for help can be heard, or if sounds of equipment being operated would indicate, if the sounds should cease for a length of time, to other workmen in the area that the person operating the equipment may be in trouble.

(8) (57.18-27) All workmen entering or leaving a mine shall be checked in and out. An accurate record of each entry and exit of workmen shall be kept at the mine entrance.

[Order 72-1, § 296-61-030, filed 2/25/72, effective 4/1/72.]

WAC 296-61-040 Personal protective equipment and clothing--General, surface and underground. The rules for personal protective equipment and clothing shall be as specified by the department of labor and industries in the general safety standards or occupational health standards, and the following standards shall also apply.

(1) (57.15-2) All workmen shall wear suitable head protection when in or around a mine or plant where a hazard exists which could cause an injury to the head.

(2) (57.15-3) All workmen shall wear suitable protective footwear when in or around an area of a mine or plant where a hazard exists which could cause an injury to the feet.

(3) (57.15-4) All workmen shall wear safety glasses, goggles, or face shields or other suitable protective devices when in or around an area of a mine or plant where a hazard exists which could cause injury to unprotected face or eyes.

(4) (57.15-5) Safety belts and lines shall be worn by workmen when there is danger of falling; a second workman shall tend the lifeline when confined or dangerous areas are entered. (See WAC 296-61-140.)

(5) (57.15-7) Protective clothing or equipment shall be worn when welding, grinding, torch-cutting, snagging or chipping, handling molten metals, acids, or caustics, or when exposed to harmful rays, dusts, or flying materials of any kind.

(6) (57.15-20) Life jackets or vests shall be worn where there is danger from falling into water. New equipment shall have a positive buoyancy of at least fifteen and one-half pounds, shall be U.S. Coast Guard approved, and shall be replaced when the positive buoyancy diminishes to thirteen pounds or less.

[Order 72-1, § 296-61-040, filed 2/25/72, effective 4/1/72.]

WAC 296-61-050 General requirements. (1) (57-.20-1) Intoxicating beverages and narcotics shall not be permitted or used in or around mines. Workmen under the influence of alcohol or narcotics shall not be permitted on the job. This rule shall not apply to persons taking prescription drugs and narcotics as directed by a physician, providing such use shall not endanger the workman or others.

(2) (57.20-2) Every place of work shall have an adequate supply of water of a quality meeting the state board of health standards. Drinking utensils shall be of the sanitary type. Piping and outlets conveying nonpotable water shall be identified so that they are readily distinguished from piping and outlets carrying potable water.

(3) (57.20-5) Carbon tetrachloride shall not be used as a cleaning solvent or as a fire extinguishing agent.

(4) (57.20-9) Dusts suspected of being explosive shall be tested for explosibility. If tests prove positive, appropriate control measures shall be taken.

(5) (57.20-10) If water or silt will create a hazard, a retaining dam of substantial construction shall be erected and shall be inspected at regular intervals.

(6) (57.20-20) (Surface only.) Access to unattended mine openings shall be restricted by gates or doors, or the openings shall be fenced and posted.

(7) (57.20-21) Upon abandonment of any mine, the owner or operator shall effectively close or fence off all surface openings into which persons could fall or through which workmen could enter. Trespass warnings and appropriate danger notices shall be posted at or near each opening or entrance.

(8) (57.20-31) (Underground only.) Before blasting, workmen shall be located in a safe area. Such areas shall be where the blast will not create hazards, such as: Accumulations of water, gas, mud, or flammable atmosphere.

(9) (57.14-25) (57.14-26) (57.14-31) (57.14-32) Any person, firm, corporation or association involved in any type of operation as referred to by the title of these standards shall provide and maintain in use, belt shifters or other mechanical contrivances for the purpose of throwing on or off belts on pulley while running, where the same are practicable with regard to the nature and

purpose of said belts and the dangers to workmen therefrom; also reasonable safeguards for all vats, pans, trimmers, cut–off, gang edger, and other saws, planers, cogs, gearings, belting, shafting, coupling, set screws, live rollers, conveyors, and machinery of other similar description, which it is practicable to guard and which can be effectively guarded with due regard to the ordinary use of such machinery and appliances, and the dangers to workmen therefrom, and with which the workmen are liable to come into contact while in performance of their duties; and shall correct any other unsafe methods of performing work which can be corrected with due regard to the general performance of such work; and if any machine or equipment, or any part thereof, is in a defective condition, and its operation would be extrahazardous because of such defect, or if any machine is not safeguarded as provided in this chapter, the use thereof is prohibited.

(10) (57.14–29) To avoid accidental activation of machinery, electrical devices or other equipment while performing maintenance, repair, clean–up, or construction work, the main disconnect(s) (line circuit breakers), or supply valve(s) shall first be deenergized or deactivated and locked or tagged out. Equipment shall be stopped and tagged or locked out before workmen remove guards or reach into any potentially hazardous area. The only exception will be when the equipment must be in motion in order to make proper adjustments. (See WAC 296–61–130.)

(11) (57.14–30) Workmen shall not work on or from mobile equipment in a raised position until it has been securely blocked in place. This does not preclude the use of equipment specifically designed as elevated mobile work platforms.

(12) (57.14–33) Pulleys of conveyors shall not be cleaned manually while the conveyor is in motion.

(13) (57.14–34) Belt dressing shall not be applied manually while belts are in motion unless an aerosol–type dressing is used.

(14) (57.14–35) Machinery shall not be lubricated while in motion where a hazard exists. Use of lubricating fittings or cups sufficiently extended to eliminate the hazard is permissible.

(15) (57.14–45) Welding operations shall be shielded and well ventilated in a manner which will protect workmen from harmful exposures.

(16) (57.4–75) Conveyors shall be equipped with slippage detection devices. Multiple conveyor systems shall be equipped with interlocking shut down system.

[Order 72–1, § 296–61–050, filed 2/25/72, effective 4/1/72.]

WAC 296–61–060 Illumination. (1) (57.17–1) (Surface only.) All areas shall be sufficiently illuminated in order that workmen in the area can safely perform their assigned duties. When the adequacy of illumination for the area or task performed is questionable, a determination of the amount of illumination needed shall be make by the industrial hygiene section of the division of safety.

(2) (57.17–10) (Underground) Each person, when underground, shall carry an electric lamp which shall be maintained in good working condition.

[Order 72–1, § 296–61–060, filed 2/25/72, effective 4/1/72.]

WAC 296–61–070 Guards and guarding. (1) General safety standards to prevail where applicable. Driving mechanisms, power transmission equipment or apparatus, prime movers, shear or pinch points, or other similar hazardous areas or exposure shall be properly safeguarded with standard safeguards as required by the general safety standards.

(2) (57.14–1) Gears; sprockets; chains; drive head, tail, and take–up pulleys; flywheels, couplings, shafts, saw blades; fan inlets; and similar exposed moving machine parts which may be contacted by workmen and which may cause injury to workmen shall be guarded.

(3) (57.14–2) All belts and rope drives exposed to contact, which are so located that should the belt or rope break and the whip–like motion of the belt or rope could strike a workman, shall be properly guarded.

(4) (57.14–6) Except when testing the machinery, guards shall be securely in place while machinery is being operated.

(5) (57.14–26) Unsafe equipment or machinery shall be removed from service immediately.

(6) (57.14–8) (57.14–9) (57.14–14) Grinding wheels must be provided with a hooded guard of sufficient strength to withstand the shock of a bursting wheel. This guard must be adjusted close to the wheel and extend forward over the top of the wheel to a point at least thirty degrees beyond a vertical line drawn through the center of the wheel.

(a) Arbor ends must be guarded.

(b) Speed of wheels must not exceed the speed guaranteed by the manufacturer.

(c) Where practicable, grinding wheels must be provided with safety flanges.

(d) Work to be ground shall be held firmly against the steady rest in front of the wheel.

(e) The steady rest shall be properly adjusted and as near the wheel as possible.

(f) The side of emery wheels shall not be used for grinding unless it is designed for side grinding.

(g) Face shields or goggles, in good condition, shall be worn when operating a grinding wheel.

(7) (57.14–10) Hand–held power tools, other than rock drills, shall be equipped with controls requiring constant hand or finger pressure to operate the tools or shall be equipped with friction or other equivalent safety devices.

(8) (57.14–13) Forklift trucks, front–end loaders, and bulldozers shall be provided with substantial canopies when necessary to protect the operator.

[Order 72–1, § 296–61–070, filed 2/25/72, effective 4/1/72.]

WAC 296–61–080 Fire prevention and control--General. (1) (57.4–1) No person shall smoke or use an open flame:

(a) Where flammable solvents, liquids, fluids, or other flammable materials are stored, transported, handled or used; or

(b) Where oil or grease is stored, transported, handled, or used, if smoking or the use of an open flame may cause a fire; or

(c) Within an unsafe distance of any area where smoking or the use of any open flame may cause a fire or an explosion.

(2) (57.5-2) Signs warning against smoking and open flames shall be posted so they can be readily seen in areas or places where fire or explosion hazards exist.

(3) (57.4-4) Flammable liquids shall be stored in accordance with standards of the National Fire Protection Association or other recognized agencies approved by the U.S. Bureau of Mines. Small quantities of flammable liquids drawn from storage shall be kept in appropriately labeled safety cans.

(4) (57.4-8) Fuel lines shall be equipped with valves to cut off fuel at the source and shall be located and maintained to minimize fire hazards.

(5) (57.4-9) All heat or ignition sources, including lighting equipment, capable of producing combustion shall be insulated or isolated from combustible materials.

(6) (57.4-10) Electrical conductors shall be adequately insulated:

(a) Where they pass through doors or walls,

(b) Where they present a fire hazard, or

(c) Where they may be exposed to contact.

(7) (57.4-11) Abandoned electrical circuits shall be deenergized and isolated so that they cannot become energized inadvertently.

(8) (57.4-14) Solvents with flash points lower than 100°F. (38°C.) shall not be used for cleaning.

(9) (57.4-15) Solvents or flammable materials shall not be used when the following conditions exist:

(a) When there is open flame or source of ignition present,

(b) When the temperature can elevate the temperature of the solvent above its flash point, or

(c) When near any source of heat which may cause the creation of a hazardous condition.

(10) (57.4-18) Oxygen cylinders shall not be stored near oil or grease or in rooms, or areas used or designated for the storage of oil or grease.

(11) (57.4-19) Gauges and regulators used with oxygen or acetylene cylinders shall be kept clean and free of oil and grease.

(12) (57.4-20) Battery-charging stations shall be located in well-ventilated areas, and away from sources of ignition.

(13) (57.4-21) Internal combustion engines, except diesels, shall have the motor stopped while fueling and extreme care shall be taken to prevent spilling fuel on hot parts. The brakes shall be set on mobile equipment prior to fueling.

(14) (57.4-22) Each mine shall be equipped with or be provided with fire extinguishing equipment suitable for the size of the area and types of fire which could be expected.

(15) (57.4-23) Firefighting equipment which is provided on the mine property shall be strategically located, readily accessible, plainly marked, properly maintained, and inspected periodically. Records shall be kept of such inspections.

(16) (57.4-29) When welding, cutting or heating of materials is to be done near combustible materials, proper precautions shall be taken to ensure that the combustible material is not ignited from sparks, smoldering pieces of metal or the flame. A fire extinguisher shall be at the work site.

(17) (57.4-33) Valves on oxygen and acetylene cylinders shall be kept closed when not in use.

(18) (57.4-40) Fire alarm systems shall be provided and maintained in operating condition or adequate fire alarm procedures shall be established to warn promptly all persons who may be endangered by a fire.

(19) (57.4-46) Containers of gasoline, diesel fuel, liquefied petroleum gases, and other flammable liquids, when not buried, shall not be stored within one hundred feet of the following:

(a) Mine openings,

(b) Buildings or snowsheds connected to mine openings,

(c) Fan installations or housings,

(d) Hoist houses.

(20) (57.4-50) Specific escape and evacuation plans shall be established and kept current. Escape routes shall be marked plainly.

(21) (57.4-51) Fire-alarm systems adequate to warn all employees (underground) shall be provided and maintained in operating condition.

(22) (57.4-52) Gasoline shall not be taken, stored or used underground except in permissible flame safety lamps.

(23) (57.4-53) The use of liquefied petroleum gases underground shall be limited to maintenance work.

(24) (57.4-54) Oil, grease, or diesel fuel stored underground shall be kept in suitable tightly sealed containers in fire-resistant areas, at safe distances from explosives magazines, electrical installations, and shaft stations.

(25) (57.4-58) Fires shall not be built underground. Burning open-flame torches and candles shall not be left unattended underground.

(26) (57.4-65) When welding or cutting near combustible materials underground, the surrounding area shall, if practical, be wet down thoroughly before and after work is done, and a fire patrol of the area shall be maintained afterward for at least eight hours. In addition, when welding or cutting in shafts, winzes or raises, barriers, bulkheads or other, protective measures shall be used to prevent injury to anyone working or traveling below.

(27) (57.4-67) A mine rescue station equipped with at least ten sets of approved and properly maintained two-hour, self-contained breathing apparatus, adequate supplies, and spare parts shall be maintained at mines employing seventy-five or more men underground, or, in lieu thereof, the mine shall be affiliated with a central mine rescue station which meets the approval of the U.S. Bureau of Mines.

(28) (57.4–69) Approved mine rescue apparatus shall be properly maintained for immediate use. The equipment shall be tested at least once a month and records kept of the tests.

(29) (57.4–70) At mines employing seventy–five or more men underground, at least two rescue crews (ten men) shall be trained at least annually in the use, care, and limitations of self–contained breathing and fire–fighting apparatus and in mine–rescue procedures. Smaller mines shall have at least one man so trained for each ten men employed underground.

[Order 72–1, § 296–61–080, filed 2/25/72, effective 4/1/72.]

WAC 296–61–090 Travelways and escapeways--Surface and underground. (1) (57.11–1) Safe means of access shall be provided and maintained to all working places.

(2) (57.11–2) Crossover, elevated walkways, elevated ramps, and stairways shall be of substantial construction, provided with handrails, and maintained in good condition. Where necessary, toeboards shall be provided.

(3) (57.11–3) Ladders shall be of substantial construction and maintained in good condition.

(4) (57.11–5) Fixed ladders used underground shall be anchored securely and installed to provide at least three inches of toe clearance.

(5) Fixed ladders used above ground shall be anchored securely and have not less than seven inches clearance from the center of rungs to the nearest permanent object in back of the ladder.

(6) (57.11–6) Ladders shall project at least three and one–half feet above every platform in the ladderway and at least three and one–half feet above the collar of the shaft, winze, or raise, unless convenient and secure handholds are fixed at such places.

(7)(a) (57.11–9) Walkways with outboard railings shall be provided wherever persons are required to walk alongside elevated conveyor belts. Inclined walkways shall be covered with nonskid type material or provided with cleats.

(b) Whenever conveyors pass adjacent to or over working areas or passageways used by workmen, protective guards shall be installed. These guards shall be designed to catch and hold any load or materials which could create a hazard by falling or becoming dislodged.

(8) (57.11–12) Openings above, below, or near travelways through which men or materials may fall shall be protected by railings, barriers, or covers. If it is impractical to install such protective devices, other means or methods shall be instituted which will afford equivalent protection for the workmen.

(9) (57.11–13) Crossovers or underpasses with proper safeguards shall be provided over or under all conveyors which cannot otherwise be crossed safely.

(10) (57.11–14) Moving conveyors shall be crossed only at designated crossovers or underpasses.

(11) (57.11–16) Regular used walkways and travelways on which snow or ice has accumulated shall be sanded, salted, or cleared as soon as possible.

(12) (57.11–27) Scaffolds and working platforms shall be of substantial construction and provided with handrails and maintained in good condition. Floorboards shall be laid properly and the scaffolds and working platform shall not be overloaded. Working platforms shall be provided with toeboards when necessary.

(13) (57.11–36) Trap doors or adequate guarding shall be provided in ladderways at each level. Doors shall be kept operable.

(14) (57.11–50) Every underground mine shall have two separate properly maintained escapeways to the surface which are so positioned that damage to one shall not lessen the effectiveness of the other, or a method of refuge shall be provided when only one opening to the surface is possible.

(15) (57.11–51) Escape routes shall be:

(a) Inspected at regular intervals maintained in a safe travelable condition.

(b) Marked with conspicuous and easily read direction signs that clearly indicate the ways of escape.

(16) (57.11–52) Underground refuge areas shall be:

(a) Of fire–resistant construction, preferably in untimbered areas of the mine.

(b) Large enough to accommodate readily the normal number of men in the particular area of the mine.

(c) Constructed so they can be made gastight.

(d) Provided with compressed air lines, waterlines, suitable handtools, and stopping materials.

(17) (57.11–53) Mine maps showing escape routes, directions of principal airflow, locations of telephones, fire doors, and ventilation doors, shall be posted and available. Maps shall be brought up to date as necessary.

(18) (57.11–54) Telephone or other approved types of voice communication shall be provided between the surface and refuge chambers. Such systems shall be independent of the mine power supply.

(19) (57.11–55) Designated escapeways inclined more than thirty degrees from the horizontal shall be equipped with stairways, ladders, cleated walkways or emergency hoisting facilities.

[Order 72–1, § 296–61–090, filed 2/25/72, effective 4/1/72.]

WAC 296–61–100 Air quality, ventilation and radiation. (1) (57.5–1) Except as permitted by Standard (4) (Federal 57.5–5) in this section:

(a) The exposure to airborne contaminants of a person working in a mine shall not exceed, on the basis of a time–weighted average, the threshold limit values adopted by the American Conference of Governmental Industrial Hygienists, as set forth and explained in the conference's publication entitled "Threshold Limit Values of Airborne Contaminants." Excursions above the listed threshold limit values shall not be of a greater magnitude than is characterized as permissible by the conference. This paragraph:

(a) Does not apply to airborne contaminants given a "C" designation by the conference – for example, nitrogen dioxide.

(b) Workmen shall be withdrawn from areas in which there is a concentration of an airborne contaminant given a "C" designation by the conference which exceeds the threshold limit value (ceiling "C" limit) listed for that contaminant.

(2) (57.5–2) A sufficient quantity of air shall be circulated through the working places of the mine to maintain a quality of air which is safe and respirable. Dust, gas, mist, and fume surveys shall be conducted as frequently as necessary to determine the adequacy of control measures.

(3) (57.5–3) Holes shall be collared and drilled wet, or other efficient dust–control measures shall be used when drilling nonwater–soluble material. Efficient dust–control measures shall be used when drilling water–soluble materials.

(4) (57.5–5) Respirators shall not be substituted for environmental control measures. However, where environmental controls have not been developed or when necessary by nature of the work involved (for example, welding, sand blasting, lead burning), a workman may work for reasonable periods of time in concentrations of airborne contaminants which exceed ceiling "C" limits or the limit of permissible excursions referred to in Standard (1) (Federal 57.5–1) in this section, if such workman wears a respiratory protective device approved by the Bureau of Mines as protection against the particular hazards involved.

(5) UNDERGROUND. (57.5–22) All surface fans, casings and air ducts connecting with the mine openings and also the fan houses and other buildings in close proximity shall be made of noncombustible material throughout; or, if of combustible material, it shall be made fire–resistant.

(6) (57.5–28) Unventilated areas shall be sealed, or barricaded and posted against entry.

(7) RADIATION. In the standards in 57.5 which relate to radiation, a "working level" (WL) means any combination of the short–lived radon daughters in one liter of air that will result in the ultimate emission of 1.3×10^5 MeV (million electron volts) of potential alpha energy, and exposure to these radon daughters over a period of time expressed in terms of "working level months" (WLM). Inhalation of air containing a radon daughter concentration of 1 WL for 170 hours results in an exposure of 1 WLM.

(8) (57.5–37) Mine atmosphere shall be sampled to determine if hazardous concentrations of radon daughters are present. Where potentially hazardous concentrations are found, or known sources of radon exist, each active work area shall be sampled as often as necessary by a qualified person.

(9) (57.5–38) No workman shall be permitted to receive an exposure of more than six working level months in any consecutive three–month period and no more than twelve working level months in any consecutive twelve–month period.

(10) (57.5–39) If samples show an atmospheric concentration or radon daughters of more than 1.0 working level, but less than 2.0 working levels, immediate corrective action shall be taken or the workmen shall be withdrawn. When concentrations higher than 2.0 working levels are found, the workmen shall be withdrawn from the area until corrective action is taken and the radon–daughter atmospheric concentrations are reduced to 1.0 working level or less.

(11) (57.5–40) Where uranium is mined, if measurements in areas indicate exposure to concentrations of radon daughters in excess of 0.3 working level, complete individual exposure records shall be kept for all workmen entering these areas.

(12) (57.5–41) Smoking shall be prohibited where uranium is mined.

(13) (57.5–42) If levels of permissible exposures to concentrations of radon daughters different from those prescribed in standard (7) radiation, in this section, are recommended by the environmental protection agency and approved by the president, no workmen shall be permitted to receive exposures in excess of those levels after the effective dates established by the agency.

[Order 72–1, § 296–61–100, filed 2/25/72, effective 4/1/72.]

WAC 296–61–110 Regulations pertaining to use of diesel equipment underground. Permission will be granted for specified diesel equipment, working in a specified location under specified conditions, as follows:

(1) Application shall be made to the mining section, division of safety, department of labor and industries, for permission to use specified diesel equipment in a specified underground area and should include the following information:

(a) The type of construction and complete identification data and specifications including analysis of the undiluted exhaust gases of the diesel equipment.

(b) The location of the underground mine where the diesel equipment is to be used, accompanied by a drawing showing the underground area and description of the ventilation system.

(2) Before the diesel equipment is taken underground, written permission shall be obtained from the division of safety or its duly authorized representative. A satisfactory test on surface, to show that the exhaust gases do not exceed the maximum percentage of carbon monoxide permitted, shall be required.

(3) Diesel equipment may only be used underground where the mine ventilation is controlled by mechanical means and shall not be operated if the ventilating current is less than 75 CFM per horsepower, based on the maximum brake horsepower of the engines.

(4) Air measurements shall be made at least once weekly in the diesel engine working area and the measurements entered in the *Underground Diesel Engine Record Book.* Permissible maximum amounts of noxious gases are as follows:

At engine exhaust ports	Carbon Monoxide	.10%	1,000 ppm[1]
Next to equipment	Carbon Monoxide	.005%	50 ppm
General atmosphere	Carbon Monoxide	.005%	50 ppm
General atmosphere	Nitrogen Dioxide	.0005%	5 ppm
General atmosphere	Aldehydes	.0002%	2 ppm

[1]Parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 mm. Hg. pressure.

[Order 72-1, § 296-61-110, filed 2/25/72, effective 4/1/72.]

WAC 296-61-120 Electricity--Surface and underground. (1) (57.12-1) Circuits shall be protected against excessive overloads by the use of fuses or circuit breakers of the correct type and capacity.

(2) (57.12-2) Electrically-operated equipment and electrical circuits shall be provided with switches and/or other controls. Such switches and/or controls shall be of approved design and construction and shall be properly installed.

(3) (57.12-3) Individual overload protection or short-circuit protection shall be provided for the trailing electrical cables of mobile equipment.

(4) (57.12-7) Trailing cable and power-cable connections to junction boxes shall not be made or broken under load.

(5) (57.12-11) High-potential transmission cables shall be covered, insulated, or placed according to acceptable electrical codes to prevent contact with low-potential circuits.

(6) (57.12-14) Shovel trailing cables shall not be moved with the shovel dipper unless cable slings or sleds are used.

(7) (57.12-30) When a potentially dangerous condition is found the equipment or wiring shall be immediately deenergized and the condition corrected before the equipment or wiring is reenergized.

(8) (57.12-16) Electrical equipment shall be deenergized before work is done on such equipment. Switches shall be locked out or other measures taken which shall prevent the equipment from being energized without the knowledge of the individuals working on it. Such locks, or preventative device, shall be removed by the persons who installed them, or other authorized personnel may remove a lock or device only when he is assured it is safe to do so and when the person who placed the device is not available.

(9) (57.12-17) Power circuits shall be deenergized before work is done on such circuits unless hot-line tools or other equipment approved for such use is used. Suitable warning signs shall be posted by the workmen who are to do the work. Switches shall be locked out or other measures taken which shall prevent the power circuits from being energized without the knowledge of the workmen working on them. Such locks, signs, or preventative devices shall be removed by the workman who installed them or other authorized personnel may remove a lock or device only when he is assured it is safe to do so and when the person who places the device is not available.

(10) (57.12-18) Principal power switches shall be labeled to show which units they control, unless identification can be made readily by location.

(11) (57.12-20) Dry wooden platforms, insulating mats, or other electrically nonconductive material shall be kept in place at all switchboards and power-control switches where shock hazards exist. However, metal plates on which a person normally would stand and which are kept at the same potential as the grounded, metal, noncurrent-carrying parts of the power switches to be operated, may be used.

(12) (57.12-21) Suitable danger signs shall be posted at all major electrical installations.

(13) (57.12-23) Electrical connections and resistor grids that are difficult or impractical to insulate shall be guarded, unless protection is provided by location.

(14) (57.12-25) All metal enclosing or encasing electrical circuits shall be grounded or provided with equivalent protection. This requirement does not apply to battery-operated equipment.

(15) (57.12-26) Metal fencing and metal buildings enclosing transformers and switchgear shall be grounded.

(16) (57.12-27) Frame grounding or equivalent protection shall be provided for mobile equipment powered through trailing cables.

(17) (57.12-28) Continuity and resistance of grounding systems shall be tested immediately after installation and at reasonable periodic intervals.

(18) (57.12-33) Hand-held electric tools shall not be operated at high potential voltages.

(19) (57.12-36) Fuses shall not be removed or replaced by hand in an energized circuit, and they shall not otherwise be removed or replaced in an energized circuit unless equipment and techniques especially designed to prevent electrical shock are provided and used for such purpose.

(20) (57.12-37) Fuse tongs or hot-line tools shall be used when fuses are removed or replaced in high-potential circuits.

(21) (57.12-40) Operating controls shall be installed in such a manner that they can be operated without danger of contact with energized conductors.

(22) (57.12-41) Switches and starting boxes shall be of safe design and capacity.

(23) (57.12-45) Overhead electrical transmission lines above ground shall be installed as specified by the National Electrical Safety Code, Washington state electrical construction code or Washington state statutes, whichever is most restrictive.

(24) (57.12-71) When equipment must be moved or operated near a power line (other than trolley lines) and can come within ten feet of the power line proper barricades shall be erected or the power line shall be deenergized.

(25) (57.12-47) Guy wires of poles supporting high-potential conductors shall be equipped with insulators installed as required by the applicable safety rules or laws.

(26) (57.12-48) Telegraph, telephone, or signal wires shall not be installed on the same crossarm with power conductors. When installed on poles supporting powerlines they shall be installed as specified by the National Electrical Safety Code or Washington state rules or laws, whichever affords the greatest degree of protection.

(27) (57.12-65) Powerlines, including trolley wires, and telephone circuits shall be protected against short circuits and lightning.

(28) (57.12-66) Where metallic tools or equipment can come in contact with trolley wires or bare powerlines, the lines shall be guarded or deenergized.

(29) (57.12-67) Transformers shall be totally enclosed, or shall be placed at least eight feet above the ground, or installed in a transformer house or surrounded by a substantial fence at least six feet high and at least three feet from any energized parts, casings, or wiring.

(30) (57.12-68) Transformer enclosures shall be kept locked against unauthorized entry.

(31) (57.12-80) Trolley wires and bare power conductors shall be guarded at man trip loading and unloading points, and at shaft stations. Where such trolley wires and bare power conductors are less than seven feet above the rail, they shall be guarded at all points where men work or pass regularly beneath.

(32) (57.12-82) Powerlines shall be well separated or insulated from waterlines, telephone lines, and air lines.

(33) (57.12-85) Transformer stations shall be enclosed to prevent workmen from unintentionally or inadvertently contacting energized parts.

[Order 72-1, § 296-61-120, filed 2/25/72, effective 4/1/72.]

WAC 296-61-130 Deenergizing and lock-out or tag-out procedures. (1) Procedures outlined in WAC 296-61-050(10) shall be followed:

(a) If pipelines or ducts are constructed without valves or closures, the lines or ducts shall be broken at a flange and a blank flange inserted to stop the accidental flow of any material.

(b) 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 hazard while conducting test if power source or flow of material is not shut off.

(2) A tag-out procedure will be acceptable when evidence indicates it is equivalent to a lock-out procedure.

(3) Tags shall contain the following information: Name of person authorizing placement; reason for placing; signature of workman placing tag; and department with which such workman is associated.

(4) Locking or tagging out a machine by use of a push button or other local control device only will not be acceptable as meeting the intent of these rules.

(5) Equipment shall be stopped and tagged or locked out before workmen remove guards or reach into any potentially hazardous area. The only exception will be when the equipment must be in motion in order to make proper adjustments.

(6) Each person actively engaged in the repair, maintenance or clean-up shall lock-out or tag-out the affected equipment and shall personally remove his lock or tag upon completion of his work, except when it is positively determined that a workman has left the premises without removing his lock or tag, other workmen may remove the locks or tags in accordance with a procedure formulated by each firm and approved by the division of safety.

[Order 72-1, § 296-61-130, filed 2/25/72, effective 4/1/72.]

WAC 296-61-140 Vessel or confined area requirements. (1) Management shall be responsible for developing a written procedure to be followed for safe entry of workmen into confined areas, tanks, vessels or sewers and for maintaining a safe condition while work is being performed therein. Such procedure shall include the following minimum requirements:

(a) Before workmen enter and at reasonable intervals as work progresses, all vessels, sewers or confined areas must be properly ventilated. Such areas shall be tested and/or evaluated by a person thoroughly trained and instructed in the use of instruments required, or qualified to make evaluations of conditions which may be encountered. Special consideration shall be given to the possibility that the area may be deficient of oxygen or may contain dangerous concentrations of gases or toxic substances.

(b) All equipment necessary to perform the work, including safety equipment, must be at the job site and shall be inspected or tested to assure that it functions properly.

(c) All electrical circuits, valves, ducts, pipes, and other equipment shall be locked out, tagged out, or blanked as required in accordance with the applicable rules in these standards.

(d) Prior to and while welding or burning is being done in areas where a fire or explosion hazard may exist, the applicable rules contained in these standards shall be complied with.

(e) The occupational health standards shall prevail for evaluating conditions concerning health, fire, or explosion hazards.

[Order 72-1, § 296-61-140, filed 2/25/72, effective 4/1/72.]

WAC 296-61-150 Compressed air, boilers, hoses and fittings, surface and underground--General. (1) (57.13-1) Boilers, high pressure cylinders and vessels shall be constructed, tested, inspected and maintained to conform to the standards established by the boilers and unfired pressure vessels law, chapter 70.79 RCW, and adopted rules administered by Washington state department of labor and industries, division of building and construction safety inspection services.

(2) (57.13-19) Repairs involving the pressure system of compressors, receivers, or compressed air-powered equipment shall not be attempted until the pressure has been bled off.

(3) (57.13-20) Compressed air shall not be used for cleaning purposes if it may endanger other persons in the area or for cleaning clothing while it is being worn.

(4) (57.13-21) High pressure steam or air hose lines of three-quarter inch inside diameter or greater shall have safety chains or devices affording equivalent protection installed in or between line sections and at connections of machines.

[Order 72-1, § 296-61-150, filed 2/25/72, effective 4/1/72.]

WAC 296-61-160 Materials storage and handling--General, surface and underground. (1) (57.16-3) (57.16-

4) Hazardous materials shall be labeled, handled and stored properly to prevent spillage or damage to the containers. Chemicals shall be stored in such a manner that they will not decompose, contaminate, or react with other chemicals which could create a hazard. The manufacturer's safe practice recommendations or those published by the Manufacturing Chemists Association should be followed.

(2) (57.16–5) (57.4–18) Compressed gas cylinders shall be stored away from heat sources, combustible materials or other materials, which may create hazardous conditions. Manufacturer's, supplier's or other acceptable safe practices shall be followed. Cylinders shall be secured in a manner which will prevent them from tipping or falling. Acetylene cylinders shall be stored, transported, or used while in the upright position only. Oxygen cylinders shall not be stored near oil or grease or in rooms or areas used or designated for the storage of oil or grease.

(3) (57.16–6) Valves on compressed gas cylinders shall be protected by covers when being transported or stored, and by a safe location when the cylinders are in use.

(4) (57.16–9) Workmen shall stay clear of suspended loads.

(5) (57.16–11) Workmen shall not ride on loads being moved by cranes or derricks, nor shall they ride the hoisting hooks unless a special conveyance or safety device with a lifeline is used.

[Order 72–1, § 296–61–160, filed 2/25/72, effective 4/1/72.]

WAC 296–61–170 Crane rail stops, bumpers and fenders. (57.16–14) (1) Rail stops shall be provided at both ends of the crane runway and at ends of a crane bridge. When two trolleys are operated on the same rails, bumpers shall be provided to prevent collision of the cranes or trolleys.

(2) Bumpers and rail stops shall extend at least as high as the centers of the wheels, and a warning device shall be installed to warn the operator that he is approaching the end of the runway.

(3) Rail stops shall be fastened to the girders and rails, but not to the rails alone. This does not apply to portable rail stops used temporarily as a safeguard for a specific situation.

(4) Rail stops shall be built up of steel plates and angles or be made of cast steel.

(5) When crane rails are located where workmen may be exposed to the pinch point between a crane wheel and the rail, fenders shall be installed which extend below the lowest point of the treads of the outside ridge truck wheels. They shall be of a shape and form that will tend to push or raise a man's hand, arm or leg off the rail and away from the wheel.

(6) Hoists shall be provided with a positive limit stop to prevent the hoist block from over–traveling in the upward direction.

(7) A device for locking or tagging out the disconnect switch shall be provided.

(8) Effective audible warning signals shall be provided within easy reach of the operator.

[Order 72–1, § 296–61–170, filed 2/25/72, effective 4/1/72.]

WAC 296–61–180 Crane platforms and footwalks. (57.16–15) (1) Crane 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 with standard railings and toeboards 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 at 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.

[Order 72–1, § 296–61–180, filed 2/25/72, effective 4/1/72.]

WAC 296–61–190 Pit and quarry operations--Ground control--Surface. (1) All rules contained in this standard shall prevail where applicable to this type of operation.

(2) The words "pits" or "quarry" when used in this section shall mean a cavity or opening formed in the earth by breaking, loosening, cutting, digging or pushing aside and removing therefrom the sand, gravel, ore, rock or other material.

(3) (57.3–1) Standards for the safe control of pit walls, including the overall slope of the pit wall, shall be established and followed by the operator. Such standards shall be consistent with the prudent engineering design, the nature of the ground, and the kind of mineral mined, and the ensuring of safe working conditions according to the degree of slope. Mining methods shall be selected which will ensure wall and bank stability, including benching as necessary to obtain a safe overall slope.

(4) (57.3–2) All material so located as to constitute a hazard shall be stripped for a safe distance but in no case less than ten feet from the top of pit or quarry walls. The faces of any open pit or quarry shall be given a slope to be consistent with the stability of the material to minimize the danger of rock or material from falling on workmen.

(5) The slope of the face shall be consistent with the stability of the rock. On walls where the material is loose

or unstable, benches shall be provided to assure capture of falling material.

(6) (57.3-3) Width and height of benches shall be governed by the type of equipment to be used so work can be performed safely.

(7) (57.3-4) Safe means of scaling pit-banks shall be provided. Hazardous banks shall be scaled before other work is performed in the hazardous bank area.

(8) (57.3-5) Workmen shall not work near or under dangerous banks. All loose rock and overhang shall be barred down or removed by mechanical means before proceeding with work under the face. Barring down shall not be done until workmen below are notified and are at a safe location. Other unsafe ground conditions shall be corrected or barricaded and posted.

(9) (57.3-6) Workmen engaged in barring down loose material shall approach the material from above and scale from a safe location and, when scaling from high and steeply inclined ledges, shall be provided with and wear safety belts or harness or equivalent protection which shall be attached to a safety line of which the opposite end shall be securely attached to a substantial anchorage. Safety lines used by scalers shall be of steel wire core type or other material specifically approved for this use by the division of safety.

(10) (57.3-23) Workmen shall be furnished light bars, blunt on one end for scaling loose rock.

(11) (57.3-8) The supervisor, or a competent person designated by him, shall examine working areas and faces for unsafe conditions at least at the beginning of each shift and after blasting, periods of freezing, thawing, rain or other acts of nature. Any unsafe condition found shall be corrected before any further work is performed at the immediate area or face at which the unsafe condition exists.

(12) (57.3-9) Workmen shall examine their working places before starting work and frequently thereafter, and any unsafe condition shall be corrected.

(13) (57.3-12) Workmen shall not work between equipment and the pit wall or bank where the equipment may hinder escape from falls or slides of the bank. Revolving type machines shall be located so as to allow a minimum of thirty inches clearance between the counterweight or outermost projecting part of the machine and any stationary object or the hazardous area shall be restricted to prevent workers from being caught in pinch points.

[Order 72-1, § 296-61-190, filed 2/25/72, effective 4/1/72.]

WAC 296-61-200 Ground control--Underground. (1) (57.3-20) Whenever the ground or material is not known to be stable, supports such as rock bolts, timbers or other methods shall be installed to prevent material from moving or falling. Materials or methods used shall be consistent with the nature of the ground and the method of mining being employed.

(2) (57.3-22) Miners shall examine and test the back, face, and ribs of their working places at the beginning of each shift and frequently thereafter. Supervisors shall examine the ground conditions during daily visits to insure that proper testing and ground control practices are being followed. Loose ground shall be taken down or adequately supported before any other work is done. Ground conditions along the haulageways and travelways shall be examined periodically and scaled or supported as necessary.

[Order 72-1, § 296-61-200, filed 2/25/72, effective 4/1/72.]

WAC 296-61-210 Drilling. (1) (57.7-2) Workmen shall not operate or be required to operate any equipment deemed unsafe. Any defect which would make the equipment unsafe to operate under existing conditions shall be cause to take the equipment out of service until the defects have been properly corrected.

(2) (57.7-3) The drilling area shall be inspected for hazards before starting the drilling operations.

(3) (57.7-4) Workmen shall not be on the mast while the drill bit is in operation unless they are provided with a safe platform from which to work and they are required to use safety belts and lifelines to avoid falling.

(4) (57.7-5) Drill crews and others shall stay clear of augers or drill stems that are in motion. Workmen shall not pass under or step over a moving stem or auger.

(5) (57.7-8) When drills are being moved, drill steel, tools, and other equipment shall be secured. The mast shall be placed in such a position that the drill can be moved safely.

(6) (57.7-10) In the event of power failure, drill controls shall be placed in the neutral position until power is restored.

(7) (57.7-11) The drill stem shall be resting on the bottom of the hole or on the platform with the stem secured to the mast before attempts are made to straighten a crossed cable on a reel.

(8) (57.7-12) Drills shall be attended at all times while drill is in operation or while it is being moved under its own power.

(9) (57.7-13) Drill holes large enough to constitute a hazard shall be covered or guarded.

(10) (57.7-18) Workmen shall not hold the drill steel while collaring holes, or rest their hands on the chuck or centralizer while drilling.

[Order 72-1, § 296-61-210, filed 2/25/72, effective 4/1/72.]

WAC 296-61-220 Rotary jet piercing--Surface only. (1) (57.8-2) Safety chains or other suitable locking devices shall be provided across connections to and between high pressure oxygen hose lines of one inch inside diameter or larger.

(2) (57.8-3) Suitable protective clothing or devices shall be provided and shall be used by the workman when lighting a burner. If burners must be ignited manually, a long lance or other safe device shall be used.

(3) (57.8-5) Workmen shall not smoke and open flames shall not be used in the vicinity of the oxygen storage and supply lines. Signs warning against smoking and open flames shall be posted in these areas.

[Order 72-1, § 296-61-220, filed 2/25/72, effective 4/1/72.]

WAC 296-61-230 Man hoisting--Hoists. The hoisting standards in this section apply to those hoists

and appurtenances used for hoisting workmen. However, where workmen may be endangered by hoists and appurtenances used solely for handling ore, rock, and materials, compliance with the appropriate standards will be required.

(1) (57.19–1) Hoists shall have rated capacities consistent with the loads handled and the recommended safety factors of the ropes used.

(2) (57.19–2) Hoists shall be anchored securely.

(3) (57.19–3) Belt, rope, or chains shall not be used to connect driving mechanisms to man hoists.

(4) (57.19–4) Any hoist used to hoist workmen shall be equipped with a brake or brakes which shall be capable of holding its fully loaded cage, skip, or bucket at any point in the shaft.

(5) (57.19–5) The operating mechanism of the clutch of every man hoist drum shall be provided with a locking mechanism, or interlocked electrically or mechanically with the brake to prevent accidental withdrawal of the clutch.

(6) (57.19–6) Automatic hoists shall be provided with devices that automatically apply the brakes in the event of power failure.

(7) (57.19–7) Man hoists shall be provided with devices to prevent overtravel and overspeed.

(8) (57.19–9) An accurate and reliable indicator of the position of the cage, skip, bucket, or cars in the shaft shall be provided.

(9) (57.19–10) Hoist controls shall be placed or housed so that the noise from machinery or other sources will not prevent hoistmen from hearing signals.

(10) (57.19–21) The following static–load safety factors shall be used for selecting ropes to be used for hoisting workmen and for determining when such ropes shall be removed from the man hoists:

Length of rope in shaft (feet)	Minimum Factor of safety (new rope)	Minimum Factor of safety (removed)
500 or less	8	6.4
501 – 1,000	7	5.8
1,001 – 2,000	6	5.0
2,001 – 3,000	5	4.3
3,001 – or more	4	3.6

(11) (57.19–24) The rope shall be attached to the load by the thimble–end–clip method, socketing method, or other approved methods. If the socketing method is employed, zinc or its equivalent shall be used. The use of Babbit metal or lead for socketing wire ropes is prohibited. If the thimble–and–clip method is used, the following shall be observed:

(a) The rope shall be attached to the load by passing one end around an oval thimble that is attached to the load bending the end back so that it is parallel to the long or "live" end of the rope and fastening the two parts of the rope together with clips.

(b) The U–bolt of each clip shall encircle the short of "dead" end of the rope and the distance between clips shall not be less than the figures given in the accompanying table.

(c) As a minimum the following number of clips or equivalent shall be used for various diameters of six–strand, 19–wire plow steel ropes: (Follow manufacturer's recommendations for number and installation of clips for specific type of wire rope being used.)

Diameter of Rope Inches	Number of Clips Clips	Center–to–Center Spacing of Clips, Inches
3/4	4	4 1/2
7/8	4	5 1/4
1	4	6
1 1/8	5	6 3/4
1 1/4	5	7 1/2
1 3/8	6	8 1/4
1 1/2	6	9
1 5/8	6	9 3/4
1 3/4	7	10 1/2
1 7/8	8	11 1/4
2	8	12
2 1/8	8	13
2 1/4	8	14

(d) For all ropes less than three–quarters inch in diameter, at least four clips or equivalent shall be used.

(e) When special conditions require the attachment of a sling to the hoisting cable to handle equipment in the shaft, the sling shall be attached by clips or equivalent in accordance with the table in paragraph (c) of this standard.

(12) (57.19–38) Platforms with toeboards and handrails shall be provided around elevated head sheaves.

(13) (57.19–39) Diameters of head sheaves and hoist drums should conform to the following specifications:

Rope Construction	Diameter of Sheave and Drum	
	Recommended	Minimum
	Times rope diameter	Times rope diameter
6 x 7 classification	72	42
6 x 19	45	30
6 x 37	27	18
6 x 25, Type B flattened strand	45	30
6 x 27, Type H, flattened strand	45	30
6 x 30, Type G, flattened strand	45	30
18 x 7 classification	51	34

(14) The main shaft and all equipment within or connected to it shall be inspected at least as often as indicated in the schedule below. A report of these

inspections and all other required reports shall be entered in a "daily log book" and kept on file in the mine office for two years from the date of inspection.

(a) SHAFT INSPECTION REPORT TO BE FILED IN MINE OFFICE.

Name of Inspector_____
Date_____
Remarks_____

The items listed below shall have a visual daily inspection by persons to be designated by the management. In addition, there shall be a thorough inspection at least as often as indicated below:

Fire-fighting equipment	Monthly
Ladders and platforms	Monthly
Manway	Monthly
Second exits	Monthly
Top sheave wheel	Weekly
Guides or track	Daily
Inspection and maintenance of safety dogs on cage or skip	Daily
Safety gates or guard rails	Daily
Safety hood on cages or skips	Daily
Shaft rope idlers or deflection sheaves	Daily
Skip or cage coupling	Daily
Timbers	Daily
Bell signal system	Shift
Chute gates	Shift
Chutes	Shift
Hoisting rope	Shift
Overwinding devices	Shift
Shaft clearance	Shift
Telephone system	Shift

(15) All chains and couplings must be annealed once every three months unless provided with safety straps or bridles. Records identifying the chains and/or couplings and indicating the dates of annealing shall be kept in the company office and shall be made available upon request.

[Order 72-1, § 296-61-230, filed 2/25/72, effective 4/1/72.]

WAC 296-61-240 Conveyances. (1) (57.19-45) Man cages and skips used for hoisting or lowering workmen or other persons in any vertical shaft or any incline shaft with an angle of inclination of forty-five degrees or more from the horizontal, shall be covered with a metal bonnet.

(2) (57.19-50) Buckets used to hoist workmen during vertical shaft sinking shall have:

(a) Cross heads with safety catches. If the guides are made of steel or wood, the height of the crosshead shall be at least 1 1/2 times the width of the crosshead. If wire rope guides are used the crosshead shall be at least four feet high.

(b) Overhead protection when the shaft depth exceeds fifty feet.

(c) Sufficient depth to transport men safely while they are in a standing position. Platforms may be installed within the bucket to get this desired height.

(d) Devices which will prevent the bucket from accidentally dumping if the bucket is supported by a bail attached near or below the center of the bucket.

(3) (57.19-51) Buckets shall not be used to hoist men in vertical shafts except during shaft sinking operations, inspections, maintenance and repairs.

(4) (57.19-52) Buckets shall not be used to hoist men in incline shafts except during shaft sinking operations, inspections, maintenance and repairs.

(5) (57.19-53) In shaft sinking where a platform is suspended by wire ropes, such ropes shall have an approved rating for the suspended load.

(6) (57.19-54) Where rope guides are used in shafts they shall be of locked coil construction.

[Order 72-1, § 296-61-240, filed 2/25/72, effective 4/1/72.]

WAC 296-61-250 Hoisting procedures. (1) (57.19-55) When a manually-operated hoist is used, a qualified hoistman shall remain within hearing of the telephone or signal device at all times while any workman is underground.

(2) (57.19-57) Hoistmen shall be physically fit and shall undergo yearly examinations to determine their continued fitness; certification to this effect shall be available at the mine.

(3) (57.19-58) Only experienced hoistmen shall operate the hoist except in cases of emergency and in the training of new hoistmen.

(4) (57.19-59) Whenever a regular shift of men is being hoisted or lowered, a second man familiar with and qualified to stop the hoist shall be in attendance; this provision shall not apply to shaft sinking operations, level development, or repair operations in the mine.

(5) (57.19-65) Conveyances shall not be lowered by the brakes alone except during emergencies.

(6) (57.19-69) Workmen shall not enter or leave conveyances which are in motion or after a signal to move the conveyance has been given to the hoistman.

(7) (57.19-70) Cage doors or gates shall be closed while workmen are being hoisted; they shall not be opened until the cage has come to a stop.

(8) (57.19-71) Workmen shall not ride in skips or buckets with muck, supplies, materials, or tools other than small hand tools.

(9) (57.19-73) Rock or supplies shall not be hoisted in the same shaft as workmen during shift changes, unless the compartments and dumping bins are partitioned to prevent spillage into the cage compartment.

(10) (57.19-75) Open hooks shall not be used to hoist buckets or other conveyances.

(11) (57.19-77) Buckets shall be stopped approximately fifteen feet from the shaft bottom to await a signal from one of the crew on the bottom for further lowering.

(12) (57.19-79) Where mine cars are hoisted by cage or skip, means for blocking cars shall be provided at all landings and also on the cage.

(13) (57.19-80) When tools, timbers, or other materials are being lowered or raised in a shaft by means of a bucket, skip, or cage, they shall be secured or so placed that they will not strike the sides of the shaft.

[Order 72-1, § 296-61-250, filed 2/25/72, effective 4/1/72.]

WAC 296-61-260 Signaling. (1) (57.19-90) There shall be at least two effective approved methods of signaling between each of the shaft stations and the hoist room, one of which shall be a telephone or speaking tube.

(2) (57.19-92) A method shall be provided to signal the hoist operator from cages or other conveyances at any point in the shaft.

(3) (57.19-94) A legible signal code shall be posted prominently in the hoist house within easy view of the hoistmen, and at each place where signals are given or received.

(4) (57.19-96) Any workman responsible for receiving or giving signals for cages, skips, and man trips when workmen or material are being transported shall be familiar with the posted signaling code.

[Order 72-1, § 296-61-260, filed 2/25/72, effective 4/1/72.]

WAC 296-61-270 Shafts. (1) (57.19-100) Shaft landings shall be equipped with substantial safety gates so constructed that materials will not go through or under them. Gates shall be closed except when loading or unloading shaft conveyances.

(2) (57.19-101) Positive stop blocks or a derail switch shall be installed on all tracks leading to a shaft collar or landing.

(3) (57.19-105) A safe means of passage around open shaft compartments shall be provided on landings with more than one entrance to the shaft.

(4) (57.19-107) Hoistmen shall be informed when workmen are working in a compartment affected by that hoisting operation and a sign, "men working in shaft," shall be posted at the hoist.

(5) (57.19-108) When workmen are working in a shaft "men working in shaft" signs shall be posted at all devices controlling hoisting operations which may endanger such workmen.

(6) (57.19-110) A substantial bulkhead or equivalent overhead protection shall be installed for protection of workmen working in a mine shaft.

(7) (57.19-120) A systematic procedure of inspection, testing, and maintenance of shaft and hoisting equipment shall be developed and followed. If it is found or suspected that any part is not functioning properly, the hoist shall not be used until any needed repairs or adjustments have been made.

(8) (57.19-128) Ropes shall not be used for hoisting when they have:

(a) More than six broken wires in any lay.

(b) Crown wires worn to less than sixty-five percent of the original diameter.

(c) A marked amount of corrosion or distortion.

(d) A combination of similar factors individually less severe than those above but which in aggregate might create an unsafe condition.

[Order 72-1, § 296-61-270, filed 2/25/72, effective 4/1/72.]

WAC 296-61-280 Explosives. (57.6) The term "explosives" as used in this section includes blasting agents. The standards in this section in which the term "explosives" appears are applicable to blasting agents, as well as to other explosives, unless blasting agents are expressly excluded.

(1) (57.6-1) Detonators and explosives, including blasting agents, shall be stored in magazines as required by the state of Washington explosives law, chapter 70.74 RCW and the applicable safety rules dealing with explosives, chapters 296-51 and 296-52 WAC.

(2) (57.6-2) Detonators shall not be stored in the same magazine or powder chest with explosives.

(3) (57.6-5) Areas surrounding magazines or facilities used for the storage of blasting agents shall be kept clear of all trash and other unnecessary combustible materials for a distance not less than twenty-five feet in all directions.

(4) (57.6-6) Smoking and open flame shall not be permitted within twenty-five feet of a place where explosives or detonators are stored.

(5) (57.6-8) Ammonium nitrate-fuel oil blasting agents shall be physically separated from other explosives, safety fuse, or detonating cord stored in the same magazine, and shall be stored in such a manner that oil does not contaminate the other explosives, safety fuse, or detonating cord.

(6) (57.6-20) (57.6-21) Magazines shall be:

(a) Located in accordance with the current American Tables of Distances for storage of explosives.

(b) Detached structures located away from power lines, fuse storage areas, and other possible sources of fire.

(c) Constructed substantially of noncombustible material or covered with fire-resistant material.

(d) Reasonably bullet resistant.

(e) Made of nonsparking materials on the inside, including floors. Facilities used for bulk storage of blasting agents shall not be lined with copper or zinc.

(f) Provided with adequate and effectively screened ventilation openings near the floor and ceiling.

(g) Kept locked securely when unattended.

(h) Posted with suitable danger signs so located that a bullet passing through the face of a sign will not strike the magazine.

(i) Used exclusively for storage of explosives or detonators and kept free of all extraneous materials.

(j) Kept clean and dry in the interior, and in good repair.

(k) Unheated, unless heated in a manner that does not create a fire or explosion hazard. Electrical heating devices shall not be used inside a magazine.

(l) Electrically bonded and grounded if constructed of metal.

(m) In compliance with any other applicable rules or laws concerning magazine construction and use as specified by Washington state explosives law, chapter 70.74 RCW and safety rules for explosives, chapter 296-52 WAC.

(n) (57.6-11) Illuminated only by use of approved devices. If electrically illuminated, wires must be in rigid conduit and fixtures must be explosion proof type. Switches must be located outside of the magazine.

(7) (57.6–25) (57.6–27) Underground distribution storage magazines shall be:

(a) Of substantial construction and have only nonsparking material on the inside, including the floors.

(b) Separated from all active haulageways and passageways by a solid barrier, sufficient to protect such haulageway or passageway from any potential explosion that may occur when the magazine is filled to capacity.

(c) Located where the active mining area will not be exposed to a hazardous concentration of fumes or endangered by the blast if a fire or explosion should occur.

(d) Provided with suitable warning signs. Suitable warning signs shall also be posted at the entrance to the drift in which the magazine is situated.

(e) Used only for the storage of explosives or detonators and shall be kept clean and free of extraneous material. (Note WAC 296–61–280(2) prohibits storage of detonators and explosives in the same magazine.)

(f) Provided with doors, covers or lids which shall be kept locked when unattended.

(g) Separated from the active blasting area by a safe distance and out of line of blasts.

(8) (57.6–29) (57.6–159) Powder chest (day boxes) shall be:

(a) Substantially constructed, the inside surface shall be of nonsparking material.

(b) Suitably labeled and posted with warning signs.

(c) Located away from blasting area when blasting and out of line of blasts.

(d) When used on the surface of underground mining operations and for all types of surface operations, emptied of contents at end of shift and contents returned to proper magazines for storage.

(e) Provided with fittings, devices and locks as needed and kept locked when unattended.

(9) (57.6–30) Detonator storage magazines shall be of the same construction as explosive storage magazines and shall be separated by at least twenty–five feet from explosive storage magazines.

(10) (57.6–40) Explosives and detonators shall be transported in separate vehicles unless separated by four inches of hardwood or the equivalent.

(11) (57.6–41) When explosives and detonators are hauled by trolley locomotives, covered, electrically insulated cars shall be used.

(12) (57.6–42) Self–propelled vehicles used to transport explosives or detonators shall be equipped with suitable fire extinguishers.

(13) (57.6–43) Vehicles containing explosives or detonators shall be posted with proper warning signs.

(14) (57.6–44) When vehicles containing explosives or detonators are parked, the brakes shall be set, the motive power shut off, and the vehicles shall be blocked securely against rolling.

(15) (57.6–45) Vehicles containing explosives or detonators shall not be taken to a repair garage or shop for any purpose.

(16) (57.6–46) Vehicles containing explosives or detonators shall be maintained in good condition and shall be operated at a safe speed and in accordance with all safe operating practices.

(17) (57.6–47) (57.6–200) Vehicles used to transport explosives shall have substantially constructed bodies and shall have no spark producing type metal exposed in the cargo space. The cargo carrying area shall be equipped with suitable sides and tailgates. The explosives shall not be stacked higher than the side or end enclosures. If transporting blasting agents, no zinc or copper shall be exposed in the cargo space and the space freely ventilated. If an enclosed screw conveyor is used to discharge blasting agents from the vehicle, the conveyor shall be designed in a manner which will protect the blasting agents against excessive internal pressure and excessive frictional heat.

(18) (57.6–50) 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.

(19) (57.6–51) Explosives or detonators shall not be transported on locomotives.

(20) (57.6–52) Workmen shall not smoke while transporting or handling explosives or detonators.

(21) (57.6–53) Only the necessary attendants shall ride on or in vehicles containing explosives or detonators.

(22) (57.6–54) Explosives or detonators shall not be transported on man trips.

(23) (57.6–56) Substantial, nonconductive, closed containers shall be used to carry explosives to blasting sites.

(24) (57.6–57) Nonconductive containers with tight-fitting covers shall be used to transport or carry capped fuses and electric detonators to blasting sites.

(25) (57.6–65) Vehicles on the surface containing detonators or explosives, other than blasting agents, shall not be left unattended except in blasting areas where loading or charging is in progress.

(26) (57.6–75) Men assigned to and responsible for hoisting shall be notified whenever explosives or detonators are being transported in a shaft conveyance.

(27) (57.6–76) Hoisting in adjacent shaft compartments shall be stopped while explosives are being loaded, transported or handled in a shaftway.

(28) (57.6–77) Vehicles underground shall be attended, whenever practical and possible, while loaded with explosives or detonators.

(29) (57.6–90) Persons who use explosives or detonators shall be licensed as required by chapter 70.74 RCW and chapter 296–52 WAC. They shall be experienced in using explosives in conjunction with type of work they are performing and shall be familiar with the hazards connected with the type of work they are doing. Trainees will be allowed to use explosives or detonators only while under the immediate supervision and presence of a licensed person in the type of work involved.

(30) (57.6–91) Blasting operations shall be under the direct supervision and control of authorized persons.

(31) (57.6–92) Damaged or deteriorated explosives or detonators shall be destroyed in a safe manner.

(32) (57.6–94) Holes to be blasted shall be charged as near to blasting time as practical and such holes shall be

blasted as soon as possible after charging has been completed. In no case shall the time elapsing between the completion of charging to the time of blasting exceed seventy–two hours unless prior approval has been obtained from the division of safety.

(33) (57.6–95) No person shall smoke within twenty–five feet of explosives or detonators.

(34) (57.6–96) Explosives shall be kept separated from detonators until charging is started.

(35) (57.6–97) Capped primers shall be made up at the time of charging and as close to the blasting site as conditions allow.

(36) (57.6–98) A primer shall be prepared by completely embedding a blasting cap in the center and along the longitudinal axis of an explosive cartridge. It shall be made in such a manner so that the blasting cap cannot be pulled out of the primer cartridge.

(37) (57.6–99) Only wooden or other nonsparking implements shall be used to punch holes in an explosive cartridge.

(38) (57.6–100) Tamping poles shall be blunt and squared at one end. They shall be made of wood, nonsparking material, or of special plastic acceptable to the Bureau of Mines.

(39) (57.6–101) No tamping shall be done directly on a capped primer.

(40) (57.6–102) Unused explosives and detonators shall be moved to a safe location as soon as charging operations are completed.

(41) (57.6–103) Areas in which charged holes are awaiting firing shall be guarded, or barricaded and posted, or flagged against unauthorized entry.

(42) (57.6–104) When safety fuse has been used, workmen shall not return to misfired holes for at least thirty minutes.

(43) (57.6–105) When electric blasting caps have been used, workmen shall not return to misfired holes for at least fifteen minutes.

(44) (57.6–107) Holes shall not be drilled where there is danger of intersecting a charged or misfired hole.

(45) (57.6–108) Fuse and igniters shall be stored in a cool, dry place away from oils or grease.

(46) (57.6–110) Fuses shall be cut and capped in safe, dry locations posted with "no smoking" signs.

(47) (57.6–111) Blasting caps shall be crimped to fuses only with implements designed for that specific purpose.

(48) (57.6–112) 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 workmen concerned with blasting. No fuse shall be used that burns faster than one foot in thirty seconds or slower than one foot in fifty–five seconds.

(49) (57.6–113) When firing from one to fifteen blast–holes with safety fuse ignited individually using hand–held lighter, the fuses shall be of such lengths to provide the minimum burning time specified in the following table for a particular size round:

Number of Holes in a Round	Minimum Burning Time, Minutes
1	2
2–5	2 2/3
6–10	3 1/3
11–15	5

In no case shall any forty–second–per–foot safety fuse less than thirty–six inches long or any thirty–second–per–foot safety fuse less than forty–eight inches long be used.

(50) (57.6–114) At least two workmen shall be present when lighting fuses, and no workman shall light more than fifteen individual fuses. If more than fifteen holes per workman are to be fired, igniter cord and connectors or electric blasting shall be used.

(51) (57.6–116) Fuse shall be ignited with hot–wire lighters, lead spitters, igniter cord, or other such devices designed for this purpose. Carbide lights shall not be used to light fuses.

(52) (57.6–117) Fuses shall not be ignited before the primer and the entire charge are securely in place.

(53) (57.6–119) Electric detonators of different brands shall not be used in the same round.

(54) (57.6–120) Except when being tested with a blasting galvanometer:

(a) Electric detonators shall be kept shunted until they are being connected to the blasting line or wired into a blasting round.

(b) Wired rounds shall be kept shunted until they are being connected to the blasting line.

(c) Blasting lines shall be kept shunted until immediately before blasting.

(55) (57.6–122) Permanent blasting lines shall be properly supported, insulated, and kept in good repair.

(56) (57.6–123) When electric detonators are used, charging shall be stopped immediately when the presence of static electricity or stray currents is detected; the condition shall be remedied before charging is resumed.

(a) When electric blasting caps are being used in blasting operations in the proximity of fixed radio transmitters, the following table of distances must be observed, unless it is determined by designated test procedures that there is not sufficient radio frequency energy present to create a hazard. The test procedure shall be to attach a No. 47 radio pilot lamp in place of the cap in the blasting circuit progressively as the circuit is connected, starting with the initial hole. In the event the lamp glows, the length of the wires connecting the circuit shall be altered by adding or cutting off wire until the lamp does not glow. A radio frequency field strength meter may be used in lieu of the test lamp.

Power	Watts	Distance (Ft.)
5	25	100
25	50	150
	100	220
100	250	350
250	500	450
500	1,000	650
1,000	2,500	1,000

Power	Watts	Distance (Ft.)
2,500	5,000	1,500
5,000	10,000	2,200
10,000	25,000	3,500
25,000	50,000	5,000
50,000	100,000	7,000

(b) Where electric blasting caps are being used where there is a possibility that a mobile transmitter emitting radio frequency energy may approach the blasting area, a warning sign shall be posted requiring that all radio transmitters be turned off at least fifty feet away from the blasting area.

(57) (57.6–124) When electric detonators are used, charging shall be suspended in surface mining, shaft sinking and tunneling, and workmen withdrawn to a safe location upon the approach of an electrical storm.

(58) (57.6–125) If branch circuits are used when blasts are fired from power circuits, safety switches located at safe distances from the blast areas shall be provided in addition to the main blasting switch.

(59) (57.6–127) Blasting switches shall be locked in the open position, except when closed to fire the blast. Lead wires shall not be connected to the blasting switch until the shot is ready to be fired.

(60) (57.6–128) The key or other control to an electrical firing device shall be entrusted only to the workman designated to fire the round, or rounds.

(61) (57.6–129) Electric circuits from the blasting switches to the blast area shall not be grounded.

(62) (57.6–131) Power sources shall be suitable for the number of electric detonators to be fired and for the type of circuits used.

(63) (57.6–133) If any part of a blast is connected in parallel and is to be initiated from power lines or lighting circuits, the time of current flow shall be limited to a maximum of 25 milliseconds by incorporating an arching control device in the blasting circuit, or by interrupting the circuit with an explosive charge attached to one or both lead lines and initiated by a zero–delay electric blasting cap.

(64) (57.6–134) Tools used for opening metal or nailed wooden containers of explosives or detonators shall be of nonsparking materials.

(65) (57.6–135) Holes shall not be collared in bootlegs.

(66) (57.6–136) Black blasting powder shall not be used for blasting except when a desired result cannot be obtained with another type of explosive such as in quarrying certain types of dimension stone.

(67) (57.6–137) In the use of black blasting powder:

(a) Containers shall not be opened in, or within fifty feet of any magazine; within any building in which a fuel–fired or exposed–element electric heater is in operation; where electrical or incandescent–particle sparks could result in powder ignition; or within fifty feet of any open flame.

(b) Granular powder shall be transferred from containers only by pouring.

(c) Spills of granular powder shall be cleaned up promptly with nonsparking equipment, contaminated powder shall be put into a container of water and its content disposed of promptly after the granules have disintegrated, or the spill area shall be flushed with a copious amount of water to completely disintegrate the granules.

(d) Containers of powder shall be kept securely closed at all times other than when the powder is being transferred from or into a container.

(e) Containers of powder transported by vehicles shall be in a wholly enclosed cargo space.

(f) Misfires shall be disposed of by: (1) Washing the stemming and powder charge from the borehole, and (2) removal and disposal of the initiator as a damaged explosive.

(g) Boreholes of shots that fire but fail to break, or fail to break promptly, shall not be recharged for at least twelve hours.

(68) (57.6–160) Ample warning shall be given before blasts are fired on the surface. All persons shall be cleared and removed from the blasting area unless suitable blasting shelters are provided to protect workmen who otherwise may be endangered by concussion or flyrock from blasting. Access to blast areas shall be posted with warning signs and protected by barricades or flagman.

(69) (57.6–161) 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.

(70) (57.6–162) Lead wires and blasting lines shall not be strung across power conductors, pipelines, railroad tracks, or within twenty feet of bare powerlines. They shall be protected from sources of static or other electrical contact.

(71) (57.6–163) If using a detonating type cord for blasting the double–trunk–line or loop systems shall be used.

(72) (57.6–164) Trunk lines in multiple–row blasts shall make one or more complete loops, with crossties between loops at intervals of not over two hundred feet.

(73) (57.6–166) All detonating cord knots shall be tight and all connections shall be kept at right angles to the trunk lines.

(74) (57.6–168) Misfires shall be reported to the proper supervisor and shall be disposed of safely before any other type of work is performed in that blasting area.

(75) (57.6–170) Where electric blasting is to be performed, electric circuits to equipment in the immediate area to be blasted shall be deenergized before electric detonators or millisecond delays are connected to the blasting circuit; the power shall not be turned on until after the shots are fired or the blast is deactivated by removing the electric detonators or millisecond delays.

(76) (57.6–175) Ample warning shall be given before blasts are fired underground. All persons shall be cleared and removed from areas endangered by the blast. Clear access to exits shall be provided for workmen firing the rounds.

(77) (57.6–177) Misfires shall be disposed of by the following methods:

(a) Reattempting to fire the holes if the leg wires are exposed.

(b) Washing the stemming and the charge from the borehole with water.

(c) Inserting new primers after the stemming has been washed out.

(78) (57.6–182) Blasts in shafts or winzes shall be initiated from a safe location outside the shaft or winze.

(79) (57.6–193) Where pneumatic loading is employed, before any type of blasting operation using blasting agents is put into effect, an evaluation of the potential hazard of static electricity shall be made. Adequate steps, including the grounding and bonding of the conductive parts of pneumatic loading equipment, shall be taken to eliminate the hazard of static electricity before blasting agent use is commenced.

(80) (57.6–194) Pneumatic loading equipment shall not be grounded to waterlines, air lines, rails, or the permanent electrical grounding systems.

(81) (57.6–195) Hoses used in connection with pneumatic loading machines shall be of the semiconductive type, having a total resistance low enough to permit the dissipation of static electricity and high enough to limit the flow of stray electric currents to a safe level. Wire–countered hose shall not be used because of the potential hazard from stray electric currents.

(82) (57.6–197) In small–diameter holes, blasting agents should be loaded so as to provide a continuous column that completely fills the cross section of the borehole.

(83) (57.6–198) Plastic tubes shall not be used as hole liners if blasting agents are loaded pneumatically into holes containing an electric detonator.

(84) (57.6–220) Sensitized ammonium nitrate blasting agents shall not be mixed or compounded underground. All applicable rules for sensitizing, storage and use of sensitized ammonium nitrate administered by the department of labor and industries shall be complied with.

[Order 72–1, § 296–61–280, filed 2/25/72, effective 4/1/72.]

WAC 296-61-290 Loading, hauling, dumping--General, surface and underground. (1) (57.9–2) Defective equipment which would present a hazard shall be taken out of service immediately and shall not be put back into use until the defect has been properly corrected.

(2) (57.9–3) Powered mobile equipment shall be equipped with brakes and devices which will hold equipment with loads on grades on which it will be used. The brakes and parking devices shall be kept in proper operating condition at all times.

(3) (57.9–5) Operators shall be certain, by signal or other means, that all persons are clear before starting or moving equipment.

(4) (57.9–9) Operators shall sound warning before moving a train, when the train approaches a crossing, when approaching a train on adjacent tracks, and where the operator's vision is obscured.

(5) (57.9–11) If cab windows are installed, they shall be of safety glass or of materials affording equivalent protection and view, and shall be kept clean. Cracked or broken windows shall be replaced immediately.

(6) (57.9–12) Operator's cabs shall be kept free of extraneous materials and tools shall be kept off the cab floors and walking surfaces.

(7) (57.9–20) Positive–acting stop blocks, derail devices, track skates or other adequate means shall be installed wherever necessary to protect workmen from runaway or moving railroad equipment.

(8) (57.9–22) Guards, barricades or berms shall be installed on the outer banks or elevated roadways and on sides of bridges and trestles. Haul roads of adequate width with minimum grades should be established and properly maintained in surface mining operations.

(9) (57.9–23) Trackless haulage equipment shall be operated under power control at all times.

(10) (57.9–24) Mobile equipment operators shall have full control of the equipment while it is in motion.

(11) (57.9–6) When the entire length of a conveyor is visible from the starting switch, the operator shall visually check to make certain that all workmen are in the clear before starting the conveyor. When the entire length of the conveyor is not visible from the starting switch, a positive audible or visible warning system shall be installed and operated to warn workmen that the conveyor will be started. All reasonable precautions shall be taken by the operator prior to starting a conveyor, to assure that no workman is in a hazardous location where he may be injured when the conveyor is started.

(12) (57.9–7) Unguarded conveyors with walkways shall be equipped with emergency stop devices or cords along their full length.

(13) (57.9–13) Adequate backstops or brakes shall be installed on inclined conveyor drive units to prevent conveyors from running in reverse if a hazard to workmen would be caused.

(14) (57.9–14) Riding on conveyor chains, belt, or bucket elevators shall be prohibited. Workmen shall not be allowed to walk on conveyors except for emergency and then only when the conveyors have been deenergized and the workman can do so safely. Riding of conveyors shall only be permitted on the manlift steps or platforms and handholds attached and other safety factors as specified under safety standards for belt manlifts.

(15) (57.9–25) Dippers, buckets, loading booms, or heavy suspended loads shall not be swung over the cabs of haulage vehicles until the drivers are out of the cabs and in safe locations, unless the trucks are designed specifically to protect the drivers from falling material.

(16) (55.9–26) Only authorized persons shall be allowed in areas where loading or dumping operations are being conducted.

(17) (57.9–27) If operator is on equipment, others shall notify him of their intent prior to getting on or off the equipment or entering any area where operation of the equipment may present a hazard to them.

(18) (57.9–28) Switch throws shall be installed so that at least thirty inches of clearance is maintained between the projection of moving equipment for at least ten feet on each side of throws.

(19) (57.9–30) Workmen shall not work or pass under any buckets or booms while equipment is being operated.

(20) (57.9–31) Equipment shall be made safe for travel prior to commencing travel between work areas.

(21) (57.9–32) Dippers, buckets, scraper blades, and similar movable parts shall be secured or lowered to the ground when not in use.

(22) (57.9–33) Workmen shall not ride in dippers, shovel buckets, forks, clamshells, or in the beds of haulage or ore haulage trucks for the purpose of transportation.

(23) (57.9–36) Electrically powered mobile equipment shall not be left unattended unless the master switch is in the OFF position, all operating controls are in the neutral position, and the brakes are set or other equivalent precautions are taken against rolling.

(24) (57.9–37) Mobile equipment shall not be left unattended unless the brakes are set. The wheels shall be turned into a bank or rib, or shall be blocked, when such equipment is parked on a grade.

(25) (57.9–39) Workmen shall not get on or off moving equipment, except that trainmen may get on or off slowly moving trains.

(26) (57.9–40) Workmen shall not ride on top of loaded haulage equipment.

(27) (57.9–41) Only authorized workmen shall be permitted to ride on trains or locomotives and they shall ride in a safe position.

(28) (57.9–43) Passengers shall not be permitted to ride with legs or arms extending outside any mobile equipment, nor shall they be permitted to ride unless a passenger seat or other protective device is provided.

(29) (57.9–45) Equipment to be hauled shall be loaded, protected and secured so as to prevent slipping, shifting, or spillage.

(30) (57.9–47) Spotted cars shall either have brakes set, wheels blocked, or shall be coupled to other immobilized cars to prevent each car from rolling.

(31) (57.9–48) Railroad cars with braking systems, when in use, shall be equipped with effective brake shoes.

(32) (57.9–50) Rail cars shall not be left on side tracks unless ample clearance is provided for traffic on adjacent tracks.

(33) (57.9–51) Workmen, other than railroad crewmen, shall not pass over, under, or between cars when an engine is attached to a section. Railroad crew members shall not enter such hazardous areas unless the motorman has been notified and he acknowledges.

(34) (57.9–52) Inability of a motorman to clearly recognize his brakeman's signals, when the train is under the direction of the brakeman, shall be construed by the motorman as a stop signal.

(35) (57.9–54) Berms, bumper blocks, safety hooks or similar means shall be provided to prevent over–travel and overturning at dumping locations.

(36) (57.9–58) To prevent accidents during the backing of trucks where vision is obstructed, a signalman shall be stationed at a point giving him a clear view of the rear of the truck and the operator of the truck at all times. During the hours of darkness or when necessary due to weather conditions, a signalman shall be furnished, and shall use, a signal light.

(37) (57.9–59) Public and permanent railroad crossings shall be posted with warning signs or signals, or shall be guarded when trains are passing and shall be planked or otherwise filled between the rails.

(38) (57.9–60) Where overhead clearance is restricted, warning devices shall be installed and the restricted area shall be conspicuously marked.

(39) (57.9–61) Stockpile and muckpile faces shall be trimmed to prevent hazards to workmen. Material shall be removed from stockpiles in such a manner that there will be no overhanging material.

(40) (57.9–62) Rocks too large to be handled safely shall be broken before loading.

(41) (57.9–64) Chute loading installations shall be designed and arranged so that the workmen pulling chutes will not be in a hazardous position or location.

(42) (57.9–67) Facilities used to transport workmen shall be of ample size to prevent workmen from being overcrowded.

(43) (57.9–68) Lights, flares, or other warning devices shall be posted when parked equipment creates a hazard to vehicular traffic.

(44) (57.7–69) Tires shall be deflated before repairs on them are started. Unmounted locking rim wheels shall be placed in a safety cage or other device shall be used which will prevent a locking rim from striking the workman if it should dislodge while the tire is being inflated.

(45) (57.9–81) Trucks, shuttle cars, and front–end loaders shall be equipped with emergency brakes, separate and independent of the regular braking system or there shall be a dual method of applying the brakes.

(46) (57.9–83) Where possible at least thirty inches continuous clearance from the farthest projection of moving railroad equipment shall be provided on at least one side of the tracks. All places shall be marked conspicuously where it is not possible to provide thirty inches clearance.

(47) (57.9–85) (57.9–99) Supplies, materials, and tools other than small handtools shall not be transported with workmen in man trip vehicles unless such vehicles are specifically designed to make such transportation safe. Man trips shall be operated independently of ore and supply trips.

(48) (57.9–97) Trains shall be brought to a complete stop, then moved very slowly when coupling or uncoupling cars manually.

(49) (57.9–98) Makeshift couplings shall not be used.

(50) (57.9–102) When a signalman is used during slushing operations, he shall be positioned in a safe place.

(51) (57.9–103) Collars of open draw holes shall be kept free of muck and material.

(52) (57.9–106) Ample warning shall be given to workmen who may be affected by the draw or otherwise exposed to danger from chute–pulling operations.

(53) (57.9–107) Workmen shall not stand on broken rock or ore overdraw points if there is danger that the chute will be pulled. Suitable platforms or safety lines

shall be provided and used when work must be done in such areas.

(54) (57.9–110) A sufficient number of shelter holes spaced not more than one hundred fifty feet apart shall be provided to ensure the safety of workmen along haulageways where continuous clearance of at least thirty inches from the farthest projection of moving equipment on at least one side of the haulageway cannot be maintained.

(55) (57.9–113) Man trips shall be operated at speeds consistent with the condition of tracks and equipment used.

(56) (57.9–114) Where man trips are used, discharge and boarding points shall be designated. Workmen shall not board or leave moving man trip cars.

(57) (57.9–116) During shift changes, the movement of rock or material trains shall be limited to areas where such trains could not present a hazard to workmen coming on or going off shift.

(58) (57.9–117) Workmen shall not ride between cars or on top of loaded cars.

(59) (57.9–15) Unless the operator is otherwise protected, slushers in excess of 10 horsepower shall be provided with backlash guards. All slushers shall be equipped with rollers, and drum covers, and anchored securely before slushing operations are started.

[Order 72–1, § 296–61–290, filed 2/25/72, effective 4/1/72.]

WAC 296–61–300 Aerial tramways. (1) (57.10–3) Any defect which would make the equipment unsafe to operate under existing conditions shall be cause to take the equipment out of service and it shall not be put back into use until it has been made safe.

(2) (57.10–7) Guard nets or other suitable protection shall be provided where tramways pass over roadways, walkways, or buildings.

(3) (57.10–8) Workmen other than maintenance men shall not ride aerial tramways unless the following features are provided:

(a) Two independent braking systems shall be installed, each capable of holding the maximum load.

(b) Direct communication between terminals shall be installed.

(c) A secondary or emergency source of power shall be available in case of primary power failure.

(d) The buckets shall be equipped with positive locks to prevent accidental tripping or dumping.

(4) (57.10–9) Workmen shall not ride loaded buckets.

(5) No person shall start a tramway until he is assured that all workmen are clear of the moving equipment at terminals and to the best of his ability ascertain that all workmen are clear of moving equipment between terminals.

[Order 72–1, § 296–61–300, filed 2/25/72, effective 4/1/72.]

WAC 296–61–310 Crushing and milling operations. (1) All rules contained in this standard shall prevail where applicable to this type of operation. The term "crusher" as used in this standard includes both permanent and portable installations.

(2) Land shall be leveled and all material which may create a hazard shall be removed prior to setting up and operating equipment.

(3) Plant structures shall be constructed to carry the required load without material or structural failure for the prescribed life of the material used.

(4) Conveyors shall be installed on footings and solid members capable of safely supporting four times the maximum load to which they may be subjected.

(5) Chains shall not be used to permanently support conveyors.

(6) Support members of conveyors exposed to contact by mobile equipment shall be barricaded or otherwise properly safeguarded.

(7) Entrance to jaws, etc., shall be guarded by screens, rails or other suitable means which will prevent a workman from falling into the crusher.

(8) Cone type crushers shall be equipped with suitable guards over or around the feed end which will prevent rock from flying into the work area.

(9) Dust from crushing operations shall be controlled as specified in the occupational health standards.

(10) Crusher operators and other employees working where hazardous or nuisance dust exists which is uncontrollable by other means shall be furnished with and shall properly wear approved respirators and goggles.

(11) Overhead conveyors shall be constructed and guarded so as to retain the spillage of materials which may create a hazard to persons below. Overhead protection shall be provided over walkways and roadways.

(12) Cone rolls shall be guarded to prevent material from flying and injuring workmen in the area.

(13) Conveyor drive, tail rolls and bend pulleys shall be maintained so that workmen are not required to scrape excess material out from between the belts while equipment is operating.

(14) Employees working around crushing operations shall wear approved head protection.

(15) When a workman is required to enter hoppers, storage bins or bunkers, he shall be provided with and shall wear a safety belt attached to a safety line which shall be attended by a second workman.

(16) Where bins, bunkers, or hoppers are loaded by the use of mobile equipment, bumper stops not less than ten inches by ten inches shall be installed and securely fastened in a manner which will prevent the truck or equipment from over–running the runway. Bull rails at least eight inches by eight inches or equivalent shall be securely fastened along the sides of the ramp or runway to prevent equipment from over–running sides of the runway.

(17) All wiring and grounding of equipment shall be installed and maintained to comply with the National Electrical Code.

(18) All counterweights shall be guarded for protection of workmen.

(19) All chains and sprockets, where exposed, shall be guarded.

(20) Oiling or greasing shall not be done on chains, sprockets or shafts while equipment is operating unless suitable safeguards are provided to eliminate all hazards.

(21) Substantial walkways and working platforms, equipped with toeboards and handrails, shall be installed where needed for maintenance purposes at all plants. Standard stairways or ladders shall be provided to reach all parts requiring oiling and maintenance.

(22) Bunker unloading devices shall be arranged to be operative from a safe location outside the walls of bunkers where overhead hazards exist or there is a danger of overturning.

(23) Mobile equipment shall be provided with overhead canopy or roll bars of sufficient strength to provide suitable protection for the operator.

(24) Mobile vehicles shall have adequate brakes which will safely stop and hold the vehicle on any incline or plane on which they may be required to work.

(25) All vehicles shall have cabs, cab shields, or devices installed which will protect the operator from falling or shifting material.

(26) Safety glass shall be installed in windshields, windows, and doors.

(27) A locking device shall be provided on every fifth wheel mechanism and tow bar arrangement which will prevent the accidental separation of towed and towing vehicles.

(28) Nonslip surfaces shall be provided on steps of all vehicles.

(29) All dump trucks shall be equipped with a supporting device to prevent accidental lowering of a raised truck bed while maintenance or inspection work is being done underneath.

(30) All control levers shall be designed to prevent accidental starting or tripping of the raising or lowering mechanism.

(31) Trip handles for tailgates on all dump equipment shall be located where the operator can activate the mechanism from a safe location.

(32) All self-propelled, bidirectional machines shall be equipped with a horn which shall be audible above the surrounding noise level. This horn shall be operated as needed prior to moving any machine and intermittently (not to exceed three-second intervals) when the machine is moving in either direction whenever the operator does not have a clear view in the direction of travel. A reverse signal alarm emitting a sound as required above shall be installed on all equipment of which the operator has an obstructed view to the rear unless a signalman is assigned to direct the operator and is positioned at all times in plain view of the operator and can observe the immediate area behind the equipment to ascertain that it is clear of all personnel and obstructions.

(33) If doors are removed from mobile equipment, seat belts or other devices shall be installed which will prevent the operator from accidentally falling, or being thrown out.

(34) Stationary dragline machines shall have all moving parts which are exposed to contact guarded with standard safeguards.

(35) Running lines, straps, etc., shall be frequently inspected for wear and other defects and shall be replaced prior to causing a hazardous condition.

(36) Any wire rope showing ten percent of its wires broken in a three foot length shall be removed from service. When cables show deterioration from rusting, wear, undue strain or other conditions to the extent of fifteen percent of their original strength, use of cable shall be discontinued.

[Order 72-1, § 296-61-310, filed 2/25/72, effective 4/1/72.]

WAC 296-61-320 Gassy mines. (1) All rules contained in this standard shall prevail where applicable to gassy mine operations. When applied to gassy mines, rules contained in this section shall prevail over conflicting rules in other sections.

(2) (57.21-1) A mine shall be deemed gassy, and thereafter operated as a gassy mine, if:

(a) The mining section of the division of safety classifies the mine as gassy; or

(b) Flammable gas emanating from the orebody of the strata surrounding the orebody has been ignited in the mine; or

(c) A concentration of 0.25 percent or more, by air analysis, of flammable gas emanating only from the orebody; or

(d) The strata surrounding the orebody has been detected not less than twelve inches from the back, face, or ribs in any open workings; or

(e) The mine is connected to a gassy mine.

(3) (57.21-2) Flammable gases detected while unwatering mines and similar operations shall not be used to class a mine gassy.

(4) Fire prevention.

(a) (57.21-10) Workmen shall not smoke or carry smoking materials, matches, lighters or other sources of ignition underground. The operator shall institute a reasonable program to effectuate this rule.

(b) (57.21-11) When it becomes necessary to do welding or cutting, it shall be done in open air. Open flames or sources of ignition shall not be used where flammable gases are present or may enter the air currents.

(c) (57.21-12) Welding or cutting with arc of flame underground in other than fresh air or in places where flammable gases are present or may enter the air current shall be under the direct supervision of a qualified person who shall test for flammable gases before and frequently during such operations.

(d) (57.21-13) Welding or cutting shall not be performed in atmospheres containing more than 1.0 percent of flammable gases.

(5) Ventilation.

(a) (57.21-20) Main fans shall be:

(i) Installed on the surface.

(ii) Powered electrically from a circuit independent of the mine power circuit. Internal combustion engines shall be used only for standby power, or where electrical power is not available.

(iii) Installed in fireproof housing provided with fireproof air ducts.

(iv) Offset not less than fifteen feet from the nearest side of the mine opening and equipped with ample means of pressure relief unless:

(A) The opening is not in direct line with forces which would come out of the mine should an explosion occur, and

(B) Another opening not less than fifteen feet nor more than one hundred feet from the fan opening is equipped with a weak-wall stopping or explosion doors in direct line with the forces which would come out of the mine should an explosion occur.

(v) Installed to permit prompt reversal of airflow.

(vi) Attended constantly or provided with automatic devices to give alarm when the fans slow down or stop. Such devices shall be placed so they will be seen or heard by responsible persons.

(b) (57.21-23) When single shafts are used for intake and return, the curtain wall or partition shall be constructed of reinforced concrete or equivalent and provided with pressure relief devices.

(c) (57.21-24) When a main fan fails or stops and ventilation is not restored in a reasonable time, action shall be taken to cut off the power to the areas affected and to withdraw all workmen from such areas.

(d) (57.21-26) When ventilation is not restored in a reasonable time, all workmen shall be removed from the areas affected, and after ventilation has been restored, the areas affected shall be examined by qualified persons for the presence of gas and other hazards and shall be made safe before power is restored and before workmen, other than the examiners and other authorized persons, return to the areas affected.

(e) (57.21-27) When the main fan or fans have been shut down with all workmen out of the mine, no person, other than those qualified to examine the mine or other authorized persons, shall go underground until the fans have been started and the mine examined for gas and other hazards and declared safe.

(f) (57.21-28) Booster fans shall be:

(i) Operated by permissible drive units maintained in permissible condition.

(ii) Operated only in air containing not more than one percent flammable gas.

(iii) (57.21-29) Inspected by a qualified person at least once each shift or provided with automatic devices to give alarm when the fans slow down or stop.

(iv) Equipped with devices that automatically cut off the power in areas affected if the fans slow down or stop when the fans are not provided with automatic alarm devices.

(v) Provided with air locks, the doors of which open automatically if the fan stops operating.

(g) (57.21-30) Auxiliary fans shall be:

(i) Operated by permissible drive units maintained in permissible condition.

(ii) Operated only in air containing not more than one percent flammable gas.

(h) (57.21-32) Workmen shall be withdrawn from areas affected by auxiliary or booster fans when such fans slow down or stop.

(i) (57.21-33) The volume and velocity of the current of air coursed through all active areas shall be sufficient to dilute and carry away flammable gases, smoke and fumes.

(j) (57.21-34) The quantity of air coursed through the last open crosscut in pairs or sets of entries or through other ventilation openings nearest the face, shall be at least six thousand cubic feet a minute.

(k) (57.21-35) At least once a week, a qualified person shall measure the volume of air entering the main intakes and leaving the main returns, the volume of the intake and return of each split, and the volume through the last open crosscuts or other ventilation openings nearest the active faces. Records of such measurements shall be kept in a book on the surface.

(l) (57.21-38) Changes in ventilation that materially affect the main air current or any split thereof and may affect the safety of persons in the mine shall be made only when the mine is idle. Only those persons engaged in making such changes shall be permitted in the mine during the change. Power shall be cut off in the areas affected by the change before work starts and not restored until the effect of the change has been ascertained and the affected areas determined to be safe by a qualified person.

(m) (57.21-39) If flammable gas in excess of 1.0 percent by volume is detected in the air not less than twelve inches from the back, face, and rib of an underground working place, or in the air returning from a working place or places, adjustments shall be made in the ventilation immediately so that the concentration of flammable gas in such air is reduced to 1.0 percent or less.

(n) (57.21-40) If 1.5 percent or higher concentration of flammable gas is detected in air returning from an underground working place or places, the workmen shall be withdrawn and the power cut off to the portion of the mine endangered by such flammable gas until the concentrations of such gas is reduced to 1.0 percent or less.

(o) (57.21-41) Air that has passed by an opening of any unsealed abandoned area and contains 0.25 percent or more of flammable gas shall not be used to ventilate working areas. Examinations of such air shall be conducted during the preshift examinations required by standard (7) of this section and federal (57.21-59).

(p) (57.21-42) Air that has passed through an abandoned panel or area which is inaccessible or unsafe for inspection shall not be used to ventilate any working place in such mine. No air which has been used to ventilate an area from which the pillars have been removed shall be used to ventilate any working place in such mine, except that such air if it does not contain 0.25 volume per centum or more of methane, may be used to ventilate enough advancing working places immediately adjacent to the line of retreat to maintain an orderly sequence of pillar recovery on a set of entries.

(q) (57.21-43) Abandoned areas shall be sealed or ventilated. Areas that are not sealed shall be barricaded and posted against unauthorized entry.

(r) (57.21-44) Seals shall be of substantial construction. Exposed surfaces shall be made of fire-resistant material or, if the commodity mined is combustible, seals shall be made of incombustible material.

(s) (57.21-45) One or more seals of every sealed area shall be fitted with a pipe and valve or cap to permit

sampling of the atmosphere and measurement of the pressure behind such seals.

(t) (57.21-46) Crosscuts shall be made at intervals not in excess of one hundred feet between entries and between rooms.

(u) (57.21-48) Line brattice or other suitable devices shall be installed from the last open crosscut to point near the face to assure positive air flow to the face of every active underground working place, unless the secretary or his authorized representative permits an exception to this requirement.

(v) (57.21-50) Damaged brattices shall be repaired promptly.

(w) (57.21-52) Entries or rooms shall not be started off entries beyond the last open crosscuts, except that room necks and entries not to exceed eighteen feet in depth may be turned off entries beyond the last open crosscuts if such room necks or entries are kept free of accumulations of flammable gas by use of line brattice or other adequate means.

(x) (57.21-55) The main ventilation shall be so arranged by means of air locks, overcasts, or undercasts that the passage of trips or workmen does not cause interruptions of air currents. Where air locks are impracticable, single doors may be used if they are attended constantly while the areas of the mine affected by the doors are being worked, unless they are operated mechanically or are self-closing.

(y) (57.21-56) Air locks shall be ventilated sufficiently to prevent accumulations of flammable gas inside the locks.

(6) (57.21-57) Doors shall be kept closed except when workmen or equipment are passing through the doorways.

(7) (57.21-59) Preshift examinations shall be made of all working areas by qualified persons within three hours before any workmen, other than the examiners, enter the mine.

(8) (57.21-61) Only qualified examiners and persons authorized to correct the dangerous conditions shall enter places or areas where danger signs are posted.

(9) (57.21-62) Danger signs shall not be removed until the dangerous conditions have been corrected.

(10) Equipment.

(a) (57.21-76) Diesel-powered equipment shall not be taken into or operated in places where flammable gas exceeds 1.0 percent at any point not less than twelve inches from the back, face, and rib.

(b) (57.21-77) Trolley wires and trolley feeder wires shall be on intake air and shall not extend beyond the last open crosscut or other ventilation opening. Such wires shall be kept at least one hundred fifty feet from pillar workings.

(c) (57.21-78) Only permissible equipment maintained in permissible condition shall be used beyond the last open crosscut or in places where dangerous quantities of flammable gases are present or may enter the air current.

(d) (57.21-79) Only permissible distribution boxes shall be used in working places and other places where dangerous quantities of flammable gas may be present or may enter the air current.

(e) (57.21-81) No electric equipment shall be taken into or operated in places where flammable gas can be detected in the amount of 1.0 percent or more at any point not less than twelve inches from the back, face and rib.

(f) (57.21-90) Only permissible electric lamps shall be used for portable illumination underground.

(11) Explosives. The term "explosives" as used in this standard includes blasting agents. The standards in this section in which the term "explosives" appears are applicable to blasting agents (as well as to other explosives) unless blasting agents are expressly excluded.

(a) (57.21-95) Explosives not designated as permissible by the Bureau of Mines shall not be used in any underground gassy mine until the Bureau of Mines and state inspector of mines have given written approval for each such specific explosive to be used.

(b) (57.21-96) The Bureau of Mines and the state inspector of mines in granting approval referred to in standard (11)(a) federal (57.21-95) above, shall provide the operator with a written list of conditions for using the specific explosives covered by the approval and adapted to the mining operation.

(c) (57.21-97) Blasts in gassy mines shall be initiated electrically, and multiple-shot blasts shall be initiated only with milli-second-delay detonators. Permissible blasting units of capacity suitable for the number of holes in a round to be blasted shall be used unless the round is fired from the surface when all workmen are out of the mine.

(d) (57.21-98) Boreholes shall be stemmed as prescribed for the explosives to be used.

(e) (57.21-99) Examinations for gas shall be made immediately before and after firing each shot or round.

(f) (57.21-100) Shots or rounds shall not be fired in places where flammable gas can be detected with a permissible flame safety lamp, or where 1.0 percent or more of flammable gas can be detected by any other Bureau of Mines approved device or method, at a point not less than twelve inches from the back, face, and rib.

[Order 72-1, § 296-61-320, filed 2/25/72, effective 4/1/72.]

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sampling of the atmosphere and measurement of the pressure behind such seals.

(t) (57.21-46) Crosscuts shall be made at intervals not in excess of one hundred feet between entries and between rooms.

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[Order 72-1, § 296-61-320, filed 2/25/72, effective 4/1/72.]

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PART Q—HAZARDOUS CHEMICALS IN LABORATORIES

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.

296-62-07301 4-Nitrobiphenyl. [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.

296-62-07313 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.

296-62-07315 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.

296-62-07317 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.

296-62-07319 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.

296-62-07321 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.

296-62-07323 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.

296-62-07325 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.

296-62-07327 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.

296-62-07335 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.

296-62-07341 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.

296-62-07345 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.

296-62-07349 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.

296-62-07353 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; 85-10-004 (Order 85-09), § 296-62-07353, filed 4/19/85; 85-01-022 (Order 84-24), § 296-62-07353, filed 12/11/84.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

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.

296-62-09011 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.

296-62-14531 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.

296-62-146 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.

296-62-14601 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.

296-62-14603 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.

296-62-14605 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.

296-62-14607 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.

296-62-150 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.

296-62-155 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.

296-62-157 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.

296-62-160 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.

296-62-165 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.

296-62-170 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.

296-62-175 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 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.

296-62-185 References. [Order 70-8, § 296-62-185, filed 7/31/70, effective 9/1/70.] Repealed by Order 73-3, filed 5/7/73.

296-62-3150 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.

296-62-900 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.

296-62-901 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.

296-62-902 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.

296-62-903 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.

296-62-904 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.

296-62-905 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.

296-62-906 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.

296-62-907 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.

296-62-908 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 Bureau of Mines, 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 surroundings 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 his 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) "Workmen," "personnel," "man," "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 his 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 his 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.

(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: 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.]

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 maintained (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 provided. 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 may 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 section 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 which includes; labels and other forms of warning, material safety data sheets, and information and training. In addition, this section requires distributors to transmit the required information to employers.

(2) This section 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 section 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; and,

(c) Employers shall ensure that laboratory employees are apprised of the hazards of the chemicals in their workplaces in accordance with WAC 296-62-05415.

(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 section 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 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 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 section 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 food, food additive, color additive, drug, cosmetic, or medical or veterinary device, 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.) and regulations issued under that act, when they are subject to the labeling requirements of that act and labeling regulations issued under that act by the Food and Drug Administration;

(c) Any distilled spirits (beverage alcohols), wine, or malt beverages 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; and,

(d) 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.

(6) This section 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) Tobacco or tobacco products;

(c) Wood or wood products;

(d) Articles;

(e) Food, drugs, cosmetics, or alcoholic beverages in a retail establishment which are packaged for sale to consumers;

(f) Foods, drugs, or cosmetics intended for personal consumption by employees while in the workplace;

(g) Any transportation of a hazardous chemical or substance, provided such transportation is subject to regulations issued by the United States department of transportation or the Washington utilities and transportation commission;

(h) 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, where the employer can demonstrate it is used in the workplace in the same manner as normal consumer use, and which use results in a duration and frequency of exposure which is not greater than exposures experienced by consumers; and

(i) 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 (i.e., tablets or pills.)

[Statutory Authority: Chapter 49.17 RCW. 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 section. (1) Article means 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 in part upon its shape or design during end use; and

(c) Which does not release, or otherwise result in exposure to, a hazardous chemical under normal conditions of use.

(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 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 ninety–nine percent or more of the total volume of the mixture.

(6) 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.

(7) 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.

(8) 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 section, pipes or piping systems are not considered to be containers.

(9) 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.

(10) Director means the director of the department of labor and industries or his/her designee.

(11) Distributor means a business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers.

(12) 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 section, 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.

(13) 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.

(14) 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.

(15) 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.

(16) Flammable means a chemical that falls into one of the following categories:

(a) Aerosol flammable: 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;

(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: 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: A solid, other than a blasting agent or explosive as defined in WAC 296–52–030, 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.

(17) 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 in (a), (b), or (c) of this subsection.

(18) 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.

(19) Hazardous chemical means any chemical which is a physical hazard or a health hazard.

(20) Hazard warning means any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the hazard(s) of the chemical(s) in the container(s).

(21) 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 section, 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.

(22) 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.

(23) 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.

(24) Importer means the first business within Washington which receives hazardous chemicals produced in other states or countries, for the purpose of supplying them to distributors or purchasers within Washington.

(25) Label means any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

(26) Material safety data sheet (MSDS) means written or printed material concerning a hazardous chemical which is prepared in accordance with WAC 296–62–05413.

(27) 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.

(28) Organic peroxide means an organic compound that contains the bivalent–0–0–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.

(29) 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.

(30) 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.

(31) Produce means to manufacture, process, formulate, or repackage.

(32) Purchaser means an employer with a workplace who purchases a hazardous chemical for use within that workplace.

(33) Pyrophoric means a chemical that will ignite spontaneously in air at a temperature of 130°F (54.4°C) or below.

(34) Responsible party means someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

(35) 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.

(36) 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, Appendix D, provides a legal definition of trade secret and WAC 296–62–05417 sets out the criteria to be used in evaluating trade secrets.

(37) 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.

(38) Use means to package, handle, react, or transfer.

(39) Water–reactive means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

(40) Work area means a room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

(41) Workplace means an establishment at one geographical location containing one or more work areas.

[Statutory Authority: Chapter 49.17 RCW. 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 definition of health hazard in this section. 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, Occupational health standards—Safety standards for carcinogens; or,

(b) *Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment*, American Conference of Governmental Industrial Hygienists (ACGIH) (latest edition).

Note: The chemical manufacturer, importer, or employer is still responsible for evaluating the hazards associated with the chemicals in these source lists in accordance with the requirements 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); or

(c) Chapter 296-62 WAC, Occupational health standards—Safety standards for carcinogens – Part F—Carcinogens.

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 permissible exposure limit or ACGIH threshold limit value, or could present a health hazard 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. The written description may be incorporated into the written hazard communication program required under WAC 296-62-05409.

[Statutory Authority: Chapter 49.17 RCW. 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);

(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 section 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 in the workplace, 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 section.

(4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, and the director or his/her designee in accordance with the requirements of WAC 296-62-05209.

[Statutory Authority: Chapter 49.17 RCW. 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.]

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) For solid metal (such as a steel beam or a metal casting) that is not exempted as an article due to its downstream use, 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. 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. This exception to requiring labels on every container of hazardous chemicals is only for the solid metal itself and does not apply to hazardous chemicals used in conjunction with, or known to be present with, the metal and to which employees handling the metal may be exposed (for example, cutting fluids or lubricants.)

(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 section in a manner which does not conflict with the requirements of the Hazardous Materials Transportation Act (18 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 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.

(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.

(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 section if existing labels already convey the required information.

[Statutory Authority: Chapter 49.17 RCW. 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 for each hazardous chemical they produce or import. Employers shall have a material safety data sheet for each hazardous chemical which they use.

(2) Each material safety data sheet shall be in English 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 permissible exposure limit or ACGIH Threshold Limit Value, or could present a health hazard 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 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, 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 carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions), or by WISHA;

(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 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) 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. The chemical manufacturer or importer shall either provide material safety data sheets with the shipped containers or send them to the employer prior to or at the time of the shipment. If the material safety data sheet is not provided with a shipment that has been labeled as a hazardous chemical, the employer shall obtain one from the chemical manufacturer, importer, or distributor as soon as possible.

(7) Distributors shall ensure that material safety data sheets, and updated information, are provided to other distributors and employers. Retail distributors which sell hazardous chemicals to commercial customers 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. Chemical manufacturers, importers, and distributors need not provide material safety data sheets to retail distributors which have informed them that the retail distributor does not sell the product to commercial customers or open the sealed container to use it in their own workplaces.

(8) The employer shall maintain copies of the required material safety data sheets for each hazardous chemical in the workplace, and shall ensure that they are

readily accessible during each work shift to employees when they are in their work area(s).

(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.

(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, Industrial Hygiene Section, P.O. Box 207, Olympia, Washington 98504. 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.

[Statutory Authority: Chapter 49.17 RCW. 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. Employers shall provide employees with information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard 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.

(1) Information. Employees shall be informed of:

(a) The requirements of this section;

(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 section.

Note: Laboratories are not required to have a written hazard communication program, but it is recommended.

(2) 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.

(3) Upon receipt of a written or verbal request, the department shall prepare and make available 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 296-62-05427.

(4) 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: 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, or epidemiologist) 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 section 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 trade secret.

[Statutory Authority: Chapter 49.17 RCW. 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. Employers shall be in compliance with this section within the following time periods:

(1) Chemical manufacturers and importers shall label containers of hazardous chemicals leaving their workplaces, and provide material safety data sheets with initial shipments by November 25, 1985.

(2) Distributors shall be in compliance with all provisions of this section applicable to them by November 25, 1985.

(3) Employers shall be in compliance with all provisions of this section by May 25, 1986, including initial training for all current employees.

[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 (Z129.1-1982) — 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 section, health hazards include but are not limited to any chemicals which meet any of the following definitions, as determined by the criteria set forth in Appendix B.

(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 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 (LC_{50}) 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.

(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 tissues 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.
(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. 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, or WISHA that a chemical is a carcinogen or potential carcinogen will be considered conclusive evidence for purposes of this section.

(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 established 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.

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. 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, 1972-1977
Present (Multivolume work) Summaries are available in supplemental volumes.
49 Sheridan Street
Albany, New York

Industrial Hygiene and Toxicology, by F.A. Patty
John Wiley & Sons, Inc.
New York, NY
(Five volumes)

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
6500 Glenway Avenue, Bldg. D–5
Cincinnati, OH 45211

Note: Information on the physical hazards of chemicals may be found in publication's 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. 85–14

Registry of Toxic Effects of Chemical Substances

NIOSH Pub. No. 80–102 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

(5) WISHA's Occupational Health standards—Safety standards for carcinogens, chapter 296–62 WAC – Part F—Carcinogens.

BIBLIOGRAPHIC DATA BASES

Service Provider	File Name
Bibliographic Retrieval Services (BRS), 1200 Route 7, Latham, NY 12110.	Biosis Previews CA Search Medlars NTIS Hazardline American Chemical Society Journal Excerpta Medica IRCS Medical Science Journal Pre–Med
	Intl. Pharmaceutical Abstracts Paper Chem
Lockheed – DIALOG Information Service, Inc., 3460 Hill View Avenue, Palo Alto, CA 94304.	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
SDC – Orbit, SDC Information Service, 2500 Colorado Avenue, Santa Monica, CA 90406.	CAS Files Chemdex, 2,3 NTIS
National Library of Medicine, Department of Health and Human Services, Public Health Service, National Institutes of Health, Bethesda, MD 20209.	Hazardous Substances Data Bank (NSDB) Medline Files Toxline Files Cancerlit RTECS Chemline
Pergamon International Information Corp., 1340 Old Chain Bridge, Rd., McLean, VA 22101.	Laboratory Hazard Bulletin
Questel, Inc., 1625 Eye Street, NW. Suite 818, Washington, DC 20006.	CIS/ILO Cancernet
Chemical Information System ICI (ICIS), Bureau of National Affairs, 1133 15th Street, NW. Suite 300, Washington, DC 20005.	Structure and Nomenclature Search System (SANSS) Acute Toxicity (RTECS) Clinical Toxicology of Commercial Products Oil and Hazardous Materials Technical Assistance Data System CCRIS CESARS
Occupational Health Services, 400 Plaza Drive, Secaucus, NJ 07094.	MSDS Hazardline

[Statutory Authority: Chapter 49.17 RCW. 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.]

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 other 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: 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.]

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.]

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. This section contains the requirements to be followed when establishing a respiratory protection program.

[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 Scope. This standard sets forth accepted practices when respiratory protection is used in controlling employee exposures to harmful air contaminants to comply with permissible exposure limits or to protect employees in oxygen-deficient atmospheres, or when respirators are utilized for emergency or rescue use.

[Statutory Authority: 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.]

WAC 296-62-07103 Purpose. The purpose of this standard is to provide minimum performance requirements for the selection and use of respirators and the implementation of a respirator program.

[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.]

WAC 296-62-07105 Definitions. (1) Abrasive-blasting respirator. See "respirator." A respirator designed to protect the wearer against inhalation of abrasive material and against impact and abrasion from rebounding abrasive material.

(2) Accepted. Reviewed and listed as satisfactory for a specified use by the director or his or her designee.

(3) Aerodynamic diameter. The diameter of a unit density sphere having the same settling velocity as the particle in question of whatever shape and density.

(4) Aerosol. A system consisting of particles, solid or liquid, suspended in air.

(5) Air-line respirator. See "respirator."

(6) Air-purifying respirator. See "respirator."

(7) Air-regulating valve. An adjustable valve used to regulate, but which cannot completely shut off the airflow to the facepiece, helmet, hood, or suit of an air-line respirator.

(8) Air-supply device. A hand- or motor-operated blower for the hose mask, or a compressor or other source of respirable air for the air-line respirator.

(9) Approved. Tested and listed as satisfactory by the Bureau of Mines (BM) of the U.S. Department of Interior, or jointly by the Mining Enforcement and Safety Administration (MESA) of the U.S. Department of Interior and the National Institute for Occupational Safety and Health (NIOSH) of the U.S. Department of Health and Human Services, or jointly by the Mine Safety and Health Administration (MSHA) of the U.S. Department of Labor and NIOSH under the provisions of Title 30, Code of Federal Regulations, Part 11.

(10) Bioassay. A determination of the concentration of a substance in a human body by an analysis of urine, feces, blood, bone, or tissue.

(11) Breathing tube. A tube through which air or oxygen flows to the facepiece, mouthpiece, helmet, hood, or suit.

(12) Canister (air-purifying). A container with a filter, sorbent, or catalyst, or any combination thereof, which removes specific contaminants from the air drawn through it.

(13) Canister (oxygen-generating). A container filled with a chemical which generates oxygen by chemical reaction.

(14) Carcinogen. A substance known to produce cancer in some individuals following a latent period (for example: Asbestos, Chromates, radioactive particulates).

(15) Cartridge (air-purifying). A small canister.

(16) Catalyst. In respirator use, a substance which converts a toxic gas (or vapor) into a less-toxic gas (or vapor).

(17) Ceiling concentration. The concentration of an airborne substance that shall not be exceeded.

(18) Chemical-cartridge respirator. See respirator.

(19) Confined space. See WAC 296-62-14501(1).

(20) Contaminant. A harmful, irritating, or nuisance material that is foreign to the normal atmosphere.

(21) Corrective lens. A lens ground to the wearer's individual corrective prescription to permit normal visual acuity.

(22) Demand. A type of self-contained breathing apparatus or type of air-line respirator which functions due to the negative pressure created by inhalation (i.e., air flow into the facepiece on "demand").

(23) Detachable coupling. A device which permits the respirator wearer, without using hand tools, to detach the air-supply line from that part of the respirator worn on the person.

(24) Dust. See WAC 296-62-07001(1).

(25) Emergency respirator use. Wearing a respirator when a hazardous atmosphere suddenly occurs that requires immediate use of a respirator either for escape from the hazardous atmosphere or for entry into the hazardous atmosphere.

(26) Exhalation valve. A device that allows exhaled air to leave a respirator and prevents outside air from entering through the valve.

(27) Eyepiece. A gas-tight, transparent window(s) in a full facepiece, helmet, hood, or suit, through which the wearer may see.

(28) Facepiece. That portion of a respirator that covers the wearer's nose and mouth in quarter-mask (above the chin) or half-mask (under the chin) facepiece or that covers the nose, mouth, and eyes in a full facepiece. It is designed to make a gas-tight or particle-tight fit with the face and includes the headbands, exhalation valve(s), and connections for an air-purifying device or respirable gas source, or both.

(29) Face shield. A device worn in front of the eyes and a portion of, or all of, the face, whose predominant function is protection of the eyes and the face.

(30) Fibrosis-producing dust. Dust which, when inhaled, deposited, and retained in the lungs, may produce findings of fibrotic growth that may cause pulmonary disease.

(31) Filter. A media component used in respirators to remove solid or liquid particles from the inspired air.

(32) Filter respirator. See respirator.

(33) Fog. A mist of sufficient concentration to perceptibly obscure vision.

(34) Full facepiece. See facepiece.

(35) Fume. See WAC 296-62-07001(2).

(36) Gas. An aeriform fluid which is in the gaseous state at ordinary temperature and pressure.

(37) Gas mask. See respirator.

(38) Goggle. A device, with contour-shaped eyecups with glass or plastic lenses, worn over eyes and held in place by a headband or other suitable means for the protection of the eyes and eye sockets.

(39) Half-mask facepiece. See facepiece.

(40) Hazardous atmosphere. Any atmosphere, either immediately or not immediately dangerous to life or health, which is oxygen deficient or which contains a toxic or disease-producing contaminant.

(41)Head harness. That part of a facepiece assembly which secures the facepiece to the wearer.

(42) Helmet. That portion of a respirator which shields the eyes, face, neck, and other parts of the head.

(43) High-efficiency filter. A filter which removes from air 99.97% or more of monodisperse dioctyl phthalate (DOP) particles having a mean particle diameter of 0.3 micrometer.

(44) Hood. That portion of a respirator which completely covers the head, neck, and portions of the shoulders.

(45) Hose mask. See respirator.

(46) Immediately dangerous to life or health (IDLH). Any atmosphere that poses an immediate hazard to life or produces immediate irreversible debilitating effects on health.

(47) Inhalation valve. A device that allows respirable air to enter a respirator and prevents exhaled air from leaving the respirator through the valve.

(48) Irrespirable. Unfit for breathing.

(49) Maximum use limit of filter, cartridge, or canister. The maximum concentration of a contaminant for which an air–purifying filter, cartridge, or canister is approved for use.

(50) Mist. See WAC 296-62-07001(4).

(51) Mouthpiece. That portion of a respirator which is held in the wearer's mouth and is connected to an air–purifying device or respirable gas source, or both. It is designed to make a gas–tight or particle–tight fit with the mouth.

(52) MPCa. Maximum permissible airborne concentration. These concentrations are set by the National Committee on Radiation Protection. They are recommended maximum average concentrations of radionuclides to which a worker may be exposed, assuming that he works 8 hours a day, 5 days a week, and 50 weeks a year.

(53) Negative pressure respirator. A respirator in which the air pressure inside the respiratory–inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.

(54) Nonroutine respirator use. Wearing a respirator when carrying out a special task that occurs infrequently.

(55) Nose clamp. A device used with a respirator equipped with a mouthpiece that closes the nostrils of the wearer (sometimes called a nose clip).

(56) Not immediately dangerous to life or health. Any hazardous atmosphere which may produce physical discomfort immediately, chronic poisoning after repeated exposure, or acute adverse physiological symptoms after prolonged exposure.

(57) Odor threshhold limit. The lowest concentration of a contaminant in air that can be detected by the olfactory sense.

(58) Oxygen deficiency – immediately dangerous to life or health. An atmosphere which causes an oxygen partial pressure of 100 millimeters of mercury column or less in the freshly inspired air in the upper portion of the lungs which is saturated with water vapor.

(59) Oxygen deficiency – not immediately dangerous to life or health. An atmosphere having an oxygen concentration below the minimum legal requirement of 18.0% by volume for respirable air at sea–level conditions, but above that which is immediately dangerous to life or health.

(60) Particulate matter. A suspension of fine solid or liquid particles in air, such as: Dust, fog, fume, mist, smoke, or spray. Particulate matter suspended in air is commonly known as an aerosol.

(61) Permissible exposure limit (PEL). The legally established time–weighted average (TWA) concentration or ceiling concentration of a contaminant that shall not be exceeded.

(62) Pneumoconiosis–producing dust. Dust which, when inhaled, deposited, and retained in the lungs, may produce signs, symptoms, and findings of pulmonary disease.

(63) Positive–pressure respirator. A respirator in which the air pressure inside the respiratory–inlet covering is positive in relation to the air pressure of the outside atmosphere during exhalation and inhalation.

(64) Powered air–purifying respirator. See respirator.

(65) Pressure demand. Similar to a demand type respirator but so designed to maintain positive pressure in the facepiece at all times.

(66) Protection factor. The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer. As used herein, a protection factor is synonymous with the fit factor assigned to a respirator facepiece by the use of qualitative and quantitative fitting tests.

(67) Rescue respirator use. Wearing a respirator for entry into a hazardous atmosphere to rescue a person(s) in the hazardous atmosphere.

(68) Resistance. Opposition to the flow of air, as through a canister, cartridge, particulate filter, orifice, valve, or hose.

(69) Respirable. Suitable for breathing.

(70) Respirator. A device designed to protect the wearer from the inhalation of harmful atmospheres.

(71) Respiratory–inlet covering. That portion of a respirator which connects the wearer's respiratory tract to an air–purifying device or respirable gas source, or both. It may be a facepiece, helmet, hood, suit, or mouthpiece/nose clamp.

(72) Routine respirator use. Wearing a respirator as a normal procedure when carrying out a regular and frequently repeated task.

(73) Sanitization. The removal of dirt and the inhibiting of the action of agents that cause infection or disease.

(74) Self–contained breathing apparatus. See respirator.

(75) Service life. The period of time that a respirator 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 inspired air.

(76) Smoke. A system which 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.

(77) Sorbent. A material which is contained in cartridge or canister and which removes toxic gases and vapors from the inhaled air.

(78) Spray. A liquid, mechanically produced particle with sizes generally in the visible or macroscopic range.

(79) Supplied–air respirator. See respirator.

(80) Supplied–air suit. A suit that is impermeable to most particulate and gaseous contaminants and that is provided with an adequate supply of respirable air.

(81) Time–weighted average (TWA). The average concentration of a contaminant in air during a specific time period.

(82) Valve (air or oxygen). A device which controls the pressure, direction, or rate of flow of air or oxygen.

(83) Vapor. The gaseous state of a substance that is solid or liquid at ordinary temperature and pressure.

(84) Welding helmet. A device designed to provide protection for the eyes and face against intense radiant energy and molten metal splatter encountered in the welding and cutting of metals.

(85) Window indicator. A device on a cartridge or canister that visually denotes the service life of the cartridge or canister.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07105, filed 7/27/81.]

WAC 296-62-07107 Permissible practice. (1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fumes, sprays, mists, fogs, smokes, vapors, gases, or other airborne contaminants, the primary objective shall be to prevent atmospheric contamination. When effective administrative or engineering controls are not feasible, or while they are being instituted or evaluated, appropriate respirators shall be used pursuant to the following requirements.

(2) Employer responsibility.

(a) Respirators shall be provided at no cost to an employee by the employer and the employer shall ensure the use of such equipment when such equipment is necessary to protect the health of the employee.

(b) The employer shall provide respirators which are applicable and suitable for the purpose intended.

(c) The employer shall be responsible for the establishment and maintenance of a respiratory protection program which shall minimally include the general requirements outlined in WAC 296-62-07109.

(3) Employee responsibility. The employee shall use the provided respiratory protection in accordance with instructions and training received. The employee shall notify a responsible person of any defect.

[Statutory Authority: Chapters 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 Minimal acceptable respirator program. (1) Standard operating procedures. Written standard operating procedures covering a complete respirator program shall be established and implemented in conformance with subsections (2) through (15) of this section. The employer shall, upon request, submit a copy of the written standard operating procedures to the director.

(2) Program administration. Responsibility and authority for the respirator program shall be assigned to a single person. This program administrator shall have sufficient knowledge of respiratory protection to properly supervise the respirator program.

(3) Physiological and psychological limitations for respirator wearers. The respirator program administrator or his or her designee, using guidelines established by a physician, shall determine whether or not a person may be assigned to a task requiring the use of a respirator. Persons with physical disabilities such as, but not limited to, respiratory impairments, or claustrophobia when wearing a respirator, shall not be assigned to tasks requiring the use of respirators unless it has been determined by a qualified physician that they are physically able to perform the work and use the equipment. All respirator user's medical status should be reviewed annually.

(4) Approved or accepted respirators shall be used. Any modification of an approved respirator that is not authorized by the approving agencies voids the approval.

(5) Respirator selection. Respirators shall be selected on the basis of the hazards to which the worker is exposed. (See WAC 296-62-07113)

(6) Training. Each worker required to wear a respirator shall be given training such that he or she is knowledgeable and proficient with respect to the respirator to be worn. Refresher training shall be given at least annually.

(7) Respirator fit. Each respirator wearer shall be fitted in accordance with WAC 296-62-07113. Each wearer of a respirator equipped with a facepiece shall check the seal of the respirator by appropriate means. This may be done by using procedures recommended by the respirator manufacturer.

(8) Facial hair, contact lenses, and eye and face protective devices. A negative pressure respirator, any self-contained breathing apparatus, or any respirator which is used in an atmosphere immediately dangerous to life or health (IDLH), equipped with a facepiece shall not be worn if facial hair comes between the sealing periphery of the facepiece and the face or if facial hair interferes with valve function. The wearer of a respirator shall not be allowed to wear contact lenses if the risk of eye damage is increased by their use. If a spectacle, goggle, face shield, or welding helmet must be worn with a facepiece, it shall be worn so as not to adversely affect the seal of the facepiece to the face. (See WAC 296-62-07115(3).)

(9) Issue of respirators. The proper type of respirator for each respiratory hazard shall be listed in the written standard operating procedures.

(10) Respirator inspection. The respirator shall be inspected by the wearer prior to each use to ensure that it is in proper working condition. Each respirator stored for emergency or rescue use shall be inspected at least once a month. (See WAC 296-62-07115 and 296-62-07117.)

(11) Monitoring respirator use. Supervisory personnel shall periodically monitor the use of respirators to ensure that they are worn properly. (See WAC 296-62-07115(7).)

(12) Evaluating respiratory hazard. Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained. (See WAC 296-62-07115(8).)

(13) Medical and bioassay surveillance. When appropriate, medical surveillance, including bioassay, shall be

carried out to determine if respirator wearers are receiving adequate respiratory protection. A physician shall determine the requirements of the surveillance program.

(14) Respirator maintenance. Respirator maintenance shall be performed regularly. Maintenance shall be carried out on a schedule which ensures that each respirator wearer is provided with a respirator that is clean and in good operating condition. Maintenance shall include: (a) Washing, sanitizing, rinsing, and drying, (b) inspection for defects, (c) replacement of worn or deteriorated parts, (d) repair if necessary, and (e) storage to protect against dust, sunlight, excessive heat, extreme cold, excessive moisture, damaging chemicals, and physical damage. (See WAC 296-62-07117.)

(15) Respirator program evaluation. An appraisal of the effectiveness of the respirator program shall be carried out at least annually. Action shall be taken to correct defects found in the program.

[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 Respirable air and oxygen for self-contained breathing apparatus and supplied air respirators. Compressed gaseous air, compressed gaseous oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Compressed gaseous or liquid oxygen shall meet the requirements of the United States Pharmacopeia for medical or breathing oxygen. Chemically generated oxygen shall meet the requirements of U.S. Department of Defense Military Specification MIL-E-83252 or Military Specification MIL-O-15633c. Compressed gaseous air shall meet at least the requirements of the specification for Type I – Grade D breathing air, and liquid air shall meet at least the requirements for Type II – Grade B breathing air as described in American National Standard Commodity Specification for Air, ANSI Z86.1-1973 (Compressed Gas Association Commodity Specification for Air, G-7.1, 1973).

(1) Compressed gaseous air may contain low concentrations of oil. If high-pressure oxygen passes through an oil- or grease-coated orifice, an explosion or fire may occur. Therefore, compressed gaseous oxygen shall not be used in supplied-air respirators or in open-circuit-type self-contained breathing apparatus that have previously used compressed air.

(2) Breathing air may be supplied to respirators from cylinders or air compressors. Cylinders shall be tested and maintained in accordance with applicable department of transportation specifications for shipping containers (Title 49, Code of Federal Regulations, Part 173, General Requirements for Shipments and Packagings, and Part 178, Shipping Container Specifications). 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 adsorber 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 alarm or an equally as effective alternative if approved by the department.

(a) 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.

(b) If the use of an alarm at the compressor will not effectively provide warning to the respirator wearer of a carbon monoxide problem, a remote alarm or other means of warning the wearer shall be used.

(3) Breathing air couplings shall be incompatible with outlets for nonrespirable plant air or other gas systems to prevent inadvertent servicing of air-line respirators with nonrespirable gases.

(4) Breathing gas containers shall be marked in accordance with American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, ANSI Z48.1-1954 (R1971); Federal Specification BB-A-1034a, June 21, 1968, Air, Compressed for Breathing Purposes; or Interim Federal Specification GG-B-675d, September 23, 1976, Breathing Apparatus, Self-Contained. Further details on sources of compressed air and its safe use will be found in Compressed Gas Association Pamphlet G-7, 1976, Compressed Air for Human Respiration.

[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 Selection of respirators. (1) General considerations. Proper selection of respirators shall be made in accordance with the classification, capabilities, and limitations listed in tables I through IV of this section. Additional guidance may be obtained by referring to American National Standard Practices for Respiratory Protection Z88.2 – 1980.

(2) Respirator protection factor (PF). Respirators shall be selected according to the characteristics of the hazards involved, the capabilities and limitations of the respirators, and the ability of each respirator wearer to obtain a satisfactory fit with a respirator. Taking into account the capabilities and limitations of respirators and the results of respirator-fitting tests, a table of respirator protection factors has been prepared (see Table V). A respirator protection factor is a measure of the degree of protection provided by a respirator to a wearer. Multiplying either (a) the permissible time-weighted average concentration or the permissible ceiling concentration, whichever is applicable, for a toxic substance, or (b) the maximum permissible airborne concentration for a radionuclide by a protection factor assigned to a respirator gives the maximum concentration of the hazardous substance in which the respirator

can be used. Limitations of filters, cartridges, and canisters also shall be considered (see Table V).

(3) Respirator–fitting tests. A qualitative or quantitative respirator–fitting test shall be used to determine the ability of each individual respirator wearer to obtain a satisfactory fit with a negative–pressure respirator. The results of qualitative or quantitative respirator fitting–tests shall be used to select specific types, makes, and models of negative–pressure respirators for use by individual respirator wearers. A respirator–fitting test shall be carried out for each wearer of a negative–pressure respirator equipped with a facepiece. Respirator–fitting tests shall not be required for positive–pressure respirators or for mouthpiece respirators.

(a) Qualitative respirator–fitting test – A person wearing a respirator is exposed to an irritant smoke, an odorous vapor, or other suitable test agent. An air–purifying respirator must be equipped with an air–purifying element(s) which effectively removes the test agent from inspired air. If the respirator wearer is unable to detect penetration of the test agent into the respirator, the respirator wearer has achieved a satisfactory fit with the respirator.

(b) Quantitative respirator–fitting test – A person wears a respirator in a test atmosphere containing a test agent in the form of an aerosol, vapor, or gas. Instrumentation, which samples the test atmosphere and the air inside the respiratory–inlet covering of the respirator, is used to measure quantitatively the penetration of the test agent into the respiratory–inlet covering.

(c) When carrying out a qualitative or quantitative respirator–fitting test, the respirator wearer shall carry out a series of exercises which simulate work movements.

(d) When carrying out respirator–fitting tests, it shall be an acceptable procedure to make the following modifications to respirators provided that such modifications do not affect the seal of the respirators to wearers.

(i) When carrying out a qualitative or quantitative respirator–fitting test which uses an aerosol as the test agent, it shall be acceptable procedure to equip an air–purifying respirator with a high–efficiency filter.

(ii) When carrying out a qualitative or quantitative respirator–fitting test which uses a vapor or gas as the test agent, it shall be acceptable procedure to equip an air–purifying respirator with an appropriate cartridge or canister which removes the vapor or gas from air.

(iii) When carrying out a quantitative respirator–fitting test, it shall be acceptable procedure to attach a sampling probe to the respirator which is connected by flexible tubing to an instrument which measures the penetration of the test agent into the respirator.

(e) If a qualitative respirator–fitting test has been used in respirator selection, a person shall be allowed to use only the specific make(s) and model(s) of respirator(s) for which the person obtained a satisfactory fit, and the respirator protection factor listed under "qualitative test" in Table V shall apply. Under no circumstances shall a person be allowed to use any respirator for which the results of the qualitative respirator fitting test indicate that the person is unable to obtain a satisfactory fit.

(f) If a quantitative respirator–fitting test has been used in selecting a respirator, the test results shall be used to assign a respirator protection factor to each person for each specific make and model of respirator tested. The assigned respirator protection factor shall be applied when the person wears the specific respirator in a hazardous atmosphere, but it shall not exceed the respirator protection factor listed under "quantitative test" in table V for the particular type of respirator.

(4) Respirator–fitting test records. Records of respirator–fitting tests shall be kept for at least the duration of employment. These records shall include the following information:

(a) Type of respirator–fitting test used;

(b) Specific make and model of respirator tested;

(c) Name of person tested;

(d) Name of test operator;

(e) Date of test;

(f) Results of respirator–fitting tests;

(i) Success or failure of person to obtain satisfactory fit if a qualitative respirator–fitting test was carried out.

(ii) Respirator protection factor based upon test results if a quantitative respirator–fitting test was carried out.

(5) Face dimensions and facepiece sizes. The wide range of face dimensions may require more than a single size of respirator facepiece to provide a proper fit to all respirator users. Therefore, respirator facepieces of more than one size should be available in any respirator–selection program involving respirators equipped with facepieces.

Table 1
Classification of Respiratory Hazards According to Their Biological Effect

Oxygen Deficiency

Minimum legal requirements: 18.0% by volume for respirable air at sea-level conditions. (See Note 1.)

Occurrence: Confined or unventilated cellars, wells, mines, ship holds, tanks, burning buildings, and enclosures containing inert atmospheres.

Atmospheric oxgen content (percent by volume) versus expected conditions:

20.9%: Oxygen content of normal air at sea-level conditions.

Oxygen Volume Percent at Sea Level	Physiological Effects
16%-12%	Loss of peripheral vision, increased breathing volume, accelerated heartbeat, impaired attention and thinking, impaired coordination.
12%-10%	Very faulty judgement, very poor muscular coordination, muscular exertion causes fatigue that may cause permanent heart damage, intermittent respiration.
10%-6%	Nausea, vomiting, inability to perform vigorous movement, unconsciousness followed by death.
Less than 6%	Spasmatic breathing, convulsive movements, death in minutes.

Gas and Vapor Contaminants

Asphyxiants: Interfere with utilization of oxygen in the body.

Simple asphyxiants: Physiologically inert substances that dilute oxygen in the air (for example: nitrogen, hydrogen, helium, methane). See Oxygen Deficiency, Column 1.

Chemical asphyxiants: Low concentrations interfere with supply or utilization of oyygen in the body (for example: carbon monoxide, hydrogen cyanide, cyanogen, and nitriles).

Irritants: Corrosive in action. May cause irritation and inflammation of parts of the respiratory system (also skin and eyes) and pulmonary edema (for example: ammonia hydrogen chloride, formaldehyde, sulfur dioxide, chlorine, ozone, nitrogen dioxide, phosgene, and arsenic trichloride).

Anesthetics: Causes loss of feeling and sensation with unconsciousness and death possible (for example: nitrous oxide, hydrocarbons, and ethers). Some anesthetics injure body organs (for example: carbon tetrachloride [liver and kidneys], chloroform [liver and heart], benzene [bone marrow], and carbon disulfide [nervous system]).

Sensitizers: Cause increased probability of physiological reactions (for example: isocyanates, epoxy resin systems).

Systemic poisons: Damage organs and systems in the body (for example: mercury [nervous system and various organs], phosphorus [bone], hydrogen sulfide [respiratory paralysis], and arsine [red blood cells and liver]).

Carcinogens: produce cancer in some individuals after a latent period (for example: vinyl chloride, benzene).

Particulate Contaminants (Dust, fog, fume, mist, smoke, and spray)

Relatively inert: May cause discomfort and minor irritation, but generally without injury at reasonable concentrations (for example: marble, gypsum).

Pulmonary-fibrosis-producing: produce nodulation and fibrosis in the lung, possibly leading to complications (for example: quartz, asbestos).

Carcinogens: Produce cancer in some individuals after latent period (for example: asbestos, chromates, radioactive particulates).

Chemical irritants: Produce irritation, inflammation, and ulceration in the upper respiratory tract (for example: acidic mists, alkalies).

Systemic poisons: Produce pathologic reactions in various systems of the body (for example: lead, manganese, cadmium).

Allery-producing: Produce reactions such as itching, sneezing, and asthmas (for example: pollens, spices, and animal fur).

Febrile-reaction-producing: Produce chills followed by fever (for example: fumes of zinc and copper).

Combination of Gas, Vapor, and Particulate Contaminants

Combinations of contaminants 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 which is greater that the sum of their individual effects) may occur. Such effects may require extraordinary protective measures.

NOTE 1: See definition in WAC 296-62-07105 for "oxygen deficiency - not immediately dangerous to life or health" and "oxygen deficiency - immediately dangerous to life or health."

Table 2
Classification of Respiratory Hazards According to Their Properties Which Influence Respirator Selection

Gas and Vapor Contaminants	Particulate Contaminants
Inert: Substances that do not react with other substances under most conditions, but create a respiratory hazard by displacing air and producing oxygen deficiency (for example: helium, neon, argon).	Particles are produced by mechanical means by disintegration processes such as grinding, crushing, drilling, blasting, and spraying; or by physiochemical reactions such as combustion, vaporization, distillation, sublimation, calcination, and condensation. Particles are classified as follows:
Acidic: Substances that are acids or that react with water to produce an acid. In water, they produce positively charged hydrogen ions (H^{+1}) and a pH of less than 7. They taste sour, and many are corrosive to tissues (for example: hydrogen chloride, sulfur dioxide, fluorine, nitrogen dioxide, acetic acid, carbon dioxide, hydrogen sulfide, and hydrogen cyanide).	**Dust:** A solid, mechanically produced particle with sizes varying from submicroscopic to visible or macroscopic.
Alkaline: Substances that are alkalies or that react with water to produce an alkali. In water, they result in the production of negatively changed hydroxyl ions (OH^{-1}) and a pH greater than 7. They taste bitter, and many are corrosive to tissues (for example: ammonia, amines, phospine, arsine, and stibine).	**Spray:** A liquid, mechanically produced particle with sizes generally in the visible or macroscopic range.
Organic: The components of carbon. Examples are saturated hydrocarbons (methane, ethane, butane) unsaturated hydrocarbons (ethylene, acetylene) alcohols (methyl ether, ethyl ether) aldehydes (formaldehyde), ketones (methyl ketone), organic acids (formic acid, acetic acid), halides (chloroform, carbon tetrachloride), amides (formamide, acetamide), nitriles (acetonitrile), isocyanates (toluene diisocyanate), amines (methylamine), epoxies (epoxyethane, propylene oxide), and aromatics (benzene, toluene, xylene).	**Fume:** A solid condensation particle of extremely small particle size, generally less than one micrometer in diameter.
Organometallic: Compounds in which metals are chemically bonded to organic groups (for example: ethyl silicate, tetraethyl lead, and organic phosphate).	**Mist:** A liquid condensation particle with sizes ranging from submiscroscopic to visible or macroscopic.
Hydrides: Compounds in which hydrogen is chemically bonded to metals and certain other elements (for example: diborane and tetraborane).	**Fog:** A mist of sufficient concentration to perceptibly obscure vision.
	Smoke: A system which 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.

Table 3
Classification and Description of Respirators by Mode of Operation

Air-Supplying Respirators	Air-Purifying Respirators
A respirable atmosphere independent of the ambient air is supplied to the wearer. **Self-Contained Breathing Apparatus (SCBA)** A supply of air, oxygen, or oxygen-generated material is carried by the wearer. Normally equipped with full facepiece, but may be equipped with a quarter-mask facepiece, half-mask facepiece, helmet, hood or mouthpiece and nose clamp. **(1) Closed-Circuit SCBA** (oxygen only, negative pressure[a] or positive pressure[b]). **(a) Compressed liquid oxygen type.** 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 type.** Equipped with a facepiece or mouthpiece and nose clamp. Water vapor in the exhaled breath reacts with 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. **Supplied-Air Respirators** **(1) Hose Mask** Equipped with a facepiece, breathing tube, rugged safety harness, and large-diameter heavy-duty non-kinking air-supply hose. The breathing tube and air-supply hose are securely attached to the harness. The facepiece is equipped with an exhalation valve. The harness has provision for attaching a safety line. **(a) Hose mask with blower.** Air is supplied by a motor-driven or hand-operated blower. The wearer can continue to inhale through the hose if the blower fails. Up to 300 feet (91 meters) of hose length is permissible. **(b) Hose mask without blower.** The wearer provides motivating force to pull air through the hose. The hose inlet is anchored and fitted with a funnel or like object covered with a fine mesh screen to prevent entrance of coarse particulate matter. Up to 75 feet (23 meters) of hose length is permissible. **(2) Air-Line Respirator** Respirable air is supplied 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.	Ambient air, prior to being inhaled, is passed through a filter, cartridge, or canister which removes particles, vapors, gases, or a combination of these contaminants. The breathing action of the wearer operates the nonpowered type of respirator. The powered type contains a blower - stationary or carried by the wearer - which passes ambient air through an air-purifying component and then supplies purified air to the respirator-inlet covering. The nonpowered type is equipped with a facepiece or mouthpiece and nose clamp. The powered type is equipped with a facepiece, helmet, hood, or suit. **Vapor-and Gas-Removing Respirators** 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 of vapors or gases (for example: organic vapors and acidic gases) from air. **Particulate-Removing Respirators** 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. Filter may be a replaceable part or a permanent part of the respirator. Filter may be of the single-use or the reusable type. **Combination Particulate-and Vapor-and Gas-Removing Respirators** 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.

Continued

Table 3
Classification and Description of Respirators by Mode of Operation (Continued)

Atmosphere-Supplying Respirators	Air-Purifying Respirators
Self-Contained Breathing Apparatus (SCBA) (Continued) 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. (a) Demand-type.[c] 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.[d] 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 the demand mode should be used only when donning or removing the apparatus.	**Supplied-Air Respirators (Continued)** (a) Continuous-flow class. 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 is required. Air is supplied to a suit through a system of internal tubes to the head, trunk and extremities through valves located in appropriate parts of the suit. (b) Demand type.[c] Equipped with a facepiece only. The demand valve permits flow of air only during inhalation. (c) Pressure-demand type.[d] Equipped with a facepiece only. A positive pressure is maintained in the facepiece.
Combination Air-Line Respirators with Auxiliary Self-Contained Air Supply Includes an air-line respirator with 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 dangerous atmospheres have a low-pressure warning alarm and contain at least a 15-minute self-contained air supply.	
Combination Atmosphere-Supplying and Air-Purifying Respirators Provide the wearer with the option of using either of two different modes of operation: (1) an atmosphere-supplying respirator with an auxiliary air-purifying attachment which provides protection in the event the air supply fails or (2) an air-purifying respirator with an auxiliary self-contained air supply which is used when the atmosphere may exceed safe conditions for use of an air-purifying respirator.	

[a]Device produces negative pressure in respiratory-inlet covering during inhalation.

[b]Device produces positive pressure in respiratory-inlet covering during both inhalation and exhalation.

[c]Equipped with a demand valve that is activated on initiation of inhalation and permits the flow of breathing atmosphere to the facepiece. On exhalation, pressure in the facepiece becomes positive and the demand valve is deactivated.

[d]A positive pressure is maintained in the facepiece by a spring-loaded or balanced regulator and exhalation valve.

Table 4
Capabilities and Limitations of Respirators

Atmosphere-Supplying Respirators

(See WAC 296-62-07111 for specifications on respirable atmospheres.) Atmospheric-supplying respirators provide protection against oxygen deficiency and toxic atmospheres. The breathing atmosphere is independent of ambient atmospheric conditions.

General limitations: Except for some air-line suits, no protection is provided against skin irritation by materials such as ammonia and hydrogen chloride, or against sorption of materials such as hydrogen cyanide, tritium, or organic phosphate 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 table 5.)

Self-Contained Breathing Apparatus (SCBA)

The wearer carries his own breathing atmosphere.

Limitations: The period over which the device 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 irrespirable atmosphere.

Chief limitations of SCBA devices are their weight or bulk, or both, limited service life, and the training required for their maintenance and safe use.

(1) Closed-Circuit SCBA
The closed-circuit operation conserves oxygen and permits longer service life at reduced weight.

Supplied-Air Respirators

The respirable air supply is not limited to the quantity the individual can carry, and the devices are lightweight and simple.

Limitations: Limited to use in atmospheres from which the wearer can escape unharmed without the aid of the respirator.

The wearer is restricted in movement by the hose and must return to a respirable atmosphere by retracing his route of entry. The hose is subject to being severed or pinched off.

(1) Hose Mask.
The hose inlet or blower must be located and secured in a respirable atmosphere.
(a) Hose mask with blower.
If the blower fails, the unit still provides protection, although a negative pressure exists in the facepiece during inhalation.
(b) Hose mask without blower.
Maximum hose length may restrict application of device.

Air-Purifying Respirators

General limitations: Air-purifying respirators do not protect against oxygen-deficient atmospheres nor against skin irritation by, or sorption through the skin of, airborne contaminants.

The maximum contaminant concentration against which an air-purifying respirator will protect is determined by the design efficiency 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.

Nonpowered air-purifying respirators will not provide the maximum design protection specified unless the facepiece or mouthpiece/nose clamp is carefully fitted to the wearer's face to prevent inward leakage (WAC 296-62-07115(4). The time period over which protection is provided is dependent on canister, cartridge, or filter type; concentration of contaminant; humidity levels in the ambient atmosphere; and the wearer's respiratory rate.

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 in powered respirators. Respirator facepieces present special problems to individuals required to wear prescription lenses. These devices do have the advantage of being small, light, and simple in operation.

Use of air-purifying respirators in atmospheres immediately dangerous to life or health is limited to specific devices under specified conditions (See Table 5).

Vapor and Gas-Removing Respirators

Limitations: No protection is provided 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 an immediate return to fresh air.

Particulate-Removing Respirators

Limitations: Protection against non volatile particles only. No protection against gases and vapors.

Not for use in atmospheres immediately dangerous to life or health unless the device is a powered-type respirator with escape provisions (see Table 5).

Continued

Table 4
Capabilities and Limitations of Respirators (Continued)

Atmosphere-Supplying Respirators		Air-Purifying Respirators	
Self-Contained Breathing Apparatus (Cont.)	**Supplied-Air Respirators (Cont.)**	**Vapor and Gas-Removing Respirators (Cont.)**	**Particulate-Removing Respirators (Cont.)**
The negative-pressure type produces a negative pressure in the respiratory-inlet covering during inhalation, and this may permit inward leakage of contaminants; whereas the positive-pressure type always maintains a positive pressure in the respiratory-inlet covering and is less apt to permit inward leakage of contaminants. **(2) Open Circuit SCBA.** 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.	**(2) Air-Line Respirator (Continuous Flow, Demand and Pressure-Demand Types).** 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. Air-line suits may protect against atmospheres that irritate the skin or that may be absorbed through the unbroken skin. **Limitations:** Air-line respirators provide no protection if the air supply fails. Some contaminants, such as tritium, may penetrate the material of an air-line suit and limit its effectiveness. Other contaminants, such as fluorine, may react chemically with the material of an air-line suit and damage it.	Use should be avoided in atmospheres where the contaminant(s) lack sufficient warning properties (that is: odor, taste, or irritation at a concentration in air at or above the permissible exposure limit). (Vapor- and gas-removing respirators are not approved for contaminants that lack adequate warning properties. Not for use in atmospheres immediately dangerous to life or health unless the device is a powered-type respirator with escape provisions (see Table 5). **(1) Full Facepiece Respirator.** Provides protection against eye irritation in addition to respiratory protection. **(2) Quarter-Mask and Half-Mask Facepiece Respirator.** A fabric covering (facelet) available from some manufacturers shall not be used. **(3) Mouthpiece Respirator.** Shall be used only for escape application. Mouth breathing prevents detection of contaminant by odor. Nose clamp must be securely in place to prevent nasal breathing. A small lightweight device that can be donned quickly.	**(1) Full Facepiece Respirator.** Provides protection against eye irritation in addition to respiratory protection. **(2) Quarter-Mask and Half-Mask Facepiece Respirator.** A fabric covering (facelet) available from some manufacturers shall not be used unless approved for use with respirator. **(3) Mouthpiece Respirator.** Shall be used only for escape applications. Mouth breathing prevents detection of contaminant by odor. Nose clamp must be securely in place to prevent nasal breathing. A small, lightweight device that can be donned quickly.
Combination Airline Respirators with Auxiliary SC 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 15-minute auxiliary self-contained air supply. (See Table 5).		**Combination Particulate-and-Vapor-and Gas-Removing Respirators** The advantages and disadvantages of the component sections of the combination respirator as described above apply.	

Combination Atmosphere-Supplying and Air-Purifying Respirators

The advantages and disadvantages, expressed above, of the mode of operation being used will govern. The mode with the greater limitations (air-purifying mode) will mainly 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 would require such a change.

Table 5
RESPIRATOR PROTECTION FACTORS[a]

Type of Respirator	Permitted for Use in Oxygen-Deficient Atmosphere	Permitted for Use in Immediately-Dangerous-to-Life-or-Health Atmosphere[f]	Qualitative Test	Quantitative Test
Particulate-filter, quarter-mask or half-mask facepiece[b,c]	No	No	10	As measured on each person with maximum of 100.
Vapor- or gas-removing, quarter-mask or half-mask facepiece[c]	No	No	10, or maximum use limit of cartridge or canister for vapor or gas, whichever is less.	As measured on each person with maximum of 100, or maximum use limit of cartridge or canister for vapor or gas[i,j], whichever is less.
Combination particulate-filter and vapor- or gas-removing, quarter-mask or half-mask facepiece[b,c]	No	No	10, or maximum use limit of cartridge or canister for vapor or gas, whichever is less.	As measured on each person with maximum of 100, or maximum use limit of cartridge or canister for vapor or gas[i,j], whichever is less.
Particulate-filter, full facepiece[b]	No	No	100	As measured on each person with maximum of 100 if dust, fume, or mist filter is used or maximum of 1,000 if high-efficiency filter is used.
Vapor- or gas-removing, full facepiece	No	No	100, or maximum use limit of cartridge or canister for vapor or gas, whichever is less.	As measured on each person with maximum of 1,000 or maximum use limit of cartridge or canister for vapor or gas[i,j], whichever is less.
Combination particulate-filter and vapor-or gas-removing, full facepiece[b]	No	No	100, or maximum use limit of cartridge or canister for vapor or gas, whichever is less.	As measured on each person with maximum of 100 if dust, fume, or mist filter is used and maximum of 1,000 if high-efficiency filter is used, or maximum use limit of cartridge or canister for vapor or gas[i,j], whichever is less.
Powered particulate-filter, any respiratory-inlet covering[b,c,d]	No	No (yes, if escape provisions are provided[d])	N/A	N/A No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 100 if dust, fume, or mist filter is used and 3,000 if high-efficiency filter is used.
Powered vapor- or gas-removing, any respiratory-inlet covering[c,d]	No	No (yes, if escape provisions are provided[d])	N/A	N/A No tests are required due to positive-pressure operation or respirator. The maximum protection factor is 3,000 or maximum use limit of cartridge or canister for vapor of gas[i,j], whichever is less.
Powered combination particulate-filter and vapor- or gas-removing, any respirator-inlet covering[b,c,d]	No	No (yes, if escape provisions are provided[d])	N/A	N/A No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 100 if dust, fume, or mist filter is used and 3,000 if high-efficiency filter is used, or maximum use limit of cartridge or canister for vapor or gas[i,j], whichever is less.
Air-line, demand, quarter-mask or half-mask facepiece, with or without escape provisions[c,e]	Yes[f]	No	10	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.

(Continued)

Table 5
RESPIRATOR PROTECTION FACTORS[a]
(Continued)

Type of Respirator	Permitted for Use in Oxygen-Deficient Atmosphere	Permitted for Use in Immediately-Dangerous-to Life-or-Health Atmosphere[f]	Qualitative Test	Quantitative Test
Air-line, demand, full facepiece, with or without escape provisions[g]	Yes[f]	No	100	As measured on each person, but limited to the use of the respirators in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.
Air-line, continuous-flow or pressure-demand type, any facepiece without escape provisions[c]	Yes[f]	No	N/A	N/A No tests are required due to positive-pressure operation of respirator. The protection factor provided by the respirator is limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.
Air-line, continuous-flow or pressure-demand type, any facepiece with escape provisions[c,g]	Yes[g]	Yes	N/A	N/A No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 10,000 plus[h].
Air-line, continuous flow, helmet, hood, or suit, without escape provisions	Yes[f]	No	N/A	N/A No tests are required due to positive-pressure operation of respirator. The protection factor provided by the respirator is limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.
Air-line continuous flow, helmet, hood, or suit, with escape provisions[g]	Yes[g]	No	N/A	N/A No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 10,000 plus[h].
Hose mask, with or without blower, full facepiece	Yes[f]	No	10	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.
Self-contained breathing apparatus, demand-type open-circuit, or negative-pressure-type closed-circuit, quarter-mask or half-mask facepiece[c]	Yes[f]	No	10	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.
Self-contained breathing apparatus, demand-type open-circuit or negative-pressure-type closed-circuit, full facepiece or mouthpiece/nose clamp[c]	Yes (Yes[g], if respirator is used for mine rescue and mine recovery operations.)	No (Yes if respirator is used for mine rescue and mine recovery operations.)	100	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values, except when the respirator is used for mine rescue and mine recovery operations

Table 5
RESPIRATOR PROTECTION FACTORS[a]
(Continued)

Type of Respirator	Permitted for Use in Oxygen-Deficient Atmosphere	Permitted for Use in Immediately-Dangerous-to Life-or-Health Atmosphere[f]	Qualitative Test	Quantitative Test
Self-contained breathing apparatus, pressure-demand type open-circuit or positive-pressure type closed-circuit, quarter-mask or half-mask face-piece, full facepiece, or mouthpiece/nose clamp[c]	Yes[g]	Yes	N/A No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 10,000 plus[h].	N/A
Combination respirators not listed.	The type and mode of operation having the lowest respirator protection factor shall be applied to the Combination Respirator			

N/A/ means not applicable since a respirator-fitting test is not carried out.

[a]A respirator protection factor is a measure of the degree of protection provided by a respirator to a respirator wearer. Multiplying the permissible time-weighted average concentration or the permissible ceiling concentration, whichever is applicable, for a toxic substance, or the maximum permissible airborne concentration for a radionuclide, by a protection factor assigned to a respirator gives the maximum concentration of the hazardous substance for which the respirator can be used. Limitations of filters, cartridges, and canisters used in air-purifying respirators shall be considered in determining protection factors.

[b]When the respirator is used for protection against airborne particulate matter having a permissible time-weighted average concentration less than 0.05 milligram particulate matter per cubic meter of air or less than 2 million particles per cubic foot of air, or for protection against airborne radionuclide particulate matter, the respirator shall be equipped with a high-efficiency filter(s).

[c]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 shall be permitted to use a protective goggle or to use a respirator equipped with a full facepiece.

[d]If the powered air-purifying respirator is equipped with a facepiece, the escape provision means that the wearer is able to breathe through the filter, cartridge, or a canister and through the pump. If the powered air-purifying respirator is equipped with a helmet, hood, or suit, the escape provision shall be an auxiliary self-contained supply of respirable air.

[e]The escape provision shall be an auxiliary self-contained supply of respirable air.

[f]For definition of "oxygen deficiency - not immediately dangerous to life or health" see WAC 296-62-07105.

[g]For definition of "oxygen deficiency - immediately dangerous to life or health" see WAC 296-62-07105.

[h]The protection factor measurement exceeds the limit of sensitivity of the test apparatus. Therefore, the respirator has been classified for use in atmospheres having unknown concentrations of contaminants.

[i]The service life of a vapor-or-gas removing cartridge canister depends on the specific vapor or gas, the concentration of the vapor or gas in air, the temperature and humidity of the air, the type and quantity of the sorbent in the cartridge or canister, and the activity of the respirator wearer. Cartridges and canisters may provide only very short service lives for certain vapors and gases. Vapor/gas service life testing is recommended to ensure that cartridges and canisters provide adequate service lives. Reference should be made to published reports which give vapor/gas life data for cartridges and canisters.

[j]Vapor-and-gas removing respirators are not approved for contaminants that lack adequate warning properties of odor, irritation, or taste at concentrations in air at or above the permissible exposure limits.

NOTE: Respirator protection factors for air-purifying-type respirators equipped with a mouthpiece/nose clamp form of respirator-inlet covering are not given, since such respirators are approved only for escape purposes.

[Statutory Authority: Chapter 49.17 RCW. 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 Use of respirators. (1) Standard operating procedures. Written standard operating procedures shall cover a complete respirator program and shall include information necessary for the proper use of respirators, including training of respirator wearers, respirator sealing tests, issuance of respirators, inspection of respirators prior to use, monitoring respirator use, monitoring respiratory hazard, and planning for routine, nonroutine, emergency, and rescue uses of respirators.

(a) The written standard operating procedures shall include plans necessary to ensure the safe routine use and nonroutine use of respirators. Emergency and rescue uses of respirators shall be anticipated, and the written standard operating procedures shall include plans necessary to ensure the safe emergency and rescue uses of respirators. Persons who wear respirators routinely, who wear respirators nonroutinely, and who may be required to wear respirators for emergency and rescue work shall be given adequate information concerning plans covering these respirator uses to ensure the safe use of respirators.

(b) Standard operating procedures for emergency and rescue use of respirators. It is recognized that it is not possible to foresee every emergency and rescue use of respirators for every kind of operation. Nevertheless, a wide variety of possible conditions requiring the emergency or rescue use of respirators can be envisioned and an adequate emergency and rescue respirator-response capability can be achieved through a serious effort to anticipate the worst possible consequences of particular malfunctions or mishaps.

The written standard operating procedures governing the emergency and rescue uses of respirators shall be developed in the following manner:

(i) An analysis of the emergency and rescue uses of respirators that may occur in each operation shall be made by careful consideration of materials, equipment, processes, and personnel involved. Such an analysis shall be reviewed by the person who is thoroughly familiar with the particular operation. Consideration shall be given to past occurrences requiring emergency or rescue uses of respirators as well as conditions which resulted in

such respirator applications. The possible consequences of equipment or power failures, uncontrolled chemical reactions, fire, explosion, or human error shall be given consideration. All potential hazards which may result in emergency or rescue use of respirators shall be listed.

(ii) Based upon the analysis, appropriate types of respirators shall be selected, an adequate number shall be provided for each area where they may be needed for emergency or rescue use, and these respirators shall be maintained and stored so that they are readily accessible and operational when needed.

(iii) In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional person shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.

(iv) When self-contained breathing apparatus or airline respirators with an escape provision are used in atmospheres immediately dangerous to life or health, standby workers must be present at the nearest fresh air base with suitable rescue equipment.

(v) Persons using air line respirators in atmospheres immediately hazardous to life or health shall be equipped with safety harnesses and safety lines for lifting or removing persons from hazardous atmospheres or other and equivalent provisions for the rescue of persons from hazardous atmospheres shall be used. A standby worker or workers with suitable self-contained breathing apparatus shall be at the nearest fresh air base for emergency rescue.

(2) Training. The supervisor, the person issuing respirators, and the respirator wearers shall be given adequate training by a qualified person(s) to ensure the proper use of respirators. Written records shall be kept of the names of the persons trained and the dates when training occurred.

(a) Training of supervisor. A supervisor – that is, a person who has the responsibility of overseeing the work activities of one or more persons who must wear respirators – shall be given adequate training to ensure the proper use of respirators.

(b) Training of person issuing respirators. A person assigned the task of issuing respirators to persons who must wear respirators for protection against harmful atmospheres shall be given adequate training to ensure that the correct respirator is issued for each application in accordance with written standard operating procedures.

(c) Training of respirator wearer. To ensure the proper and safe use of a respirator, the minimum training of each respirator wearer shall include the following elements:

(i) The reasons for the need of respiratory protection.

(ii) The nature, extent, and effects of respiratory hazards to which the person may be exposed.

(iii) An explanation of why engineering controls are not being applied or are not adequate and of what effort is being made to reduce or eliminate the need for respirators.

(iv) An explanation of why a particular type of respirator has been selected for a specific respiratory hazard.

(v) An explanation of the operation, and the capabilities and limitations, of the respirator selected.

(vi) Instruction in inspecting, donning, checking the fit of, and wearing the respirator.

(vii) An opportunity for each respirator wearer to handle the respirator, learn how to don and wear it properly, check its seals, wear it in a safe atmosphere, and wear it in a test atmosphere.

(viii) An explanation of how maintenance and storage of the respirator is carried out.

(ix) Instructions in how to recognize and cope with emergency situations.

(x) Instructions as needed for special respirator use.

(xi) Regulations concerning respirator use.

(A) Wearing instructions and training. Wearing instructions and training, including practice demonstrations, shall be given to each respirator wearer and shall cover:

(I) Donning, wearing, and removing the respirator.

(II) Adjusting the respirator so that its respiratory-inlet covering is properly fitted on the wearer and so that the respirator causes a minimum of discomfort to the wearer.

(III) Allowing the respirator wearer to wear the respirator in a safe atmosphere for an adequate period of time to ensure that the wearer is familiar with the operational characteristics of the respirator.

(IV) Providing the respirator wearer an opportunity to wear the respirator in a test atmosphere to demonstrate that the respirator provides protection to the wearer. A test atmosphere is any atmosphere in which the wearer can carry out activities simulating work movements and respirator leakage or respirator malfunction can be detected by the wearer.

(B) Retraining. Each respirator wearer shall be retrained as necessary to assure effective respirator use. Refresher training shall be given at least annually and shall include the provisions of (c)(vii) through (xi)(A)(III) of this subsection.

(3) Respirator sealing problems. Respirators shall not be worn when conditions prevent a seal of the respirator to the wearer.

(a) A person who has hair (stubble, moustache, sideburns, beard, low hairline, bangs) which passes between the face and the sealing surface of the facepiece of the respirator shall not be permitted to wear such a respirator.

(b) A person who has hair (moustache, beard) which interferes with the function of a respirator valve(s) shall not be permitted to wear the respirator.

(c) A spectacle which has temple bars or straps which pass between the sealing surface of a respirator full facepiece and the wearer's face shall not be used.

(d) A head covering which passes between the sealing surface of a respirator facepiece and the wearer's face shall not be used.

(e) The wearing of a spectacle, a goggle, a faceshield, a welding helmet, or other eye and face protective device which interferes with the seal of a respirator to the wearer shall not be allowed.

(f) If scars, hollow temples, excessively protruding cheekbones, deep creases in facial skin, the absence of teeth or dentures, or unusual facial configurations prevent a seal of a respirator facepiece to a wearer's face, the person shall not be permitted to wear the respirator.

(g) If missing teeth or dentures prevent a seal of a respirator mouthpiece in a person's mouth, the person shall not be allowed to wear a respirator equipped with a mouthpiece.

(h) If a person has a nose of a shape or size which prevents the closing of the nose by the nose clamp of a mouthpiece/nose-clamp type of respirator, the person shall not be permitted to wear this type of respirator.

(4) Respirator sealing tests. To ensure proper protection, the wearer of a respirator equipped with a facepiece shall check the seal of the facepiece prior to each entry into a hazardous atmosphere. This may be done using procedures recommended by respirator manufacturers or by approved field tests.

(5) Issuance of respirators. The proper respirator shall be specified for each application and shall be listed in the written standard operating procedures. If a respirator is marked for the worker to whom it is assigned or for other identification purposes, the markings shall not affect the respirator performance in any way.

(6) Respirator inspection prior to use. Each person issued a respirator for routine, nonroutine, emergency, or rescue use shall inspect the respirator prior to its use to ensure that it is in good operating condition.

(7) Monitoring respirator use. The use of respirators on a routine or nonroutine basis shall be monitored to ensure that the correct respirators are being used, that the respirators are being worn properly and that the respirators being used are in good working condition.

(8) Evaluation of respiratory hazard during use. The level of the respiratory hazard in the workplace to which a person wearing a respirator is exposed shall be evaluated periodically.

(9) Leaving a hazardous area. A respirator wearer shall be permitted to leave the hazardous area for any respirator-related cause. Reasons which may cause a respirator wearer to leave a hazardous area include, but are not limited to, the following:

(a) Failure of the respirator to provide adequate protection.

(b) Malfunction of the respirator.

(c) Detection of leakage of air contaminant into the respirator.

(d) Increase in resistance of respirator to breathing.

(e) Severe discomfort in wearing the respirator.

(f) Illness of respirator wearer, including: Sensation of dizziness, nausea, weakness, breathing difficulty, coughing, sneezing, vomiting, fever, and chills.

[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.]

WAC 296-62-07117 Maintenance of respirators. (1) General. A program for the maintenance of respirators shall be adjusted to the type of plant, working conditions, hazards involved, and shall include the following:

(a) Cleaning and sanitizing.

(b) Inspection for defects.

(c) Repair.

(d) Storage.

Each respirator shall be properly maintained to retain its original shape and effectiveness.

(2) Cleaning and sanitizing. Each respirator shall be cleaned and sanitized to ensure that the respirator wearer is provided with a clean and sanitized respirator at all times. A respirator issued for other than continuous personal use by a particular worker, such as with routine, nonroutine, emergency, or rescue use, shall be cleaned and sanitized after each use.

(3) Inspection. Each respirator shall be inspected routinely before and after use. A respirator shall be inspected by the user immediately prior to each use to ensure that it is in proper working condition.

(a) After cleaning and sanitizing, each respirator shall be inspected to determine if it is in proper working condition, if it needs replacement of parts or repairs, or if it should be discarded. Each respirator stored for emergency or rescue use shall be inspected at least monthly. Respirator inspection shall include a check for tightness of connections; for the condition of the respiratory-inlet covering, head harness, valves, connecting tubes, harness assemblies, filters, cartridges, canisters, end-of-service-life indicator, and shelf life date(s); and for the proper function of regulators, alarms, and other warning systems.

(b) Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturer's instructions.

(c) A record of inspection dates, findings, and remedial actions shall be kept for each respirator maintained for emergency or rescue use.

(4) Part replacement and repair. Replacement of parts or repairs shall be done only by persons trained in proper respirator assembly and correction of possible respirator malfunctions and defects. Replacement parts shall be only those designed for the specific respirator being repaired. Reducing or admission valves, regulators, and alarms shall be returned to the manufacturer or to a trained technician for repair or adjustment. Instrumentation for valve, regulator, and alarm adjustments and tests must be approved by the valve, regulator, or alarm manufacturer.

(5) Storage. Respirators shall be stored in a manner that will protect them against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric parts. Respirators shall not be stored in such places as lockers and tool boxes unless

they are protected from contamination, distortion, and damage. Emergency and rescue-use respirators that are placed in work areas shall be quickly accessible at all times, and the storage cabinet or container in which they are stored shall be clearly marked.

[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.]

WAC 296-62-07119 Identification of air-purifying respirator canisters. (1) The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.

(2) Employers or their representative who issue or use gas masks falling within the scope of this section shall see that all gas mask canisters purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.

(3) On each canister shall appear in bold letters the following:

(a) Canister for

_____

(Name for atmospheric contaminant)
or
Type N Gas Mask Canister

(b) In addition, essentially the following wording shall appear beneath the appropriate phrase on the canister label: "For respiratory protection in atmospheres containing not more than _____ percent by volume of _____

_____

(Name of atmospheric contaminant)

(c) All of the markings specified above should be placed on the most conspicuous surface or surfaces of the canister.

(4) Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3 - micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

(5) Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas mask canisters are only designed to neutralize or remove contaminants from the air.

(6) Each gas mask canister shall be painted a distinctive color or combination of colors indicated in Table I. All colors used shall be such that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately colored pressure sensitive tape may be used for the stripes.

TABLE I

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.

TABLE I

Atmospheric Contaminants to be Protected Against	Colors Assigned*
All of the above atmospheric contaminants	Red with 1/2 – inch gray stripe completely around the canister near the top.

*Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

Note: Orange shall 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 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07119, filed 7/27/81.]

WAC 296-62-07121 Effective date. This standard shall become effective thirty days after filing with the code reviser.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07121, filed 7/27/81.]

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 92933.

(b) Alpha-Naphthylamine - Chemical Abstracts Registry Number 134327.

(c) 4,4' Methylene bis (2 - chloroaniline) - Chemical Abstracts Service Registry Number 101144.

(d) Methyl chloromethyl ether - Chemical Abstracts Service Registry Number 107302.

(e) 3,3'-Dichlorobenzidine (and its salts) - Chemical Abstracts Service Registry Number 91941.

(f) Bis-Chloromethyl ether - Chemical Abstracts Service Registry Number 542881.

(g) Beta-Naphthylamine - Chemical Abstracts Service Registry Number 91598.

(h) Benzidine - Chemical Abstracts Service Registry Number 92875.

(i) 4-Aminodiphenyl - Chemical Abstracts Service Registry Number 92671.

(j) Ethyleneimine - Chemical Abstracts Service Registry Number 151564.

(k) Beta-Propiolactone - Chemical Abstracts Service Registry Number 57578.

(l) 2-Acetylaminofluorene - Chemical Abstracts Service Registry Number 53963.

(m) 4-Dimethylaminoazobenzene - Chemical Abstract Service Registry Number 60117.

(n) N-Nitrosodimethylamine - Chemical Abstracts Service Registry Number 62759.

[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 (2)(l) 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 a carcinogen handling operation shall be provided with and required to wear and use respiratory protection in accordance with chapter 296–62 WAC, of the general safety and health standards.

(v) 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).

(vi) 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.

(vii) Employees shall be required to shower after the last exit of the day.

(viii) 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;

(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 49.17.040 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) 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).

(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).

(2) 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.

(3) 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 49.17.040 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:

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*

* 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.

(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.

(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. 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 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 chief, industrial hygiene section, department of labor and industries.

(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 paragraph (4)(a) of this section 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 subsection (4)(a) of this section 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 subdivision.

(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 (6) 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. Where respiratory protection is required under this section:

(a) The employer shall provide a respirator which meets the requirements of this subdivision and shall assure that the employee uses such respirator.

(b) Respirators shall be selected from among those jointly approved by the Mining Enforcement and Safety Administration, Department of the Interior, and the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(c) A respiratory protection program meeting the requirements of chapter 296-62 WAC shall be established and maintained.

(d) Selection of respirators for vinyl chloride shall be as follows:

Atmospheric concentration of Vinyl Chloride	Required Apparatus
(i) Unknown, or above 3,600 ppm	Open-circuit, self-contained breathing apparatus, pressure demand type, with full facepiece.
(ii) 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.
(iii) Not over 250 ppm	Type C, supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood.
(iv) Not over 100 ppm	Supplied air respirator demand type, with full facepiece.
(v) 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.
(vi) 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.

(e)(i) Entry into unknown concentrations or concentrations greater than 36,000 ppm (lower explosive limit) may be made only for purposes of life rescue; and

(ii) Entry into concentrations of less than 36,000 ppm, but greater than 3,600 ppm may be made only for purposes of life rescue, firefighting, or securing equipment so as to prevent a greater hazard from release of vinyl chloride.

(f) Where air-purifying respirators are used:

(i) Air-purifying canisters or cartridges shall 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 shall be provided where 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.

(g) Apparatus prescribed for higher concentrations may be used for any 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 (6) 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.

(i) 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:

(A) Employees engaged in hazardous operations or correcting situations of existing hazardous releases shall be equipped as required in subsection (8) of this section;

(B) 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 glustamyl 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 subsection (10)(a) of this section 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 subsection (10)(a) of this section, 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 assistant 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 assistant 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 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.

(i) Effective January 1, 1975, the provisions set forth in WAC 296–62–07329 shall apply.

APPENDIX A SUPPLEMENTARY MEDICAL INFORMATION

When required tests under paragraph (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 49.17.040 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 CH2=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 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. The employer shall assure that respirators are used where required pursuant to this section to reduce employee exposure to within the permissible exposure limits and in emergencies. Compliance with the permissible exposure limits may not be achieved by the use of respirators except:

(i) During the time period necessary to install or implement feasible engineering and work practice controls; or

(ii) In work operations such as maintenance and repair activities in which the employer establishes that engineering and work practice controls are not feasible; or

(iii) In work situations where feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the permissible exposure limits; or

(iv) In emergencies.

(b) Respirator selection.

(i) Where respiratory protection is required under this section, the employer shall select and provide at no cost to the employee, the appropriate type of respirator from Table I and shall assure that the employee wears the respirator provided.

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.

(ii) The employer shall select respirators from those approved for use with AN by the National Institute for Occupational Safety and Health under the provisions of WAC 296-62-071.

(c) Respirator program.

(i) The employer shall institute a respiratory protection program in accordance with WAC 296-62-071.

(ii) Testing. Fit testing of respirators shall be performed to assure that the respirator selected provides the protection required by Table I.

(A) Qualitative fit. The employer shall perform qualitative fit tests at the time of initial fitting and at least semiannually thereafter for each employee wearing respirators.

(B) Quantitative fit. Each employer with more than ten employees wearing negative pressure respirators shall perform quantitative fit testing at the time of initial fitting and at least semiannually thereafter for each such employee.

(iii) Employees who wear respirators shall be allowed to wash their faces and respirator facepieces to prevent potential skin irritation associated with respirator use.

(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) Effective date. This standard will become effective July 28, 1978.

(20) 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: 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 (CH_2 CHCN).

(b) Synonyms: Propenenitrile; vinyl cyanide; cyanoethylene; AN; VCN; acylon; carbacryl; fumigrian; 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.

(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:

(i) 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 Mine Safety and Health Administration (MSHA or MESA) or National Institute for Occupational Safety and Health (NIOSH) label of approval for use with organic vapors. (Older respirators may have a Bureau of Mines approval label.) 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.

(ii) Acrylonitrile does not have a detectable odor except at levels above the permissible exposure limits. Do not depend on odor to warn you when a respirator cartridge or canister is exhausted. Cartridges or canisters must be changed daily or before the end–of–service–life, whichever comes first. Reuse of these may allow acrylonitrille to gradually filter through the cartridge and cause exposures which you cannot detect by odor. If you can smell acrylonitrille while wearing a respirator,

proceed immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

(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 acrylonitrille. 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: Chapter 49.17 RCW. 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: $CH_2=CHCN$.

(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.

(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 contract 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 NISOH 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_t) 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. 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 bank 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 CS_2 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 dejector 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 integator 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 prevent 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) Respirators.

(a) General. Where respiratory protection is required under this section, the employer shall select, provide and assure the proper use of respirators.

(b) Respirators shall be used in the following circumstances:

(i) During the period necessary to install or implement feasible engineering and work practice controls; or

(ii) During maintenance and repair activities in which engineering and work practice controls are not feasible; or

(iii) In work situations where feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the permissible exposure limit; or

(iv) In emergencies.

(9) Respirator selection.

(a) Where respirators are required under this section, the employer shall select and provide, at no cost to the employee, the appropriate respirator from Table I of this section and shall assure that the employee uses the respirator provided.

(b) The employer shall select respirators from among those approved by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

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.

(c) Respirator program.

(i) The employer shall institute a respiratory protection program in accordance with WAC 296-62-071.

(ii) Employees who wear respirators shall be allowed to wash their face and respirator facepiece to prevent potential skin irritation associated with respirator use.

(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. Hygiene facilities shall be provided and practices implemented in accordance with the requirements of WAC 296-24-12009.

(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. Within 30 days of the effective date of this section or time of initial assignment, and whenever exposure to DBCP, the employer shall provide a medical examination including 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, and limitations of respirators;

(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) Effective date. This standard will become effective July 28, 1978.

(20) 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. 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); Nemafume; 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 man.

(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 National Institute for Occupational Safety and Health (NIOSH) approval label (older respirators may have a Bureau of Mines Approval label). 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. DBCP does not have a detectable odor except at 1,000 times or more above the permissible exposure limit. If you can smell DBCP while wearing a respirator, the respirator is not working correctly; go immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

(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, he is 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: Chapter 49.17 RCW. 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; Nemafume; 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: C3H5Br2 C1.

(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 WAC 296-24-95613, 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 alcohol) 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. 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 initialed *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 hematoxalin 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 radiommuno-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 $\mu g/m^3$) 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 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 $\mu g/m^3$), averaged over any eight-hour period.

(4) Notification of use.

(a) By October 1, 1978, or within sixty days after the introduction of inorganic arsenic into the workplace, every employer who is required to establish a regulated area in his 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 $\mu g/m^3$.

(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 $\mu g/m^3$ but less than 10 $\mu g/m^3$.

(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)(b) 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 at the earliest possible time but not later than December 31, 1979, 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 by December 31, 1979, 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. The employer shall assure that respirators are used where required under this section to reduce employee exposures to below the permissible exposure limit and in emergencies. Respirators shall be used in the following circumstances:

(i) During the time period necessary to install or implement feasible engineering or work practice controls;

(ii) In work operations such as maintenance and repair activities in which the employer establishes that engineering and work practice controls are not feasible;

(iii) In work situations in which engineering controls and supplemental work practice controls are not yet sufficient to reduce exposures to or below the permissible exposure limit; or

(iv) In emergencies.

(b) Respirator selection.

(i) Where respirators are required under this section the employer shall select, provide at no cost to the employee and assure the use of the appropriate respirator or combination of respirators from Table I for inorganic arsenic compounds without significant vapor pressure, or Table II for inorganic arsenic compounds which have significant vapor pressure.

(ii) Where employee exposures exceed the permissible exposure limit for inorganic arsenic and also exceed the relevant limit for particular gasses such as sulfur dioxide, any air purifying respirator supplied to the employee as permitted by this standard must have a combination high efficiency filter with an appropriate gas sorbent. (See footnote in Table I)

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 $\mu g/m^3$ (20 mg/m^3) or firefighting.	(A) Any full facepiece self–contained breathing apparatus operated in positive pressure mode.
(ii) Not greater than 20,000 $\mu g/m^3$ (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 $\mu g/m^3$ (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 $\mu g/m^3$	(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 $\mu g/m^3$	(A) Half–mask air–purifying respirator equipped with high–efficiency filter. [1] (B) Any half–mask supplied air respirator.

[1]High–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 TRICHLORIDE[2] 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 $\mu g/m^3$(20 mg/m^3) or firefighting.	(A) Any full facepiece contained breathing apparatus operated in positive pressure mode.
(ii) Not greater than 20,000 $\mu g/m^3$(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 $\mu g/m^3$(10 mg/m^3)	(A) Half–mask[2] supplied air respirator operated in positive pressure mode.
(iv) Not greater than 500 $\mu g/m^3$	(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 $\mu g/m^3$	(A) Half–mask [2] air–purifying respirator equipped with high–efficiency filter [1] and acid gas cartridge. (B) Any half–mask supplied air respirator.

[1]High efficiency filter–99.97 pct efficiency against 0.3 micrometer monodisperse diethyl–hexyl phthalate (DOP) particles.

[2]Half–mask respirators shall not be used for protection against arsenic trichloride, as it is rapidly absorbed through the skin.

(iii) The employer shall select respirators from among those approved for protection against dust, fume, and mist by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

(c) Respirator usage.

(i) The employer shall assure that the respirator issued to the employee exhibits minimum facepiece leakage and that the respirator is fitted properly.

(ii) The employer shall perform qualitative fit tests at the time of initial fitting and at least semi-annually thereafter for each employee wearing respirators, where quantitative fit tests are not required.

(iii) Employers with more than twenty employees wearing respirators shall perform a quantitative face fit test at the time of initial fitting and at least semi-annually thereafter for each employee wearing negative pressure respirators. The test shall be used to select facepieces that provide the required protection as prescribed in Table I or II.

(iv) If an employee has demonstrated difficulty in breathing during the fitting test or during use, he or she shall be examined by a physician trained in pulmonary medicine to determine whether the employee can wear a respirator while performing the required duty.

(d) Respirator program.

(i) The employer shall institute a respiratory protection program in accordance with WAC 296-62-071.

(ii) The employer shall permit each employee who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected and shall maintain an adequate supply of filter elements for this purpose.

(iii) Employees who wear respirators shall be permitted to leave work areas to wash their face and respirator facepiece to prevent skin irritation associated with respirator use.

(e) Commencement of respirator use.

(i) The employer's obligation to provide respirators commences on August 1, 1978, for employees exposed over 500 $\mu g/m^3$ of inorganic arsenic, as soon as possible but not later than October 1, 1978, for employees exposed to over 50 $\mu g/m^3$ of inorganic arsenic, and as soon as possible but not later than December 1, 1978, for employees exposed between 10 and 50 $\mu g/m^3$ of inorganic arsenic.

(ii) Employees with exposures below 50 $\mu g/m^3$ of inorganic arsenic may choose not to wear respirators until December 31, 1979.

(iii) After December 1, 1978, any employee required to wear air purifying respirators may choose, and if so chosen the employer must provide, if it will give proper protection, a powered air purifying respirator and in addition if necessary a combination dust and acid gas respirator for times where exposures to gases are over the relevant exposure limits.

(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 $\mu g/m^3$ 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 irritation 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 $\mu g/m^3$ 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. By December 1, 1978, 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;

(C) A sputum cytology examination; and

(D) 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 subsections (14)(b)(i) and (14)(b)(ii)(A), (B) and (D) 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 subsections (14)(b)(i) and (ii) of this section at least semi-annually for other covered employees.

(iii) Whenever a covered employee has not taken the examinations specified in subsection (14)(b)(i) and (ii) 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 explanation 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 by October 1, 1978 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 airborne 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 type of respiratory protective devices worn, if any;

(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;

(E) Any x-rays with a demonstrated abnormality and all subsequent x-rays;

(F) The initial cytologic examination slide and written description;

(G) The cytologic examination slide and written description for the most recent five years; and

(H) Any cytologic examination slides with demonstrated atypia, if such atypia persists for three years, and all subsequent slides and written descriptions.

(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) Effective date. This standard shall become effective thirty days after filing with the code reviser.

(20) 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.

(21) Startup dates.

(a) General. The startup dates of requirements of this standard shall be the effective date of this standard unless another startup date is provided for, either in other subsections of this section or in this subsection.

(b) Monitoring. Initial monitoring shall be commenced by August 1, 1978, and shall be completed by September 15, 1978.

(c) Regulated areas. Regulated areas required to be established as a result of initial monitoring shall be set up as soon as possible after the results of that monitoring is known and no later than October 1, 1978.

(d) Compliance program. The written program required by subsection (7)(b) as a result of initial monitoring shall be made available for inspection and copying as soon as possible and no later than December 1, 1978.

(e) Hygiene and lunchroom facilities. Construction plans for change-rooms, showers, lavatories, and lunchroom facilities shall be completed no later than December 1, 1978, and these facilities shall be constructed and in use no later than July 1, 1979. However, if as part of the compliance plan it is predicted by an independent engineering firm that engineering controls and work practices will reduce exposures below the permissible exposure limit by December 31, 1979, for affected employees, then such facilities need not be completed until one year after the engineering controls are completed or December 31, 1980, whichever is earlier, if such controls have not in fact succeeded in reducing exposure to below the permissible exposure limit.

(f) Summary of startup dates set forth elsewhere in this standard.

STARTUP DATES

August 1, 1978 – Respirator use over 500 $\mu g/m^3$.

AS SOON AS POSSIBLE BUT NO LATER THAN

September 15, 1978 – Completion of initial monitoring.

October 1, 1978 – Complete establishment of regulated areas. Respirator use for employees exposed above 50 $\mu g/m^3$. Completion of initial training. Notification of use.

December 1, 1978 – Respirator use over 10 $\mu g/m^3$. Completion of initial medical. Completion of compliance plan. Optional use of powered air-purifying respirators.

July 1, 1979 – Completion of lunch rooms and hygiene facilities.

December 31, 1979 – Completion of engineering controls.

All other requirements of the standard have as their startup date August 1, 1978.

[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 $\mu g/m^3$) (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; skin examination; nasal examination, and sputum cytology exam for the early detection of lung cancer. The cytology exams are only included in the initial exam and examinations given after employees are either 45 years or older or have 10 or more years employment over the action level. 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: (H20=1):5.73.

(E) Solubility in Water: Insoluble

(ii) Arsenic trioxide

(A) Formula: As203, (As406).

(B) Appearance: White powder

(C) Melting point: 315C

(D) Specific gravity: (H20=1):3.74

(E) Solubility in water: 3.7 grams in 100cc of water at 20C

(iii) Arsenic trichloride (liquid)(Trichloride)

(A) Formula: AsC13

(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 nonflammable.

(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 midget 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 $\mu g/m^3$) and ± 35 percent (with a confidence limit of 95 percent) for concentrations of inorganic arsenic between 5 and 10 $\mu g/m^3$.

(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 $\mu g/m^3$) 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 $\mu g/m^3$ (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;

(D) A sputum cytology examination; and

(E) 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 $\mu g/m^3$). 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 arsenial 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 parasthenias 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 paralyses occur; 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 myclopoiesis.

(4) Bibliography:

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Pinto, S. S., and K. W. Nelson. 1976. Arsenic Toxicology and Industrial Exposure, Annu. Rev. Paramacol. Toxicol. 16:95.

Vallee, B. L., Ulmer, D. D., and W. E. C. Wacker. 1960. Arsenic Toxicology and Biochemistry. AMA Arch. Indust. Health 21:132.

(5) Sputum cytology.

(a) Sputum can be collected by aerosol inhalation during the medical exam or by spontaneous early morning cough at home. Sputum is induced by transoral inhalation of an aerosolized solution of 8 percent sodium chloride in water. After inhaling as few as 3 to 5 breaths, the subject usually yields an adequate sputum. All sputum should be collected directly into 60 percent alcohol.

(b) Scientific evidence suggests that chest x–rays and sputum cytology should be used together as screening tests for lung tests for lung cancer in high risk populations such as workers exposed to inorganic arsenic. The tests are to be performed every 6 months on workers who are 45 years of age or older or have worked in the regulated area for 10 or more years. Since the tests seem to be complementary, it may be advantageous to alternate the test procedures. For instance, chest x–rays could be obtained in June and December and sputum cytologies could be obtained in March and September. Facilities for providing necessary diagnostic investigation should be readily available as well as chest physicians, surgeons, radiologists, pathologists, and immunotherapists to provide any necessary treatment services.

[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 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. 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 C_2H_4O.

[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.]

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.

[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. The employer shall provide respirators, and ensure that they are used, where required by WAC 296-62-07355 through 296-62-07389. Respirators shall be used in the following circumstances.

(a) During the interval necessary to install or implement feasible engineering and work practice controls;

(b) In work operations, such as maintenance and repair activities, vessel cleaning, or other activities for which engineering and work practice controls are not feasible;

(c) In work situations where feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the TWA or excursion limit; and

(d) In emergencies.

(2) Respirator selection.

(a) Where respirators are required under WAC 296-62-07355 through 296-62-07389, the employer shall select and provide, at no cost to the employee, the appropriate respirator as specified in Table 1, and shall ensure that the employee uses the respirator provided.

(b) The employer shall select respirators from among those jointly approved as being acceptable for protection against EtO by the Mine Safety and Health Administration (MSHA) and by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

(3) Respirator program. Where respiratory protection is required by WAC 296-62-07355 through 296-62-07389, the employer shall institute a respirator program in accordance with WAC 296-62-071.

(4) Protective clothing and equipment. Where eye or skin contact with liquid EtO or EtO solutions may occur, the employer shall select and provide, at no cost to the employee, appropriate protective clothing or other equipment in accordance with WAC 296-24-07501 and 296-24-07801 and to protect any area of the body that may come in contact with liquid EtO or EtO in solution, and shall ensure that the employee wears the protective clothing and equipment provided.

[Statutory Authority: Chapter 49.17 RCW. 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.

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.

[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;

(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 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.

(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 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 296-62-07379 Dates. (1) Effective date.

(a) WAC 296-62-07355 through 296-62-07389 shall become effective thirty days after filing with the code reviser.

(b) The requirements in the amended subsections in this section which pertain only to or are triggered by the excursion limit shall become effective December 30, 1988.

(2) Start-up dates.

(a) The requirements of WAC 296-62-07359 through 296-62-07377, including feasible work practice controls but not including engineering controls specified in WAC 296-62-07365(1), shall be complied with within one hundred eighty days after the effective date of WAC 296-62-07355 through 296-62-07389.

(b) Engineering controls specified by WAC 296-62-07365(1) shall be implemented within one year after the effective date of WAC 296-62-07355 through 296-62-07389.

(c) Compliance with the excursion limit requirements in this section shall be by March 30, 1989, except that implementation of engineering controls specified for compliance with excursion limit shall be by June 30, 1989.

[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.]

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 (C_2H_4O).

(b) Synonyms: Dihydrooxirene, dimethylene oxide, EO, 1,2-epoxyethane, EtO, ETO, oxacyclopropane, oxane, oxidoethane, alpha/beta-oxidoethane, oxiran, oxirane.

(c) Ethylene oxide can be found as a liquid or vapor.

(d) EtO is used in the manufacture of ethylene glycol, surfactants, ethanolamines, 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 chromosome 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 where engineering controls are not feasible. As of the effective date of the standard, 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 joint Mine Safety and Health Administration (MSHA) and National Institute for Occupational Safety and Health (NIOSH) label of approval for use with ethylene oxide. 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.

(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 discharges 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: 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, oxidoethane, alpha/beta-oxidoethane, oxiran, oxirane.

(ii) Formula: (C_2H_4O).

(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 non-flammable;

(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 WAC 296-24-956, 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 alkalies, 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. 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 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 splashproof 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. 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 blistering 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/m^3)

(ii) Procedure: Samples are collected on two charcoal tubes in series and desorbed with 1% CS_2 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/m^3) (based on 1.0 liter air sample).

(v) Reliable quantitation limit: 52.2 ppb (0.094 mg/m^3) (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% CS_2 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–epoxy–ethane; oxane; C_2H_4O; 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: CH_2—CH_2;

(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/m^3 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% CS_2 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% CS_2 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% CS_2.

(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 date 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:

$$\text{ETO, mg/m}^3 = \frac{AXB}{C}$$

where:
A = μg/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 = molecular weight of ETO.

(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 μg/mL standard of ethylene oxide into 1% CS_2 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 μg/mL	1 x 1.5 μg/mL	2 x 3.0 μg/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% CS_2 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 µg/mL	1 x 1.5 µg/mL	2 x 3.0 µg/mL
Injection	.7421	1.4899	3.1184
	.7441	1.5826	3.0447
	.7831	1.4628	2.9149
	.7753	1.4244	2.9185
Average	.7612	1.4899	2.9991
Standard Deviation	.0211	.0674	.0998
CV	.0277	.0452	.0333

$$CV = \frac{3(.0277)^2 + 3(.0452)^2 + 3(.0333)^2}{3 + 3 + 3}$$

CV + 0.036

(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
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/m^3) 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

[1]None.

(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 dosimeters, Tedler 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 spectometer.

(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 laboratories 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.]

PART H--AIR CONTAMINANTS

WAC 296-62-075 Air contaminants. (1) An employee's exposure to any substance listed in Tables 1 or 2 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 Tables 1 and 2.

(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.

(3) The transitional limits listed in Table 2 of WAC 296-62-07515 may be utilized to determine the need for engineering controls until December 31, 1992.

[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:

$$E = \frac{C_aT_a + C_bT_b + \ldots + C_nT_n}{8}$$

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 Tables 1 or 2 (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 p/m
Two hours exposure at 75 p/m
Four hours exposure at 50 p/m

Substituting this information in the formula, we have

$(2\times150+2\times75+4\times50)\div8=81.25$ p/m

Since 81.25 ppm is less than 100 p.p.m., 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 or 2 (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: 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:

$$E_m = \frac{C_1}{L_1} + \frac{C_2}{L_2} + \ldots + \frac{C_n}{L_n}$$

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 $< 1\%$ SiO_2, is mandatory for substances in these categories and for which no specific permissible limits have been assigned. This limit, for a normal workday, does not apply to brief exposures at higher concentrations. Neither does it apply to those substances which may cause physiologic impairment at lower concentrations but for which a threshold limit has not yet been adopted.

[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/M^3) of air for total dust or 5 milligrams per cubic meter (mg/M^3) 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 or 2 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 or 2.

[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.

HT/PEL
TABLE1.1

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin 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 296-62-07341)	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	---	---	---	---	---

HT/PEL
TABLE1.2

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin Designation
Aluminum, metal and oxide (as Al)	7429-90-5	---	---	---	---	---	---	---
Total dust		---	10	---	---	---	---	---
Respirable fraction		---	5.0	---	---	---	---	---
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	---	---	---	---	---
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	---	---	---	---	---
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
Anitmony 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, Organic compounds (as As)	7440-38-2	---	0.2	---	---	---	---	---

HT/PEL
TABLE1.3

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Arsenic, Inorganic compounds, (as As) (see WAC 296-62-07347 for applications and exclusions)	((~~Varies with compound~~)) 7440-38-2	---	0.2	---	---	---	---	---
Arsine	7784-42-1	0.05	0.2	---	---	---	---	---
Asbestos (see WAC 296-62-((~~07515~~))077 through 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 compounds (as Ba)	7440-39-3	---	0.5	---	---	---	---	---
Barium Sulfate	7727-43-7	---	---	---	---	---	---	---
Total dust	---	---	10.0	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Benomyl	17804-35-2	---	---	---	---	---	---	---
Total dust	---	0.8	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Benzene, (see WAC 296-62-07523) d/	71-43-2	1.0	---	5.0	---	---	---	---
Benzidine, (see WAC 296-62-073)	92-87-5	---	---	---	---	---	---	---
p-Benzoquimone, (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 compounds (as Be)	7440-41-7	0.002	---	0.005 (30 min.)	---	0.025	---	---

HT/PEL
TABLE1.4

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Biphenyl (see Diphnyl)	---	---	---	---	---	---	---	---
Bismuth telluride, Undoped	1304-82-1	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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	---	---	---	---	---
((~~Respirable Fraction~~			~~5.0~~					~~))~~
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 Chlorobromethane)	---	---	---	---	---	---	---	---
Bromoform	15-25-2	0.5	5.0	---	---	---	---	X
Butadiene (1,3-butadiene)	106-99-0	10	22	---	---	---	---	---
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	---	---	---

HT/PEL
TABLE1.5

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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 C_rO_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)	1306-19-0	---	---	---	---	---	0.05	---
Cadmium dust and salts (as Cd)	7440-43-9	---	0.05	---	---	---	---	---
Calcium arsenate (see WAC 296-62-07347)	---------	---	---	---	---	---	---	---
Calcium carbonate	1317-65-3	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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	---	---	---	---	---
Calcium sulfate	7778-18-9	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---

HT/PEL
TABLE1.6

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	30,00	54,000	---	---	---
Carbon disulfide	75-15-0	4.0	12	12	36	---	---	X
Carbon monoxide	630-08-0	35	40	---	---	200	229	---
Carbon tetrabromide	558-13-4	0.1	1.4	0.3	4.0	---	---	---
Carbon tetrachloride	56-23-5	2.0	12.6	---	---	---	---	---
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	---	---	---	---	---
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	---

HT/PEL
TABLE1.7

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin Designation
α- Chloroacetophenone (Phenacyl((~~de~~)) chloride)	532-21-4	0.05	0.3	---	---	---	---	---
Chloroacetyl chloride	79-04-9	0.05	0.2	---	---	---	---	---
Chlorobenzene (Monochlorobenzene)	108-90-7	75	350	---	---	---	---	---
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

HT/PEL
TABLE1.8

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin Designation
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	---	---	---	---	---
Chlorpyrifos	2921-88-2	---	0.2	---	---	---	---	X
Chromic acid and chromates (as Cr_2O_3)	Varies w/compounds	---	---	---	---	---	0.1	---
Chromium (II) compounds (as Cr)	7440-47-3	---	0.5	---	---	---	---	---
Chromium (III) compounds (as Cr)	7440-47-3	---	0.5	---	---	---	---	---
Chromium (VI) compounds (as Cr)	---	---	0.05	---	---	---	---	---
Chromium Metal	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	---	---	---	---	---
Coal Dust (less than 5% SiO_2) Respirable ((~~quartz~~)) fraction	---	---	2.0	---	---	---	---	---
Coal dust (greater than or equal to 5% SiO_2) Respirable ((~~quartz~~)) fraction	---	---	0.1	---	---	---	---	---
Coal tar pitch volatiles (benzene soluble fraction anthracene, BaP, phenanthrene, acridine, chrysene, pyrene)	65996-93-2	---	0.2	---	---	---	---	---

HT/PEL
TABLE1.9

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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)	---	---	---	---	---	---	---	---
Crag® herbicide (Sesone)	136-78-7	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Cresol (all isomers)	1319-77-3	5.0	22	---	---	---	---	X
Crotonaldehyde	123-73-9; 4170-30-3	2.0	6.0	---	---	---	---	---
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	---	---	---	---	---

HT/PEL
TABLE1.10

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Cyclopentane	287-92-3	600	1,720	---	---	---	---	---
Cyhexatin	13121-70-5	---	5.0					
2,4-D (Dichlorylphenoxy-acetic acid)	94-75-7	---	10	---	---	---	---	---
DDT (Dichlorodiphenyltri-chloroethane)	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 (4-hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	---	---	---	---	---
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 (see WAC 296-62-07345)	96-12-3	---	---	---	---	---	---	---
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	---	---	---

HT/PEL
TABLE1.11

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1/] Number	TWA ppm [a/]	TWA mg/m3 [b/]	STEL [c/] ppm [a/]	STEL [c/] mg/m3 [b/]	CEILING ppm [a/]	CEILING mg/m3 [b/]	Skin Designation
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	---	---	---	---	---
Dicyclopentadienyl iron	102-54-5	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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	---	---	---	---	---

HT/PEL
TABLE1.12

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1/] Number	TWA ppm [a/]	TWA mg/m3 [b/]	STEL [c/] ppm [a/]	STEL [c/] mg/m3 [b/]	CEILING ppm [a/]	CEILING mg/m3 [b/]	Skin Designation
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 (see 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	148-01-6	---	5.0	---	---	---	---	---
(3, 5-Dinitro-o-toluamide)	---	---	5.0	---	---	---	---	---
Dinitrobenzene (all isomers)	(alpha)528-29-0; (((~~MPTA~~))meta) 99-65-0; (((~~P~~))para) 100-25-4	0.15	1.0	---	---	---	---	X

HT/PEL
TABLE1.13

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	---	---	---
Disulfram	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	112-62-9	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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)	---	---	---	---	---	---	---	---

HT/PEL
TABLE1.14

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Ethane	---	Simple	Asphyxiant	---	---	---	---	---
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-hepatone)	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

HT/PEL
TABLE1.15

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Ethylene oxide (see WAC 296-62-07353)	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	---	---	---	---	---
Ethylidine 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	---	---	---	---	---
Ferrovanadium dust	12604-58-9	---	1.0	---	3.0	---	---	---
Fluorides (as F)	Varies w/compound	---	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	1.0	---	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	---	---	---	---	---
((Respirable Fraction			5.0					))

HT/PEL
TABLE1.16

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	---	---	---	---	---
Glycidol (2, 3-Epoxy-1- propanol)	556-52-5	25	75	---	---	---	---	---
Glycol monoethyl ether (see 2-Ethoxyethanol)	---	---	---	---	---	---	---	---
Grain dust (oat, wheat, barley)	---	---	10	---	---	---	---	---
Graphite, natural	7782-42-5	---	---	---	---	---	---	---
Respirable dust	---	---	2.5	---	---	---	---	---
Graphite, Synthetic	---	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Guthion® (see Azinphosmethyl)	---	---	---	---	---	---	---	---
Gypsum	13397-24-5	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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	---	---	---	---	---

HT/PEL
TABLE1.17

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin Designation
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 w/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	---	---	---	---	---

HT/PEL
TABLE1.18

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin Designation
Iron pentacarbonyl (as Fe)	13463-40-6	0.1	0.8	0.2	1.6	---	---	---
Iron salts, soluble (as Fe)	Varies w/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	---	---	---
Kaolin								
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Ketene	463-51-4	0.5	0.9	1.5	3.0	---	---	---
Lead inorganic (as Pb) (see WAC 296-62-07521)	7439-92-1	---	0.15	---	---	---	---	---
Lead arsenate (see WAC 296-62-07347)	3687-31-8	---	0.15	---	---	---	---	---
Lead chromate	7758-97-6	---	0.05	---	---	---	---	---
Limestone	1317-65-3							
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Lindane	58-89-9	---	0.5	---	---	---	---	X

HT/PEL
TABLE1.19

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	---	---	---	---	---
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	---	---	---	---	---
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	---	---	---	---	---

HT/PEL
TABLE1.20

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	---	---	---
Methyl chloroform (1, 1, 1-trichlorethane)	71-55-6	350	1,900	450	2,450	---	---	---
Methyl chloromethyl ether (see WAC 296-62-073)	107-30-2	---	---	---	---	---	---	---

HT/PEL
TABLE1.21

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m3 [b]	STEL [c] ppm [a]	STEL mg/m3 [b]	CEILING ppm [a]	CEILING mg/m3 [b]	Skin Designation
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	75-09-2	100	---	500	---	---	---	---
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)	---	---	---	---	---	---	---	---

HT/PEL
TABLE1.22

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m3 [b]	STEL [c] ppm [a]	STEL mg/m3 [b]	CEILING ppm [a]	CEILING mg/m3 [b]	Skin Designation
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	---	---	---
Methylene bisphenyl isocyanate (MDI)	101-68-8	---	---	---	---	0.02	0.2	---
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	---	---	---	---	---
((~~Monomethyl aniline~~	~~100-16-8~~	~~0.5~~	~~2.0~~					))
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	---	---	---	---	---	---	---

HT/PEL
TABLE1.23

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Neon	7440-01-9	Simple	Asphyxiant	---	---	---	---	---
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	---	---	---	---	---
Nickle, (as Ni)	7440-02-0							
Metal and insoluble compounds		---	1.0	---	---	---	---	---
Soluble compounds		---	0.1	---	---	---	---	---
Nicotine	54-11-5	---	0.5	---	---	---	---	X
Nitrapyrin (see 2-Chloro-6 trichloromethyl pyridine)	1929-82-4	---	((10))---	---	---	---	---	---
Total dust		---	10	---	---	---	---	---
Respirable fraction		---	5.0	---	---	---	---	---
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	---	---	---	---	---	---	---

HT/PEL
TABLE1.24

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	30	54	---	---	---	---	---
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 1910-42-5 2074-50-2	---	0.1	---	---	---	---	X
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	---	---	---	---	---
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

HT/PEL
TABLE1.25

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin Designation
Pentaerythritol	115-77-5	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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	---	---	---	---	---
Petroleum distillates (Naptha)	---	100	400	---	---	---	---	---
Phenol	108-95-2	5.0	19	---	---	---	---	X
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	---	---	---	---	---

HT/PEL
TABLE1.26

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS [1] Number	TWA ppm [a]	TWA mg/m³ [b]	STEL [c] ppm [a]	STEL [c] mg/m³ [b]	CEILING ppm [a]	CEILING mg/m³ [b]	Skin Designation
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	---	---	---	---	---
Picric acid	88-89-1	---	0.1	---	---	---	---	X
Pindone (see Pival) (2-Pivalyl-1, 3-indandione)	83-26-1	---	0.1	---	---	---	---	---
Piperazine dihydrochloride	142-64-3	---	5.0	---	---	---	---	---
Pival® (see Pindone)	---------	---	---	---	---	---	---	---
Plaster of Paris	26499-65-0	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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	---	---	---	---	---
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	---	---	---	---	---

HT/PEL
TABLE1.27

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	---	---	---	---	---
Rotenone	83-79-4	---	5.0	---	---	---	---	---
Rouge								
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Rubber solvent (naphtha) ((400))8002-05-9 ((~~1,600~~))100 ((—))400				---	---	---	---	---
Selenium compounds (as Se)	7782-49-2	---	0.2	---	---	---	---	---

HT/PEL
TABLE1.28

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL) c/

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL ppm a/	STEL mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	---	6.0	---	---	---	---	---
Total dust	---	---	6.0	---	---	---	---	---
Respirable fraction	---	---	3.0	---	---	---	---	---
Silica, crystalline cristobalite (as quartz) respirable dust	14464-46-1	---	0.05	---	---	---	---	---
Silica, crystalline quartz (as quartz), respirable dust	14808-60-7	---	0.1 g/ h/	---	---	---	---	---
Silica, crystalline tripoli (as quartz), respirable dust	1317-95-9	---	0.1	---	---	---	---	---
Silica, crystalline tridymite (as quartz), respirable dust	15468-32-3	---	0.05	---	---	---	---	---
Silica, fused, respirable dust	60676-86-0	---	0.1	---	---	---	---	---
Silicates (less than 1% crystalline silica:								
Mica (Respirable dust)	12001-26-2	---	3.0	---	---	---	---	---
Soapstone, Total dust		---	6.0	---	---	---	---	---
Soapstone, Respirable dust		---	3.0	---	---	---	---	---
Talc (containing asbestos): use asbestos limit (see WAC 296-62-07517)								

HT/PEL
TABLE1.29

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Talc (containing no asbestos), Respirable dust Tremolite (see WAC 296-62-07517)	14807-96-6	---	2.0	---	---	---	---	---
Silicon	7440-21-3							
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Silicon Carbide	409-21-2							
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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	---	---	---	---	---
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	---	---	---

HT/PEL
TABLE1.30

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
Subtilisins ~~((1395-21-7))~~	9014-01-1	---	---	---	0.00006 (60 min.) jj/	---((0.00006))	---	---
Sucrose	57-50-1	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Sulfotep (see TEDP)	---	---	---	---	---	---	---	---
Sulfur dioxide	7446-09-5	2.0	5.0	5.0	10	---	---	X
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 Metal and oxide dusts	7440-25-7	---	5.0	---	---	---	---	---
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	---	---	---	---	---
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	---	---	---	---	---

HT/PEL
TABLE1.31

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
1, 1, 2, 2-Tetrachloroethane	79-34-5	1.0	7.0	---	---	---	---	X
Tetrachloroethylene (see Perchloroethylene)	---	---	---	---	---	---	---	---
Tetrachloromethane (see Carbon tetrachloride)	---	---	---	---	---	---	---	---
Tetrachloronaphhalene	1335-88-2	---	2.0	---	---	---	---	X
Tetraethyl lead (as Pb)	78-00-2	---	0.075	---	---	---	---	X
Tetrahydrofuan	109-99-9	200	590	250	735	---	---	---
Tetramethyl lead (as Pb)	75-74-1	---	0.075	---	---	---	---	X
Tetramethyl succinonitrile	3333-52-6	0.5	3.0	---	---	---	---	X
Tetranitromethane	509-14-8	1.0	8.0	---	---	---	---	---
Tetrasodium pyrophosphate	7722-88-5	---	5.0	---	---	---	---	---
Tetryl (2, 4, 6-trinitrophenyl-methylnitramine)	479-45-8	---	1.5	---	---	---	---	X
Thallium (soluble compounds) (as Tl)	7440-28-0	---	0.1	---	---	---	---	X
4, 4-Thiobis (6-tert-butyl-m-cresol)	96-69-5	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Thioglycolic acid	68-11-1	1.0	4.0	---	---	---	---	X
Thionyl chloride	7719-09-7	---	---	---	---	1.0	5.0	---
Thiram® (see WAC 296-62-07519)	137-26-8	---	5.0	---	---	---	---	---
Tin (as Sn) Inorganic compounds (except oxides)	7440-31-5	---	2.0	---	---	---	---	---
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	108-88-3	100	375	150	560	---	---	---

HT/PEL
TABLE1.32

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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	---	---	---	---	---	---	---
1, 1, 1-Trichloroethane (see Methyl chloroform)	---	---	---	---	---	5.0	40	---
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)	---	---	---	---	---	---	---	---

HT/PEL
TABLE1.33

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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 V_2O_5) Respirable dust and fume	1314-62-1	---	0.05	---	---	---	---	---
Vegetable oil mist	---	---	---	---	---	---	---	---
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Vinyl acetate	108-05-1	10	30	20	60	---	---	---
Vinyl benzene (see Styrene)	---	---	---	---	---	---	---	---
Vinyl bromide	593-60-2	5.0	20	---	---	---	---	---
Vinyl chloride (see WAC 296-62-07329)	75-01-4	---	---	---	---	---	---	---
Vinyl cyanid (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	---	---	---	---	---

HT/PEL
TABLE1.34

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS 1/ Number	TWA ppm a/	TWA mg/m3 b/	STEL c/ ppm a/	STEL c/ mg/m3 b/	CEILING ppm a/	CEILING mg/m3 b/	Skin Designation
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 CrO_3)	Varies w/compound	---	0.05	---	---	---	0.1	---
Zinc oxide	1314-13-2							
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
Zinc oxide fume	1314-13-2	---	5.0	---	10	---	---	---
Zinc stearate	557-05-1							
Total dust	---	---	10	---	---	---	---	---
Respirable fraction	---	---	5.0	---	---	---	---	---
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°C and 760 mm. Hg. pressure (torr.).
b/ Approximate milligrams of subtance per cubic meter of air.
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 subsegments 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).

HT/PEL
TABLE1.35

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

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/ Total dust formula for Silica (as quartz) is: $\frac{30 \text{ mg/m}^3}{\% \text{ SiO}_2 + 3}$

h/ 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
2	90
2.5	75
3.5	50
5.0	25
10	0

containing less than 1% quartz if 1% quartz, use quartz limit.

The measurements under this note refer to the use of an AEC (now NRC) instrument. The respirable fraction of coal dust is determined with an MRE the figure corresponding to that of 2.4 mg/m^3 in the table for coal dust is 4.5 mg/m^3.

Notes: i/ 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.

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j/ Compliance with the subtilisins PEL is assessed by sampling with a high volume sampler (600-800 liters per minute) for at least 60 minutes.

HT/PEL
TABLE2.1

TABLE 2
TRANSITIONAL LIMITS

The transitional limits listed are in effect until December 31, 1992. These limits require the use of engineering controls, where feasible, the additional protection to achieve the more protective limits listed in Table 1 may be achieved using protective control measures as set forth in WAC 296-62-07501(3).

Substance	PEL ppm	PEL mg/m^3	Acceptable Ceiling Concentration ppm	Acceptable Ceiling Concentration mg/m^3
Carbon disulfide	10	---	15	---
Carbon monoxide	50	55	---	---
Carbon tetrachloride	5.0	---	20	---
Chloroform (Trichloromethane)	10	50	50	240
Coal dust-respirable (less than 5% SiO_2)	---	2.4	---	---
Cobalt metal, dust and fume (as Co)	---	0.1	---	---
Ethylene dichloride	10	---	15	---
Ethylene glycol dinitrate	0.05	0.3	0.2	1.0
Nitrogen dioxide	---	---	5.0	9.0
Nitroglycerin	0.05	0.5	0.2	2.0 ((~~1.0~~))
Perchloroethylene (Tetrachloroethylene)	50	---	200	---
Styrene	100	---	200	---

[Statutory Authority: Chapter 49.17 RCW. 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 $\mu g/m^3$) 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) 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 $\mu g/m^3$) 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:

Maximum permissible limit (in $\mu g/m^3$) = 400 ÷ 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 (6) 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.

(4) Exposure monitoring.

(a) General.

(i) For the purposes of subsection (4), employee exposure is that exposure which would occur if the employee were not using a respirator.

(ii) With the exception of monitoring under subdivision (4)(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 (4)(c)(i) if the sampling and analytical methods used meet the accuracy and confidence levels of subdivision (4)(i) of this section.

(d) Positive initial determination and initial monitoring.

(i) Where a determination conducted under subdivision (4)(b) and (4)(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 (4)(i) of this section.

(e) Negative initial determination. Where a determination, conducted under subdivisions (4)(b) and (4)(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 (4)(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 (4)(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 (4)(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 (4)(f)(ii), except as otherwise provided in subdivision (4)(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 $\mu g/m^3$.

(5) 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 (6) 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 $\mu g/m^3$, 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 $\mu g/m^3$.

TABLE I
IMPLEMENTATION SCHEDULE

Industry[1]	Compliance Dates[2] 200 $\mu g/m^3$	100 $\mu g/m^3$	50 $\mu g/m^3$
Primary lead production	([3])	[2]June 29, 1984	[2]June 29, 1991.
Secondary lead production	([3])	[2]June 29, 1984	[2]June 29, 1986.
Lead–acid battery manufacturing	([3])	[2]June 29, 1983	[2]June 29, 1986.
Automobile manufacture/ solder grinding	([3])	N/A	[2]June 29, 1986.
Electronics, gray iron foundries, ink manufacture, paints and coatings manufacture, wall paper manufacture, can manufacture, and printing	([3])	N/A	[2]June 29, 1982.
Brass and bronze ingot manufacture, lead chemical manufacture, and secondary copper smelting	([3])	N/A	[4]5 years.
Nonferrous foundries	([3])	N/A	[4,5]5 years.
All other industries	([3])	N/A	[4]2 1/2 years.

Note: [1]Includes ancillary activities located on the same worksite.
[2]This date is calculated by counting, from June 29, 1981, (the date when the United States Supreme Court denied certiorari and lifted the stay on the implementation of paragraph (5)(a)), the number of years specified for the particular industry in the original lead standard for compliance with the given airborne exposure level. The denial of certiorari followed a decision of the United States Court of Appeals for the District of Columbia Circuit finding compliance with paragraph (5)(a) to be feasible for the relevant industries.
[3]On effective date. This continues an obligation from WAC 296–62–07515 Table 1 which had been in effect since 1973.
[4]Expressed as the number of years from the date on which the court lifts the stay on the implementation of paragraph (5)(a) for the particular industry.
[5]Large nonferrous foundries (20 or more employees) are required to achieve 50 $\mu g/m^3$ by means of engineering and work practice controls. Small nonferrous foundries (fewer than 20 employees), however, are only required to achieve 75 $\mu g/m^3$ by such controls. All foundries are required to comply within five years.

(b) Respiratory protection. Where engineering and work practice controls do not reduce employee exposure to or below the 50 $\mu g/m^3$ permissible exposure limit, the employer shall supplement these controls with respirators in accordance with subsection (6).

(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 (5)(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 (7), (8) and (9) of this regulation;

(G) An administrative control schedule required by subdivision (5)(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) Bypass of interim level. Where an employer's compliance plan provides for a reduction of employee exposures to or below the PEL solely by means of engineering and work practice controls in accordance with the implementation schedule in Table I, and the employer has determined that compliance with the 100 $\mu g/m^3$ interim level would divert resources to the extent that it clearly precludes compliance, otherwise attainable, with the PEL by the required time, the employer may proceed with the plan to comply with the PEL in lieu of compliance with the interim level if:

(i) The compliance plan clearly documents the basis of the determination;

(ii) The employer takes all feasible steps to provide maximum protection for employees until the PEL is met; and

(iii) The employer notifies the director in writing within ten working days of the completion or revision of the compliance plan reflecting the determination.

(e) 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.

(f) 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.

(6) Respiratory protection.

(a) General. Where the use of respirators is required under this section, the employer shall provide, at no cost to the employee, and assure the use of respirators which comply with the requirements of this subsection. Respirators shall be used in the following circumstances:

(i) During the time period necessary to install or implement engineering or work practice controls, except that after the dates for compliance with the interim levels in Table I, no employer shall require an employee to wear a negative pressure respirator longer than 4.4 hours per day;

(ii) In work situations in which engineering and work practice controls are not sufficient to reduce exposures to or below the permissible exposure limit; and

(iii) Whenever an employee requests a respirator.

(b) Respirator selection.

(i) Where respirators are required under this section the employer shall select the appropriate respirator or combination of respirators from Table II.

TABLE II
RESPIRATORY PROTECTION FOR LEAD AEROSOLS

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.

(ii) The employer shall provide a powered, air-purifying respirator in lieu of the respirator specified, in Table II whenever:

(A) An employee chooses to use this type of respirator; and

(B) This respirator will provide adequate protection to the employee.

(iii) The employer shall select respirators from among those approved for protection against lead dust, fume, and mist by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

(c) Respirator usage.

(i) The employer shall assure that the respirator issued to the employee exhibits minimum facepiece leakage and that the respirator is fitted properly.

(ii) Employers shall perform either quantitative or qualitative face fit tests at the time of initial fitting and at least every six months thereafter for each employee wearing negative pressure respirators. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, and shall be conducted in accordance with Appendix D. The tests shall be used to select facepieces that provide the required protection as prescribed in Table II.

(iii) If an employee exhibits difficulty in breathing during the fitting test or during use, the employer shall make available to the employee an examination in accordance with subitem (10)(c)(i)(C) of this section to determine whether the employee can wear a respirator while performing the required duty.

(d) Respirator program.

(i) The employer shall institute a respiratory protection program in accordance with WAC 296-62-071.

(ii) The employer shall permit each employee who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected and shall maintain an adequate supply of filter elements for this purpose.

(iii) Employees who wear respirators shall be permitted to leave work areas to wash their face and respirator facepiece whenever necessary to prevent skin irritation associated with respirator use.

(7) 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 (7)(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 $\mu g/m^3$ 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 (7)(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 (9)(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 (7)(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.

(8) 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.

(9) 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 cosmetics are not applied, except in change rooms, lunchrooms, and showers required under subdivision (9)(b) through (9)(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 (9)(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).

(10) 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 (10)(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 protoporphyrin levels to each employee covered under item (10)(a)(i) of this section on the following schedule:

(A) At least every six months to each employee covered under item (10)(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 μg/100 g of whole blood. This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 μg/100 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 (11)(a)(i), 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 the this section shall have an accuracy (to a confidence level of ninety–five percent) within plus or minus fifteen percent or 6 μg/100 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 μg/100 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 (11)(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 (10)(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 μg/100 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 (10)(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 (10)(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 (10)(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.

(11) Medical removal protection.

(a) Temporary medical removal and return of an employee.

(i) Temporary removal due to elevated blood lead levels.

(A) First year of the standard. During the first year following the effective date of the standard, the employer shall remove an employee from work having a daily eight hour TWA exposure to lead at or above 100 $\mu g/m^3$ 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 80 $\mu g/100$ g of whole blood;

(B) Second year of the standard. During the second year following the effective date of the standard, the employer shall remove an employee from work having a daily eight hour TWA exposure to lead at or above 50 $\mu g/m^3$ 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 70 $\mu g/100$ g of whole blood;

(C) Third year of the standard, and thereafter. Beginning with the third year following the effective date of the standard, 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 $\mu g/100$ g of whole blood; and

(D) Fifth year of the standard, and thereafter. Beginning with the fifth year following the effective date of the standard, 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 $\mu g/100$ 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 $\mu g/100$ 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 80 $\mu g/100$ g, when two consecutive blood sampling tests indicate that the employee's blood lead level is at or below 60 $\mu g/100$ g of whole blood;

(II) For an employee removed due to a blood lead level at or above 70 $\mu g/100$ g, when two consecutive blood sampling tests indicate that the employee's blood lead level is at or below 50 $\mu g/100$ g of whole blood;

(III) For an employee removed due to a blood lead level at or above 60 $\mu g/100$ g, or due to an average blood lead level at or above 50 $\mu g/100$ g, when two consecutive blood sampling tests indicate that the employee's blood lead level is at or below 40 $\mu g/100$ g of whole blood;

(IV) 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 (11)(b)(i) of this section.

(12) 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 (12)(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 selection, fitting, use, and limitations of respirators;

(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 (12)(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.

(13) 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.

(14) Recordkeeping.

(a) Exposure monitoring.

(i) The employer shall establish and maintain an accurate record of all monitoring required in subsection (4) 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 (10) 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 (10) 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 (11) 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 (14) 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 (14) 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.

(15) 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 (4) 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.

(16) Effective date. The effective date of this standard is September 6, 1980.

(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. Appendices are available from:

The Technical Services Section
Division of Industrial Safety and Health
P.O. Box 207
Olympia, WA 98504 (206) 753-6381

(18) Startup dates. All obligations of this standard commence on the effective date except as follows:

(a) The initial determination under subdivision (4)(b) shall be made as soon as possible but no later than thirty days from the effective date.

(b) Initial monitoring under subdivision (4)(d) shall be completed as soon as possible but no later than ninety days from the effective date.

(c) Initial biological monitoring and medical examinations under subsection (10) shall be completed as soon as possible but no later than one hundred eighty days from the effective date. Priority for biological monitoring and medical examinations shall be given to employees whom the employer believes to be at greatest risk from continued exposure.

(d) Initial training and education shall be completed as soon as possible but no later than one hundred eighty days from the effective date.

(e) Hygiene and lunchroom facilities under subsection (9) shall be in operation as soon as possible but no later than one year from the effective year.

(f) Respiratory protection required by subsection (6) shall be provided as soon as possible but no later than the following schedule:

(i) Employees whose eight-hour TWA exposure exceeds 200 $\mu g/m^3$ - on the effective date.

(ii) Employees whose eight-hour TWA exposure exceeds the PEL but is less than 200 $\mu g/m^3$ - one hundred fifty days from the effective date.

(iii) Powered, air-purifying respirators provided under (6)(b)(ii) - two hundred ten days from the effective date.

(iv) Quantitative fit testing required under item (6)(c)(ii) - one year from effective date. Qualitative fit testing is required in the interim.

(g) Written compliance plans required by subdivision (5)(c) shall be completed and available for inspection and copying as soon as possible but no later than the following schedule:

(i) Employers for whom compliance with the PEL or interim level is required within one year from the effective date - six months from the effective date.

(ii) Employers in secondary lead smelting and refining and in lead storage battery manufacturing—one year from the effective date.

(iii) Employers in primary smelting and refining industry – one year from the effective date from the interim level; five years from the effective date for PEL.

(iv) Plans for construction of hygiene facilities, if required – six months from the effective date.

(v) All other industries—one year from the date on which the court lifts the stay on the implementation of paragraph (5)(a) for the particular industry.

(h) The permissible exposure limit in subsection (3) shall become effective one hundred fifty days from the effective date.

[Statutory Authority: Chapter 49.17 RCW. 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 measuring 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. The employer shall provide respirators, and assure that they are used, where required by this section. Respirators shall be used in the following circumstances:

(i) During the time period necessary to install or implement feasible engineering and work practice controls;

(ii) In 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, such as some maintenance and repair activities, vessel cleaning, or other operations where engineering and work practice controls are infeasible because exposures are intermittent in nature and limited in duration;

(iii) In work situations where 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; and

(iv) In emergencies.

(b) Respirator selection.

(i) Where respirators are required or allowed under this section, the employer shall select and provide, at no cost to the employee, the appropriate respirator as specified in Table 1 of this section, and shall assure that the employee uses the respirator provided.

(ii) The employer shall select respirators from among those jointly approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11. Negative pressure respirators shall have filter elements approved by MSHA/NIOSH for organic vapors or benzene.

(iii) Any employee who cannot wear a negative pressure respirator shall be given the option of wearing a respirator with less breathing resistance such as a powered air-purifying respirator or supplied air respirator.

(c) Respirator program. The employer shall institute a respiratory protection program in accordance with Part E, Respiratory protection, WAC 296-62-071 through 296-62-07121.

(d) Respirator use.

(i) Where air-purifying respirators are used, the employer shall replace the air purifying element at the expiration of service life or at the beginning of each shift in which they will be used, whichever comes first.

(ii) If an air purifying element becomes available with an end of useful life indicator for benzene approved by MSHA/NIOSH, the element may be used until such time as the indicator shows no further useful life.

(iii) The employer shall permit employees who wear respirators to leave the regulated area to wash their faces and respirator facepieces as necessary in order to prevent skin irritation associated with respirator use or to change the filter elements of air-purifying respirators whenever they detect a change in breathing resistance or chemical vapor breakthrough.

(e) Respirator fit testing.

(i) The employer shall perform, and certify the results of, either quantitative or qualitative fit tests at the time of initial fitting and at least annually thereafter for each employee wearing a negative pressure respirator. The test shall be used to select a respirator facepiece which exhibits minimum leakage and provides the required protection as prescribed in Table 1 of this section. The employer shall provide and assure that the employee wears a respirator demonstrated by the fit test to provide the required protection.

(ii) The employer shall follow the test protocols outlined in Appendix E of this standard for whichever type of fit testing the employer chooses.

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.
(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 met 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) Dates.

(a) Engineering and work practice controls required by subsection (6)(a) of this section shall be implemented no later than December 10, 1989.

(b) Coke and coal chemical operations may comply with (b)(ii) of this subsection or alternately include within the compliance program required by subsection (6)(b) of this section, a requirement to phase in engineering controls as equipment is repaired and replaced. For coke and coal chemical operations choosing the latter alternative, compliance with the engineering controls requirements of subsection (6)(a) of this section shall be achieved no later than December 10, 1992. Substantial compliance with the engineering control requirements shall be achieved no later than December 10, 1990.

(14) 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. The protocols on respiratory fit testing in Appendix E are mandatory.

[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; benzine 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. 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.

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 carbon 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 μL.

(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:

mg/m3=(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:

ppm=(mg/m3)(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	
2	617.5	
3	662.0	$\bar{X}$ = 640.2
4	641.1	SD = 14.9
5	636.4	CV = 0.023
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	3936.5	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
$\overline{CV}$= 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
$\overline{CV}$= 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 uBondapack 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 or 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 296-62-07533 Appendix E qualitative and quantitative fit testing procedures. Fit test protocols.

(1) The employer shall include the following provisions in the fit test procedures. These provisions apply to both qualitative fit testing (QLFT) and quantitative fit testing (QNFT).

(a) The test subject shall be allowed to pick the most comfortable respirator from a selection including respirators of various sizes from different manufacturers. The selection shall include at least three sizes of elastomeric facepieces of the type of respirator that is to be tested, i.e., three sizes of half mask; or three sizes of full facepiece; and units from at least two manufacturers.

(b) Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a comfortable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning the respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.

(c) The test subject shall be informed that he/she is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

(d) The test subject shall be instructed to hold each facepiece up to the face and eliminate those which obviously do not give a comfortable fit.

(e) The more comfortable facepieces are noted; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in (f) of this subsection. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

(f) Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

(i) Position of the mask on the nose;

(ii) Room for eye protection;

(iii) Room to talk; and

(iv) Position of mask on face and cheeks.

(g) The following criteria shall be used to help determine the adequacy of the respirator fit:

(i) Chin properly placed;

(ii) Adequate strap tension, not overly tightened;

(iii) Fit across nose bridge;

(iv) Respirator of proper size to span distance from nose to chin;

(v) Tendency of respirator to slip; and

(vi) Self–observation in mirror to evaluate fit and respirator position.

(h) The test subject shall conduct the negative and positive pressure fit checks as described below or ANSI Z88.2–1980. Before conducting the negative or positive pressure test, the subject shall 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 shall be selected and retested if the test subject fails the fit check tests.

(i) Positive pressure test. Close off the exhalation valve and exhale gently onto the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

(ii) Negative pressure test. 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 facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

(i) The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, or long sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

(j) If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respiratory disease or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

(k) The test subject shall be given the opportunity to wear the successfully fitted respirator for a period of two weeks. If at any time during this period the respirator becomes uncomfortable, the test subject shall be given the opportunity to select a different facepiece and to be retested.

(l) The employer shall certify that a successful fit test has been administered to the employee. The certification shall include the following information:

(i) Name of employee;

(ii) Type, brand, and size of respirator; and

(iii) Date of test.

Where QNFT is used, the fit factor, strip chart, or other recording of the results of the test, shall be retained with the certification. The certification shall be maintained until the next fit test is administered.

(m) Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least five minutes before the start of the fit test.

(n) Test exercises. The test subject shall perform exercises, in the test environment, in the manner described below:

(i) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(ii) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as to not hyperventilate.

(iii) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(iv) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

(v) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from one hundred, or recite a memorized poem or song.

(vi) Grimace. The test subject shall grimace by smiling or frowning.

(vii) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in

place shall be substituted for this exercise in those test environments such as shroud type QNFT units which prohibit bending at the waist.

(viii) Normal breathing. Same as exercise in (n)(i) of this subsection.

Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for fifteen seconds.

The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become uncomfortable, another model of respirator shall be tried.

(2) Qualitative fit test (QLFT) protocols.

(a) General.

(i) The employer shall assign specific individuals who shall assume full responsibility for implementing the respirator qualitative fit test program.

(ii) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and assure that test equipment is in proper working order.

(iii) The employer shall assure that QLFT equipment is kept clean and well maintained so as to operate at the parameters for which it was designed.

(b) Isoamyl acetate protocol.

(i) Odor threshold screening.

The odor threshold screening test, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of isoamyl acetate.

(A) Three one-liter glass jars with metal lids are required.

(B) Odor free water (e.g., distilled or spring water) at approximately twenty-five degrees C shall be used for the solutions.

(C) The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor free water in a one liter jar and shaking for thirty seconds. A new solution shall be prepared at least weekly.

(D) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but shall not be connected to the same recirculating ventilation system.

(E) The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor free water using a clean dropper or pipette. The solution shall be shaken for thirty seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

(F) A test blank shall be prepared in a third jar by adding 500 cc of odor free water.

(G) The odor test and test blank jars shall be labeled 1 and 2 for jar identification. Labels shall be placed on the lids so they can be periodically peeled, dried off, and switched to maintain the integrity of the test.

(H) The following instruction shall be typed on a card and placed 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."

(I) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

(J) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

(K) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

(ii) Isoamyl acetate fit test.

(A) The fit test chamber shall be similar to a clear fifty-five gallon drum liner suspended inverted over a two-foot diameter frame so that the top of the chamber is about six inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

(B) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

(C) After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(D) A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

(E) Upon entering the test chamber, the test subject shall be given a six-inch by five-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 cc of pure IAA. The test subject shall hand the wet towel on the hook at the top of the chamber.

(F) 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 test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the head exercises; or to demonstrate some of the exercises.

(G) If at any time during the test, the subject detects the banana like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(H) If the test has failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber and again begin the procedure described in (b)(ii)(A) through (G) of this subsection. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about five minutes before

retesting. Odor sensitivity will usually have returned by this time.

(I) When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having the subject break the face seal and take a breath before exiting the chamber.

(J) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. To keep the test area from becoming contaminated, the used towels shall be kept in a self sealing bag so there is no significant IAA concentration build–up in the test chamber during subsequent tests.

(c) Saccharin solution aerosol protocol. The saccharin solution aerosol QLFT protocol is the only currently available, validated test protocol for use with particulate disposable dust respirators not equipped with high–efficiency filters. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(i) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

(A) Threshold screening as well as fit testing subjects shall wear an enclosure about the head and shoulders that is approximately twelve inches in diameter by fourteen 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 NZ FT 14 and NZ FT 15 combined, is adequate.

(B) The test enclosure shall have a three–quarter inch hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(C) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her wide open mouth with tongue extended.

(D) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer the test conductor shall spray the threshold check solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(E) The threshold check solution consists of 0.83 grams of sodium saccharin USP in 1 cc of warm water. It can be prepared by putting 1 cc of the fit test solution (see (b)(ii)(E) of this subsection) in 100 cc of distilled water.

(F) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(G) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted.

(H) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

(I) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

(J) The test conductor will take note of the number of squeezes required to solicit a taste response.

(K) If the saccharin is not tasted after thirty squeezes (subitem (J)), the test subject may not perform the saccharin fit test.

(L) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(M) Correct use of the nebulizer means that approximately 1 cc of liquid is used at a time in the nebulizer body.

(N) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.

(ii) Saccharin solution aerosol fit test procedure.

(A) The test subject may not eat, drink (except plain water), or chew gum for fifteen minutes before the test.

(B) The fit test uses the same enclosure described in (c)(i) of this subsection.

(C) The test subject shall don the enclosure while wearing the respirator selected in (c)(i) of this subsection. The respirator shall be properly adjusted and equipped with a particulate filter(s).

(D) A second DeVilbiss Model 40 Inhalation Medication Nebulizer is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(E) The fit test solution is prepared by adding eighty–three grams of sodium saccharin to 100 cc of warm water.

(F) As before, the test subject shall breathe through the open mouth with tongue extended.

(G) The nebulizer is inserted into the hole in the front of the enclosure and the fit test solution is sprayed into the enclosure using the same number of squeezes required to elicit a taste response in the screening test.

(H) After generating the aerosol the test subject shall be instructed to perform the exercises in subsection (1)(h) of this section.

(I) Every thirty seconds the aerosol concentration shall be replenished using one–half the number of squeezes as initially.

(J) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected.

(K) If the taste of saccharin is detected, the fit is deemed unsatisfactory and a different respirator shall be tried.

(d) Irritant fume protocol.

(i) The respirator to be tested shall be equipped with high–efficiency particulate air (HEPA) filters.

(ii) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its characteristic odor.

(iii) Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part No. 5645, or equivalent. Attach one end of the smoke tube to a low flow air pump set to deliver two hundred milliliters per minute.

(iv) Advise the test subject that the smoke can be irritating to the eyes and instruct the subject to keep his/her eyes closed while the test is performed.

(v) The test conductor shall direct the stream of irritant smoke from the smoke tube towards the face seal area of the test subject. He/she shall begin at least twelve inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

(vi) The exercises identified in subsection (1)(n) of this section shall be performed by the test subject while the respirator seal is being challenged by the smoke.

(vii) Each test subject passing the smoke test without evidence of a response shall be given a sensitivity check of the smoke from the same tube once the respirator has been removed to determine whether he/she reacts to the smoke. Failure to evoke a response shall void the fit test.

(viii) The fit test shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agent.

(3) Quantitative fit test (QNFT) protocol.

(a) General.

(i) The employer shall assign specific individuals who shall assume full responsibility for implementing the respirator quantitative fit test program.

(ii) The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and assure that test equipment is in proper working order.

(iii) The employer shall assure that QNFT equipment is kept clean and well maintained so as to operate at the parameters for which it was designed.

(b) Definitions.

(i) "Quantitative fit test." The test is performed in a test chamber. The normal air–purifying element of the respirator is replaced by a high–efficiency particulate air (HEPA) filter in the case of particulate QNFT aerosols or a sorbent offering contaminant penetration protection equivalent to high–efficiency filters where the QNFT test agent is a gas or vapor.

(ii) "Challenge agent" means the aerosol, gas, or vapor introduced into a test chamber so that its concentration inside and outside the respirator may be measured.

(iii) "Test subject" means the person wearing the respirator for quantitative fit testing.

(iv) "Normal standing position" means standing erect and straight with arms down along the sides and looking straight ahead.

(v) "Maximum peak penetration method" means the method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise.

(vi) "Average peak penetration method" means the method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is determined by an average of the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers which calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

(vii) "Fit factor" means the ratio of challenge agent concentration outside with respect to the inside of a respirator inlet covering (facepiece or enclosure).

(c) Apparatus.

(i) Instrumentation. Aerosol generation, dilution, and measurement systems using corn oil or sodium chloride as test aerosols shall be used for quantitative fit testing.

(ii) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required exercises without disturbing the challenge agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the challenge agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(iii) When testing air–purifying respirators, the normal filter or cartridge element shall be replaced with a high–efficiency particulate filter supplied by the same manufacturer.

(iv) The sampling instrument shall be selected so that a strip chart record may be made of the test showing the rise and fall of the challenge agent concentration with each inspiration and expiration at fit factors of at least two thousand. Integrators or computers which 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.

(v) The combination of substitute air–purifying elements, challenge agent and challenge agent concentration in the test chamber shall be such that the test subject is not exposed in excess of an established exposure limit for the challenge agent at any time during the testing process.

(vi) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g., where the respirator is probed), a free air flow is allowed into the sampling line at all times and so that there is no interference with the fit or performance of the respirator.

(vii) The test chamber and test set up shall permit the person administering the test to observe the test subject inside the chamber during the test.

(viii) The equipment generating the challenge atmosphere shall maintain the concentration of challenge agent inside the test chamber constant to within a ten percent variation for the duration of the test.

(ix) The time lag (interval between an event and the recording of the event on the strip chart or computer or integrator) shall be kept to a minimum. There shall be a clear association between the occurrence of an event inside the test chamber and its being recorded.

(x) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equal diameter and of the same material. The length of the two lines shall be equal.

(xi) The exhaust flow from the test chamber shall pass through a high-efficiency filter before release.

(xii) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed fifty percent.

(xiii) The limitations of instrument detection shall be taken into account when determining the fit factor.

(xiv) Test respirators shall be maintained in proper working order and inspected for deficiencies such as cracks, missing valves and gaskets, etc.

(d) Procedural requirements.

(i) When performing the initial positive or negative pressure test the sampling line shall be crimped closed in order to avoid air pressure leakage during either of these tests.

(ii) An abbreviated screening isoamyl acetate test or irritant fume test may be utilized in order to quickly identify poor fitting respirators which passed the positive and/or negative pressure test and thus reduce the amount of QNFT time. When performing a screening isoamyl acetate test, combination high-efficiency organic vapor cartridges/canisters shall be used.

(iii) A reasonably stable challenge agent concentration shall be measured in the test chamber prior to testing. For canopy or shower curtain type of test units the determination of the challenge agent stability may be established after the test subject has entered the test environment.

(iv) Immediately after the subject enters the test chamber, the challenge agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed five percent for a half mask or one percent for a full facepiece respirator.

(v) A stable challenge concentration shall be obtained prior to the actual start of testing.

(vi) Respirator restraining straps shall not be overtightened for testing. The straps shall be adjusted by the wearer without assistance from other persons to give a reasonable comfortable fit typical of normal use.

(vii) The test shall be terminated whenever any single peak penetration exceeds five percent for half masks and one percent for full facepiece respirators. The test subject shall be refitted and retested. If two of the three required tests are terminated, the fit shall be deemed inadequate.

(viii) In order to successfully complete a QNFT, three successful fit tests are required. The results of each of the three independent fit tests must exceed the minimum fit factor needed for the class of respirator (e.g., half mask respirator, full facepiece respirator).

(ix) Calculation of fit factors.

(A) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration inside the respirator.

(B) The average test chamber concentration is the arithmetic average of the test chamber concentration at the beginning and at the end of the test.

(C) The concentration of the challenge agent inside the respirator shall be determined by one of the following methods:

(I) Average peak concentration;

(II) Maximum peak concentration; or

(III) Integration by calculation of the area under the individual peak for each exercise. This includes computerized integration.

(x) Interpretation of test results. The fit factor established by the quantitative fit testing shall be the lowest of the three fit factor values calculated from the three required fit tests.

(xi) The test subject shall not be permitted to wear a half mask, or full facepiece respirator unless a minimum fit factor equivalent to at least ten times the hazardous exposure level is obtained.

(xii) Filters used for quantitative fit testing shall be replaced at least weekly, or whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media. Organic vapor cartridges/canisters shall be replaced daily (when used) or sooner if there is any indication of breakthrough by a test agent.

[Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07533, 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 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 Bureau of Mines, the provision of WAC 296-24-006 shall apply.

(c) "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.

(d) "Director" means the director of the department of labor and industries, or his 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 one part formaldehyde per million parts of air (1 ppm) 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) Exceptions.

(A) The employer need not initiate exposure monitoring unless there is a formaldehyde hazard as defined in subsection (13) of this section or there are employee health complaints possibly associated with formaldehyde exposure.

(B) 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 unless there are employee health complaints possibly associated with formaldehyde exposure.

(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.

(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. Where respiratory protection is required, the employer shall provide the respirators at no cost to the employee and shall assure that they are properly used. The respirators shall comply with the requirements of this standard and shall reduce the concentration of formaldehyde inhaled by the employee to at or below both the TWA and the STEL. Respirators shall be used in the following circumstances:

(i) During the interval necessary to install or implement feasible engineering and work practice controls;

(ii) In 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) In work situations where feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the PELs; and

(iv) In emergencies.

(b) Respirator selection.

(i) The appropriate respirators as specified in Table 1 shall be selected from those approved by the Mine Safety and Health Administration (MSHA) and by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

(ii) The employer shall make available a powered air-purifying respirator adequate to protect against formaldehyde exposure to any employee who experiences difficulty wearing a negative-pressure respirator to reduce exposure to formaldehyde.

(c) Respirator usage.

(i) Whenever respirator use is required by this standard, the employer shall institute a respiratory protection program in accordance with WAC 296-62-07109, 296-62-07111, 296-62-07115, and 296-62-07117.

(ii) The employer shall perform either quantitative or qualitative face fit tests in accordance with the procedures outlined in Appendix E at the time of initial fitting and at least annually thereafter for all employees required by this standard to wear negative-pressure respirators.

(A) Respirators selected shall be from those exhibiting the best facepiece fit.

(B) No respirator shall be chosen that would potentially permit the employee to inhale formaldehyde at concentrations in excess of either the TWA or the STEL.

TABLE 1
MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION AGAINST FORMALDEHYDE

Condition of use or formaldehyde concentration (ppm)	Minimum respirator required[1]
Up to 10 ppm	Full facepiece with cartridges or canisters specifically approved for protection against formaldehyde[2].
Up to 100 ppm	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 100 ppm or unknown (emergencies)	Self-contained breathing apparatus (SCBA) with positive-pressure full facepiece.
	Combination supplied-air, full facepiece positive-pressure respirator with auxiliary self-contained air supply.
Firefighting	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.

(iii) Where air purifying chemical cartridge respirators are used, the cartridges shall be replaced after three hours of use or at the end of the workshift, whichever is sooner unless the cartridge contains a NIOSH-approved end-of-service indicator to show when breakthrough occurs.

(iv) Unless the canister contains a NIOSH-approved end-of-service life indicator to show when breakthrough occurs, canisters used in atmospheres up to 10 ppm shall be replaced every four hours and industrial sized canisters used in atmospheres up to 100 ppm shall be replaced every two hours or at the end of the workshift, whichever is sooner.

(v) Employers shall permit employees to leave the work area to wash their faces and respirator facepieces as needed to prevent skin irritation from respirator use.

(8) Protective equipment and clothing. Employers shall comply with the provisions of WAC 296-24-07501 and 296-24-078. 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 eyewash 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.

(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.

(i) For purposes of hazard communication, formaldehyde gas, all mixtures or solutions composed of greater than 0.1 percent formaldehyde, and materials capable of releasing formaldehyde into the air under any normal condition of use at concentrations reaching or exceeding 0.1 ppm shall be considered a health hazard.

(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 where the presence of formaldehyde constitutes a health hazard.

(ii) Information on labels. As a minimum, labels shall identify the hazardous chemical; list the name and address of the responsible party; contain the information "potential cancer hazard"; and appropriately warn of all other hazards as defined in Part C (WAC 296-62-054 through 296-62-05425), Appendices A and B.

(iii) 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 that constitute a health hazard as defined in this standard 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 that constitute a health hazard as defined in this standard 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.

(14) Employee information and training.

(a) Employee training. Written materials for employee training shall be updated as soon as possible, but no later than two months after the effective date of the standard.

(b) 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.

(c) Frequency.

(i) Employers shall provide employees with information and training on formaldehyde at the time of their initial assignment and whenever a new hazard from formaldehyde is introduced into their work area.

(ii) Employers shall provide such information and training at least annually for all employees exposed to formaldehyde concentrations at or above the action level or the STEL.

(d) 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 and equipment;

(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; and

(vii) A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency.

(e) 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 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) Respirator fit testing.

(i) The employer shall establish and maintain accurate records for employees subject to negative-pressure respirator fit testing required by this standard.

(ii) This record shall include:

(A) A copy of the protocol selected for respirator fit testing;

(B) A copy of the results of any fit testing performed;

(C) The size and manufacturer of the types of respirators available for selection; and

(D) The date of the most recent fit testing, the name and Social Security number of each tested employee, and the respirator type and facepiece selected.

(e) 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;

(ii) Medical records shall be kept for the duration of employment plus thirty years; and

(iii) Respirator fit testing records shall be kept until replaced by a more recent record.

(f) 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 designated representative.

(ii) The employer shall make employee exposure records, including estimates made from representative monitoring and available upon request for examination and copying, 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.

(16) Effective dates.

(a) Laboratories. This standard shall become effective for anatomy, histology, and pathology laboratories thirty days after the adoption date, except as noted in (b) of this subsection. For all laboratories other than anatomy, histology, and pathology, subsections (2) and (4) through (15) of this section shall become effective on September 1, 1988, except as noted in (b) of this subsection.

(b) Engineering and work practice controls. Engineering and work practice controls required by this standard shall be implemented as soon as possible, but no later than February 2, 1989.

(c) Employee training. Written materials for employee training shall be updated as soon as possible, but no later than two months after the effective date of the standard.

[Statutory Authority: Chapter 49.17 RCW. 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-1 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 opthamologist 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 firefighting 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 firefighting, 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 analysis 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:

(A) 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).

(B) If you use a negative pressure respirator, your employer must provide you with fit testing of the respirator at least once a year in accordance with the procedures outlined in WAC 296-62-07550 Appendix E.

(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 (TWA) 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 aggravated 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: Chapter 49.17 RCW. 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.

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).

Matrix: Air.

(a) Target concentration: 1 ppm (1.2 mg/m3).

(b) 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.

(c) Recommended sampling rate and air volumes: 0.1 L/min and 24 L.

(d) Reliable quantitation limit: 16 ppb (20 ug/m3).

(e) Standard error of estimate at the target concentration: 7.3%.

(f) Status of the method: A sampling and analytical method that has been subjected to the established evaluation procedures of the organic methods evaluation branch.

(13) Date: March, 1985.

(a) General discussion.

(i) 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.

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.

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.

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.

(ii) 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.

(A) 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 derivative in a typical blank front section of the recommended sampling tube.

(B) 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.

(C) Reliable quantitation limits: 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 ± 25% or better.

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.

(D) 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.

(E) 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.

(F) 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).

(G) Precision (overall procedure): The precision at the ninety–five percent confidence level for the ambient temperature storage tests was ±14.3% for formaldehyde. These values each include an additional ±5% for sampling error. The overall procedure must provide results at the target concentrations that are ±25% at the ninety–five percent confidence level.

(H) 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%.

(iii) 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.

(iv) Disadvantages: None.

(b) Sampling procedure.

(i) Apparatus:

(A) Samples are collected by use of a personal sampling pump that can be calibrated to within ±5% of the recommended 0.1 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 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 and caps. Instructions for the pretreatment and the coating of XAD–2 adsorbent are presented in (d) of this subsection.

(C) 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.

(ii) Reagents: None required.

(iii) 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.

(iv) 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.

(v) 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 volumes, was 96.2% for formaldehyde. Desorption efficiencies were essentially constant over the ranges studied.

(vi) 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.

(vii) 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.

(viii) 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.

(c) Analytical procedure.

(i) Apparatus:

(A) A gas chromatograph (GC), equipped with a nitrogen selective detector.

(B) 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.

(C) Vials, glass 2–mL with Teflon–lined caps.

(D) Volumetric flasks, pipets, and syringes for preparing standards, making dilutions, and performing injections.

(ii) Reagents:

(A) Toluene and dimethylformamide. Burdick and Jackson solvents were used in this evaluation.

(B) Helium, hydrogen, and air, GC grade.

(C) Formaldehyde, thirty–seven percent by weight, in water. Aldrich Chemical, ACS Reagent Grade formaldehyde was used in this evaluation.

(D) Ambrlite XAD–2 adsorbent coated with 2–(hydroxymethyl) piperidine (2–HMP), 10% by weight ((d) of this subsection).

(E) Desorbing solution with internal standard. This solution was prepared by adding 20 uL of dimethylformamide to 100 mL of toluene.

(iii) Standard preparation:

(A) 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.

(B) 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 analytes 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.

(C) 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.

(D) 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.

(E) 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.

(F) Desorb the standards in the same manner as the samples following the sixteen–hour reaction time.

(iv) Sample preparation:

(A) 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.

(B) Add 1 mL of desorbing solution to each vial.

(C) 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.

(D) Save the used sampling tubes to be cleaned and recycled.

(v) Analysis:

(A) GC conditions.

Column temperature:

Bi-level temperature program.

First level: 100°C to 140°C at 4°C/min following completion of the first level.

Second level: 140°C to 180°C at 20°C/min following completion of the first level.

Isothermal period: Hold column at 180°C until the recorder pen returns to baseline (usually about twenty-five minutes after injection).

Injector temperature: 180°C.

Helium flow rate: 30 mL/min (detector response will be reduced if nitrogen is substituted for helium carrier gas).

Injection volume: 51 0.8 uL.

GC column: Six-ft x 1/4-in OD (2 mm ID) glass GC column containing 10% UCON 50-HB-5100NZG651+512% KOH on 80/100 Chromosorb W-AW.

NPD conditions:

Hydrogen flow rate: 3 mL/min.

Air flow rate: 50 mL/min.

Detector temperature: 275 5151C.

(B) Use a suitable method, such as electronic integration, to measure detector response.

(C) 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.

(D) Bracket sample concentrations with standards.

(vi) 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.

(vii) Calculations:

(A) 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.

(B) 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.

(C) The acrolein and/or formaldehyde air concentration can be expressed using the following equation:

Mg/m3=(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.

(D) The following equation can be used to convert results in mg/m51351 to ppm.

ppm=(mg/m3)(24.45)/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).

(d) Backup data.

(i) 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.

(ii) Procedure to coat XAD-2 adsorbent with 2-HMP:

(A) 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.

(B) Reagents:

(I) Methanol, isooctane, and toluene.

(II) (Hydroxymethyl) piperidine.

(III) Amberlite XAD-2 nonionic polymeric adsorbent, twenty to sixty mesh, Aldrich Chemical XAD-2 was used in this evaluation.

(C) 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.

(iii) A procedure to determine formaldehyde by acid titration: Standardize the 0.1 N HCl solution using sodium carbonate and methyl orange indicator.

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:

$$\text{Formaldehyde, mg/mL} = \frac{\text{acid titer x acid normality x } 30.0}{\text{mL of Sample}}$$

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.

[Statutory Authority: Chapter 49.17 RCW. 90–03–029 (Order 89–20), § 296–62–07544, filed 1/11/90, effective 2/26/90; 89–11–035 (Order 89–03), § 296–62–07544, filed 5/15/89, effective 6/30/89; 88–21–002 (Order 88–23), § 296–62–07544, filed 10/6/88, effective 11/7/88.]

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 examiner 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 ☐
Is 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?
Yes ☐ No ☐

(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 ☐
Is so, explain circumstances:

(f) Have you noticed any sore or burning throat or itchy or burning nose when you are at work?
Yes ☐ No ☐
Is 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 every 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 296-62-07550 Appendix E--Qualitative and quantitative fit testing procedures. FIT test protocols. Because exposure to formaldehyde can affect the employee's ability to detect common odorants, fit test results from the isoamyl acetate test must be augmented by results from either the saccharin or irritant smoke test.

(1) The employer shall include the following provisions in the fit test procedures. These provisions apply to both qualitative fit testing (QLFT) and quantitative fit testing (QNFT).

(a) The test subject shall be allowed to pick the most comfortable respirator from a selection including respirators of various sizes from different manufacturers. The selection shall include at least three sizes of elastomeric facepieces of the type of respirator that is to be tested, i.e., three sizes of half mask; or three sizes of full facepiece; and units from at least two manufacturers.

(b) Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a comfortable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning the respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.

(c) The test subject shall be informed that he/she is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

(d) The test subject shall be instructed to hold each facepiece up to the face and eliminate those which obviously do not give a comfortable fit.

(e) The more comfortable facepieces are noted; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in (f) of this subsection. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

(f) Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

(i) Position of the mask on the nose;

(ii) Room for eye protection;

(iii) Room to talk;

(iv) Position of mask on face and cheeks.

(g) The following criteria shall be used to help determine the adequacy of the respirator fit:

(i) Chin properly placed;

(ii) Adequate strap tension, not overly tightened;

(iii) Fit across nose bridge;

(iv) Respirator of proper size to span distance from nose to chin;

(v) Tendency of respirator to slip;

(vi) Self-observation in mirror to evaluate fit and respirator position.

(h) The test subject shall conduct the negative and positive pressure fit checks as described below or in the latest edition of ANSI Z88.2. Before conducting the negative or positive pressure test, the subject shall 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 shall be selected and retested if the test subject fails the fit check tests.

(i) Positive pressure test. Close off the exhalation valve and exhale gently onto the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

(ii) Negative pressure test. 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 facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

(i) The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, or long sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

(j) If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respiratory disease or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

(k) The test subject shall be given the opportunity to wear the successfully fitted respirator for a period of two weeks. If at any time during this period the respirator becomes uncomfortable, the test subject shall be given the opportunity to select a different facepiece and to be retested.

(l) The employer shall certify that a successful fit test has been administered to the employee. The certification shall include the following information:

(i) Name of employee;

(ii) Type, brand, and size of respirator; and

(iii) Date of test.

Where QNFT is used, the fit factor, strip chart, or other recording of the results of the test, shall be retained with the certification. The certification shall be maintained until the next fit test is administered.

(m) Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure.

The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least five minutes before the start of the fit test.

(n) Test exercises. The test subject shall perform exercises, in the test environment, in the manner described below:

(i) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.

(ii) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as to not hyperventilate.

(iii) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(iv) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

(v) Talking. The subject shall talk out loud slowly and loudly enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from one hundred, or recite a memorized poem or song.

(vi) Grimace. The test subject shall grimace by smiling or frowning.

(vii) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT units which prohibit bending at the waist.

(viii) Normal breathing. Same as (n)(i) of this subsection.

(A) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for fifteen seconds.

(B) The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become uncomfortable, another model of respirator shall be tried.

(2) Qualitative fit test (QLFT) protocols.

(a) General.

(i) The employer shall assign specific individuals who shall assume full responsibility for implementing the respirator qualitative fit test program.

(ii) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and assure that the equipment is in proper working order.

(iii) The employer shall assure the QLFT equipment is kept clean and well maintained so as to operate at the parameters for which it was designed.

(b) Isoamyl acetate protocol.

(i) Odor threshold screening. The odor threshold screening test, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of isoamyl acetate.

(A) Three one-liter glass jars with metal lids are required.

(B) Odor free water (e.g., distilled or spring water) at approximately 25°C shall be used for the solutions.

(C) The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor free water in a one-liter jar and shaking for thirty seconds. A new solution shall be prepared at least weekly.

(D) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but shall not be connected to the same recirculating ventilation system.

(E) The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor free water using a clear dropper or pipette. The solution shall be shaken for thirty seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

(F) A test blank shall be prepared in a third jar by adding 500 cc of odor free water.

(G) The odor test and test blank jars shall be labeled 1 and 2 for jar identification. Labels shall be placed on the lids so they can be periodically peeled, dried off and switched to maintain the integrity of the test.

(H) The following instruction shall be typed on a card and placed on the table in front of the two 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 contain 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."

(I) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

(J) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

(K) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

(ii) Isoamyl acetate fit test.

(A) The fit test chamber shall be similar to a clear fifty-five gallon drum liner suspended inverted over a two-foot diameter frame so that the top of the chamber is about six inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

(B) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

(C) After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(D) A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

(E) Upon entering the test chamber, the test subject shall be given a six-inch by five-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half, and wetted with 0.75 cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

(F) 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 test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the head exercises; or to demonstrate some of the exercises.

(G) If at any time during the test, the subject detects the banana like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(H) If the test has failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber and again begin the procedure described in (b)(ii)(A) through (G) of this subsection. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about five minutes before retesting. Odor sensitivity will usually have returned by this time.

(I) When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having the subject break the face seal and take a breath before exiting the chamber.

(J) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. To keep the test area from becoming contaminated, the used towels shall be kept in a self-sealing bag so there is no significant IAA concentration build-up in the test chamber during subsequent tests.

(c) Saccharin solution aerosol protocol. The saccharin solution aerosol QLFT protocol is the only currently available, validated test protocol for use with particulate disposable dust respirators not equipped with high-efficiency filters. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(i) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

(A) Threshold screening as well as fit testing subjects shall wear an enclosure about the head and shoulders that is approximately twelve inches in diameter by fourteen 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 NZ FT 14 and NZ FT 15 combined, is adequate.

(B) The test enclosure shall have a three-quarter inch hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(C) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her wide open mouth with tongue extended.

(D) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer the test conductor shall spray the threshold check solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(E) The threshold check solution consists of 0.83 grams of sodium saccharin USP in 1 cc of warm water. It can be prepared by putting 1 cc of the fit test solution (see (c)(ii)(E) of this subsection) in 100 cc of distilled water.

(F) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(G) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted.

(H) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

(I) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

(J) The test conductor will take note of the number of squeezes required to solicit a taste response.

(K) If the saccharin is not tasted after thirty squeezes, the test subject may not perform the saccharin fit test.

(L) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(M) Correct use of the nebulizer means that approximately 1 cc of liquid is used at a time in the nebulizer body.

(N) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.

(ii) Saccharin solution aerosol fit test procedure.

(A) The test subject may not eat, drink (except plain water), or chew gum for fifteen minutes before the test.

(B) The fit test uses the same enclosure described in (c)(i) of this subsection.

(C) The test subject shall don the enclosure while wearing the respirator selected in (c)(i) of this subsection. The respirator shall be properly adjusted and equipped with a particular filter(s).

(D) A second DeVilbiss Model 40 Inhalation Medication Nebulizer is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(E) The fit test solution is prepared by adding eighty-three grams of sodium saccharin to 100 cc of warm water.

(F) As before, the test subject shall breathe through the open mouth with tongue extended.

(G) The nebulizer is inserted into the hole in the front of the enclosure and the fit test solution is sprayed into the enclosure using the same number of squeezes required to elicit a taste response in the screening test.

(H) After generating the aerosol the test subject shall be instructed to perform the exercises in subsection (1)(n) of this section.

(I) Every thirty seconds the aerosol concentration shall be replenished using one-half the number of squeezes as initially used.

(J) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected.

(K) If the taste of saccharin is detected, the fit is deemed unsatisfactory and a different respirator shall be tried.

(d) Irritant fume protocol.

(i) The respirator to be tested shall be equipped with high-efficiency particulate air (HEPA) filters.

(ii) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its characteristic odor.

(iii) Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part No. 5645, or equivalent. Attach one end of the smoke tube to a low flow air pump set to deliver two hundred milliliters per minute.

(iv) If a half-mask is being fitted, advise the test subject that the smoke can be irritating to the eyes and instruct the subject to keep his/her eyes closed while the test is performed.

(v) The test conductor shall direct the stream of irritant smoke from the smoke tube towards the face seal area of the test subject. He/she shall begin at least twelve inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

(vi) The exercises identified in subsection (1)(n) of this section shall be performed by the test subject while the respirator seal is being challenged by the smoke.

(vii) Each test subject passing the smoke test without evidence of a response shall be given a sensitivity check of the smoke from the same tube once the respirator has been removed to determine whether he/she reacts to the smoke. Failure to evoke a response shall void the fit test.

(viii) The fit test shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agent.

(3) Quantitative fit test (QNFT) protocol.

(a) General.

(i) The employer shall assign specific individuals who shall assume full responsibility for implementing the respirator quantitative fit test program.

(ii) The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and assure that test equipment is in proper working order.

(iii) The employer shall assure that QNFT equipment is kept clean and well maintained so as to operate at the parameters for which it was designed.

(b) Definitions.

(i) "Quantitative fit test." The test is performed in a test chamber. The normal air-purifying element of the respirator is replaced by a high-efficiency particulate air (HEPA) filter in the case of particulate QNFT aerosols or a sorbent offering contaminant penetration protection equivalent to high-efficiency filters where the QNFT test agency is a gas or vapor.

(ii) "Challenge agent" means the aerosol, gas, or vapor introduced into a test chamber so that its concentration inside and outside the respirator may be measured.

(iii) "Test subject" means the person wearing the respirator for quantitative fit testing.

(iv) "Normal standing position" means standing erect and straight with arms down along the sides and looking straight ahead.

(v) "Maximum peak penetration method" means the method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise.

(vi) "Average peak penetration method" means the method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is determined by an average of the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers which calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

(vii) "Fit factor" means the ratio of challenge agent concentration outside with respect to the inside of a respirator inlet covering (facepiece or enclosure).

(c) Apparatus.

(i) Instrumentation. Aerosol generation, dilution, and measurement systems using corn oil or sodium chloride as test aerosols shall be used for quantitative fit testing.

(ii) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required exercises without disturbing the challenge agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the challenge agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(iii) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high-efficiency particulate filter supplied by the same manufacturer.

(iv) The sampling instrument shall be selected so that a strip chart record may be made of the test showing the rise and fall of the challenge agent concentration with each inspiration and expiration at fit factors of at least two thousand. Integrators or computers which 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.

(v) The combination of substitute air-purifying elements, challenge agent, and challenge agent concentration in the test chamber shall be such that the test subject is not exposed in excess of an established exposure limit for the challenge agent at any time during the testing process.

(vi) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g., where the respirator is probed), a free air flow is allowed into the sampling line at all times and so that there is no interference with the fit or performance of the respirator.

(vii) The test chamber and test set-up shall permit the person administering the test to observe the test subject inside the chamber during the test.

(viii) The equipment generating the challenge atmosphere shall maintain the concentration of challenge agent inside the test chamber constant to within a ten percent variation for the duration of the test.

(ix) The time lag (interval between an event and the recording of the event on the strip chart or computer or integrator) shall be kept to a minimum. There shall be a clear association between the occurrence of an event inside the test chamber and its being recorded.

(x) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equal diameter and of the same material. The length of the two lines shall be equal.

(xi) The exhaust flow from the test chamber shall pass through a high-efficiency filter before release.

(xii) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed fifty percent.

(xiii) The limitations of instrument detection shall be taken into account when determining the fit factor.

(xiv) Test respirators shall be maintained in proper working order and inspected for deficiencies such as cracks, missing valves and gaskets, etc.

(d) Procedural requirements.

(i) When performing the initial positive or negative pressure test the sampling line shall be crimped closed in order to avoid air pressure leakage during either of these tests.

(ii) An abbreviated screening isoamyl acetate test or irritant fume test may be utilized in order to quickly identify poor fitting respirators which passed the positive and/or negative pressure test and thus reduce the amount of QNFT time. When performing a screening isoamyl acetate test, combination high-efficiency organic vapor cartridges/canisters shall be used.

(iii) A reasonable stable challenge agent concentration shall be measured in the test chamber prior to testing. For canopy or shower curtain type of test units the determination of the challenge agent stability may be established after the test subject has entered the test environment.

(iv) Immediately after the subject enters the test chamber, the challenge agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed five percent for a half mask or one percent for a full facepiece respirator.

(v) A stable challenge concentration shall be obtained prior to the actual start of testing.

(vi) Respirator restraining straps shall not be overtightened for testing. The straps shall be adjusted by the wearer without assistance from other persons to give a reasonable comfortable fit typical of normal use.

(vii) The test shall be terminated whenever any single peak penetration exceeds five percent for half masks and one percent for full facepiece respirators. The test subject shall be refitted and retested. If two of the three required tests are terminated, the fit shall be deemed inadequate.

(viii) In order to successfully complete a QNFT, three successful fit tests are required. The results of each of the three independent fit tests must exceed the minimum fit factor needed for the class of respirator (e.g., half mask respirator, full facepiece respirator).

(ix) Calculation of fit factors.

(A) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration inside the respirator.

(B) The average test chamber concentration is the arithmetic average of the test chamber concentration at the beginning and of the end of the test.

(c) The concentration of the challenge agent inside the respirator shall be determined by one of the following methods:

(I) Average peak concentration;

(II) Maximum peak concentration;

(III) Integration by calculation of the area under the individual peak for each exercise. This includes computerized integration.

(x) Interpretation of test results. The fit factor established by the quantitative fit testing shall be the lowest of the three fit factor values calculated from the three required fit tests.

(xi) The test subject shall not be permitted to wear a half mask, or full facepiece respirator unless a minimum fit factor equivalent to at least ten times the hazardous exposure level is obtained.

(xii) Filters used for quantitative fit testing shall be replaced at least weekly, or whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media. Organic vapor cartridges/canisters shall be replaced daily (when used) or sooner if there is any indication of breakthrough by a test agent.

[Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07550, filed 10/6/88, effective 11/7/88.]

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.

WAC 296-62-07701 through 296-62-07753 applies to all occupational exposures to asbestos in all industries covered by the Washington Industrial Safety and Health Act.

[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 296-62-077 through 296-62-07753:

(1) "Action level" means an airborne concentration of asbestos of 0.1 fiber per cubic centimeter (f/cc) of air calculated as an eight-hour time-weighted average.

(2) "Air lock" means a system for ingress or egress to minimize air movement between a contaminated area and an uncontaminated area, consisting of an enclosure with two curtained doorways at least six feet apart unless space prohibits.

(3) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.

(4) "Authorized person" means any person authorized by the employer and required by work duties to be present in regulated areas.

(5) "Clean room" means an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

(6) "Certified asbestos supervisor" means an individual certified by the department under WAC 296-65-012. This person shall be capable of identifying existing asbestos hazards in the workplace and have the authority to take prompt corrective measures to eliminate them, as specified in WAC 296-62-202(6). The duties of the asbestos supervisor include at least the following: Establishing the negative-pressure enclosure, mini-enclosure, glove bag, or any other engineering control used in an asbestos removal or encapsulation operation; ensuring the integrity of the control being used; supervising any employee monitoring required by the standard; ensuring that all employees involved in removal or encapsulation of asbestos wear the appropriate protective equipment, are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified in the standard; and ensuring that engineering controls in use are in proper operating condition and are functioning properly.

(7) "Curtained doorway" means overlapping plastic sheeting curtains, at least four mils in thickness, constructed and used at entrance and exit of regulated areas, and designed to restrict the movement of air from one area to another.

(8) "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.

(9) "Demolition" means the wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

(10) "Department" means the department of labor and industries.

(11) "Director" means the director of the department of labor and industries or his/her authorized representative.

(12) "Employee exposure" means that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

(13) "Equipment 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.

(14) "Fiber" means a particulate form of asbestos, five micrometers or longer, with a length-to-diameter ratio of at least three to one.

(15) "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.

(16) "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.

(17) "Regulated area" means an area established by the employer to demarcate areas where airborne concentrations of asbestos exceed, or can reasonably be expected to exceed, the permissible exposure limits. The regulated area may take the form of (a) a temporary enclosure, as required by WAC 296-62-07711, or (b) an area demarcated in any manner that minimizes the number of employees exposed to asbestos.

(18) "Removal" means the taking out or stripping of asbestos or materials containing asbestos.

(19) "Renovation" means the modifying of any existing structure, or portion thereof, where exposure to airborne asbestos may result.

(20) "Repair" means overhauling, rebuilding, reconstructing, or reconditioning of structure or substrates where asbestos is present.

(21) "Structural member" means any load-supporting or nonload-supporting member of a facility such as beams, walls, and ceilings.

[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 0.2 fiber per cubic centimeter (0.2 f/cc) of air as an eight-hour time-weighted average (TWA) as determined by the method prescribed in WAC 296-62-07735, Appendix A, 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 fifteen minutes.

[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 Communication among employers. On multi-employer worksites, an employer performing asbestos 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 of the existence of and requirements pertaining to regulated areas.

Note: Notified employers shall ensure their employees are informed and trained as required by the hazard communication standard, WAC 296-62-054 through 296-62-05427.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07706, filed 11/30/87.]

WAC 296-62-07707 Identification. (1) Before authorizing or allowing any construction, renovation, remodeling, maintenance, repair, or demolition project, an owner or owner's agent shall perform, or cause to be performed, a good faith inspection to determine whether materials to be worked on or removed contain asbestos. The inspection shall be documented by a written report maintained on file and made available upon request to the director.

Note: 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 296-62-077 through 296-62-07753.

(2) The owner or owner's agent shall make available, to any contractor 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.

(3) Any owner or owner's agent who fails to comply with subsections (1) and (2) of this section shall be subject to a mandatory fine of not less than two hundred fifty dollars for each violation. Each day the violation continues shall 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 shall be halted immediately and cannot be resumed before meeting such requirements.

(4) 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 subsection (2) of this section. Any contractor who begins any project without the copy of the written report or statement shall be subject to a mandatory fine of not less than two hundred fifty dollars per day. Each day the violation continues shall be considered a separate violation.

[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.]

WAC 296-62-07709 Exposure monitoring. (1) General.

(a) Each employer shall perform monitoring to determine accurately the airborne concentrations of asbestos to which employees may be exposed.

(b) 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.

(c) Representative eight-hour TWA employee exposures shall be determined on the basis of one or more samples representing full-shift exposures for each shift for each employee in each job classification in each work area.

(d) 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.

(e) Prior to the start of the removal, demolition, or renovation project, representative area monitoring shall be conducted for later use (see WAC 296-62-07713 (2)(c)).

(2) Initial monitoring.

(a) Each employer who has a workplace or work operation covered by this standard, except as provided for in (b) and (c) of this subsection, shall perform initial monitoring of employees who are, or may reasonably be expected to be exposed to airborne concentrations at or above the action level and/or excursion limit. The initial monitoring shall be at the initiation of each asbestos job to accurately determine the airborne concentration of asbestos to which employees may be exposed.

(b) Where the employer or his/her representative has monitored after December 20, 1985, 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) of this subsection, except for employees engaged in removal, demolition, or renovation operations using negative-pressure enclosures as required by WAC 296-62-07712.

(c) 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 action level 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.

(3) Monitoring frequency (periodic monitoring) and patterns. After the initial determinations required by subsection (2)(a) of this section, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees.

(a) In no case shall sampling be at intervals greater than six months for employees whose exposures may reasonably be foreseen to exceed the action level and/or excursion limit.

(b) Daily monitoring within regulated areas: The employer shall 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.

(c) Monitoring outside negative-pressure enclosures: The employer shall 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.

(4) Changes in monitoring frequency. If either the initial or the periodic monitoring required by subsections (2) and (3) of this section statistically indicates that employee exposures are below the action level and/or excursion limit, the employer may discontinue the monitoring for those employees whose exposures are represented by such monitoring.

(5) Additional monitoring. Notwithstanding the provisions of subsections (2)(b) and (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 above the action level 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 action level and/or excursion limit.

(6) Method of monitoring.

(a) All samples taken to satisfy the monitoring requirements of this section shall be personal samples collected following the procedures specified in WAC 296-62-07735, Appendix A.

(b) Monitoring shall 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 shall 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 shall 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;

(ii) The comparison indicates that ninety percent of the samples collected in the range 0.1 to 0.4 f/cc have an accuracy range of plus or minus twenty-five percent of the WISHA reference method results with 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.

(7) Employee notification of monitoring results.

(a) The employer shall, as soon as possible but no later than 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 shall contain the corrective action being taken by the employer to reduce employee exposure to or below the permissible exposure limits, wherever monitoring results indicated that the permissible exposure limits have been exceeded.

(8) Observation of monitoring.

(a) The employer shall 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 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. 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.

(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 concentrations of asbestos in excess of the permissible exposure limits.

(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 shall be supplied with and required to use a respirator, selected in accordance with WAC 296-62-07715.

(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) Confined space. The employer shall determine if a confined space hazard exists and shall take any necessary precautions in accordance with chapter 296-62 WAC.

[Statutory Authority: Chapter 49.17 RCW. 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 removal, demolition, and renovation operations. (1) The employer, wherever feasible, shall establish negative-pressure enclosures having a minimum of one air exchange every fifteen minutes within the enclosure before commencing removal, demolition, and renovation operations. A sufficient amount of air shall be exhausted to create a pressure of -0.02 inches of water within the enclosure with respect to the area outside the enclosure.

(2) The employer shall designate a certified asbestos supervisor who shall perform or directly supervise the following duties:

(a) Set up the enclosure;

(b) Ensure the integrity of the enclosure;

(c) Control entry to and exit from the enclosure;

(d) Supervise all employee exposure monitoring required by this section;

(e) Ensure that employees working within the enclosure wear protective clothing and respirators as required by WAC 296-62-07715 and 296-62-07717;

(f) Ensure that employees are trained in the use of engineering controls, work practices, and personal protective equipment;

(g) Ensure that employees use the hygiene facilities and observe the decontamination procedures specified in WAC 296-62-07719; and

(h) Ensure that engineering controls including HEPA filters are functioning properly.

(3) In addition to the qualifications specified in WAC 296-62-07703, the certified asbestos supervisor shall be trained in all aspects of asbestos abatement, the contents of this standard, the identification of asbestos and their removal procedures, and other practices for reducing the hazard. Such training shall be obtained in a comprehensive course conducted by an approved asbestos supervisor course as specified in WAC 296-65-007. The certified asbestos supervisor shall meet all requirements as specified in WAC 296-65-012.

(4) Exceptions:

(a) For small-scale, short-duration operations, such as pipe repair, valve replacement, installing electrical conduits, installing or removing drywall, roofing, and other general building maintenance or renovation, the employer is not required to comply with the requirements of WAC 296-62-07712(1). Employers wishing to take advantage of the exemption in this subsection shall comply with WAC 296-62-07753, Appendix J.

(b) A certified asbestos supervisor shall not be required for projects consisting of less than 48 square feet or 10 lineal feet of asbestos-containing material.

[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. (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 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 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 296-62-07715.

(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 shall use them to reduce employee exposure to or below 0.5 fiber per cubic centimeter of air (as an eight-hour time-weighted average) and shall 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 ventilation and dust collection systems shall 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, shall 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 shall not be used for work related to asbestos.

(f) Wet methods. Asbestos shall 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. No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, enclosed, or ventilated so as to prevent effectively the release of airborne fibers of asbestos so as to expose employees to levels in excess of the permissible exposure limits prescribed in WAC 296-62-07705.

(h) Compressed air. Compressed air shall 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 capture the dust cloud created by the compressed air.

(2) Clean-up.

(a) After completion of asbestos removal, demolition, and renovation operations, all surfaces in and around the work area shall be cleared of any asbestos debris.

(b) Lock-down. Where asbestos has been removed, encapsulant shall be applied to ensure binding of remaining fibers.

(c) The employer shall demonstrate by monitoring that the airborne fiber concentration is below the action level; or, at or below the airborne fiber level existing prior to the start of the removal, demolition, or renovation project; whichever level is lower.

(3) Compliance program.

(a) Where either the time weighted average and/or excursion limit is exceeded, the employer shall 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 shall be reviewed and updated as necessary to reflect significant changes in the status of the employer's compliance program.

(c) Written programs shall be submitted upon request for examination and copying to the director, affected employees and designated employee representatives.

(d) The employer shall not use employee rotation as a means of compliance with the permissible exposure limits specified in WAC 296-62-07705.

[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. The employer shall provide respirators, and ensure that they are used, where required by WAC 296-62-077 through 296-62-07753. Respirators shall be used in the following circumstances:

(a) During the interval necessary to install or implement feasible engineering and work practice controls;

(b) In work operations, such as maintenance and repair activities, or other activities for which engineering and work practice controls are not feasible;

(c) In work situations where feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the permissible exposure limits;

(d) In emergencies;

(e) In all regulated areas; and

(f) Whenever employee exposure exceeds the permissible exposure limits.

(2) Respirator selection.

(a) Where respirators are required under this section, the employer shall select and provide at no cost to the employee, the appropriate respirator as specified in Table 1 of this section and shall ensure that the employee uses the respirator provided. The employer shall select respirators from among those approved as being acceptable for protection by the Mine Safety and Health Administration (MSHA) or by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

(b) The employer shall provide a powered, air-purifying respirator in lieu of any negative pressure respirator specified in Table 1 of this section whenever:

(i) An employee chooses to use this type of respirator; and

(ii) This respirator will provide adequate protection to the employee.

TABLE 1—RESPIRATORY PROTECTION FOR ASBESTOS FIBERS

Concentration of asbestos fibers	Required Respirator[a]
Not in excess of 2 f/cc.	1. Half-mask, air-purifying respirator, other than a disposable respirator, equipped with high-efficiency filters.[b]
Not in excess of 10 f/cc.	1. Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 20 f/cc.	1. Any powered air-purifying respirator equipped with high-efficiency filters. 2. Any supplied-air respirator operated in continuous flow mode.
Not in excess of 200 f/cc.	1. Full facepiece supplied-air respirator operated in pressure demand mode.
Greater than 200 f/cc or unknown concentration.	1. Full facepiece supplied-air respirator operated in pressure-demand mode equipped with either an auxiliary positive pressure self-contained breathing apparatus or a HEPA filter.[c] 2. Full facepiece positive-pressure self-contained breathing apparatus (SCBA).

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.
c. See subsection (5)(c) of this section for fit testing requirements.

(3) Special respiratory protection requirements. Unless specifically identified in this subsection, respirator selection for asbestos removal, demolition, and renovation operations shall be in accordance with Table 1 of subsection (2) 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 to employees engaged in the following asbestos operations:

(a) 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

(b) Any dry removal of asbestos.

(4) Respirator program.

(a) Where respiratory protection is required, the employer shall institute a respirator program in accordance with WAC 296-62-071.

(b) The employer shall permit each employee who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected and shall maintain an adequate supply of filter elements for this purpose.

(c) Employees who wear respirators shall be permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

(d) No employee shall be assigned to tasks requiring the use of respirators if, based upon his or her most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by the use of a respirator. Such employee shall be assigned to another job or given the opportunity to transfer to a different position whose duties he or she is able to perform 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, if such a different position is available.

(5) Respirator fit testing.

(a) The employer shall ensure that the respirator issued to the employee exhibits the least possible facepiece leakage and that the respirator is fitted properly.

(b) 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 every six months thereafter. The qualitative fit tests may be used only for testing the fit of half-mask respirators to be worn in concentrations of asbestos not in excess of 2 f/cc, and shall be conducted in accordance with WAC 296-62-07739, Appendix C. The tests shall be used to select facepieces that provide the required protection as prescribed in Table 1 of this section.

(c) Any supplied-air respirator facepiece equipped with a back-up HEPA filter shall be quantitatively fit tested with the air supply disconnected at the time of initial fitting and at least every six months thereafter. The quantitative fit tests shall be conducted using the procedures described in WAC 296-62-07739(2), Appendix C, for negative pressure respirators.

[Statutory Authority: Chapter 49.17 RCW. 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, the employer shall provide at no cost to the employee and ensure 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 work clothing shall be placed and stored in closed containers which prevent dispersion of the asbestos outside the container.

(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(2).

(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) Protective clothing for removal, demolition, and renovation operations.

(a) The competent person shall periodically examine worksuits worn by employees for rips or tears that may occur during performance of work.

(b) When rips or tears are detected while an employee is working within a negative-pressure enclosure, rips and tears shall be immediately mended, or the worksuit shall be immediately replaced.

[Statutory Authority: Chapter 49.17 RCW. 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 small-scale, short-duration operations, as described in WAC 296-62-07712(4), 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 for removal, demolition, and renovation operations.

(a) Decontamination area. Except for small-scale, short-duration operations, as described in WAC 296-62-07753 Appendix J, the employer shall establish a decontamination area that is adjacent and connected to the regulated area for the decontamination of employees contaminated with asbestos. 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.

(b) Clean room. The clean room shall be equipped with a locker or appropriate storage container for each employee's use.

(c) Shower area. Where feasible, shower facilities shall be provided which comply with WAC 296-24-12009(3). The showers shall be contiguous both to the equipment room and the clean change 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 change room, the employer shall ensure that employees:

(i) Remove asbestos contamination from their worksuits using a HEPA vacuum before proceeding to a shower that is not contiguous to the work area; or

(ii) Remove their contaminated worksuits, don clean worksuits, and proceed to a shower that is not contiguous to the work area.

(d) Equipment room. The equipment room shall be supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective clothing and equipment.

(e) Decontamination area entry procedures.

(i) 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.

(ii) Before entering the enclosure, the employer shall ensure that employees pass through the equipment room.

(f) Decontamination area exit procedures.

(i) Before leaving the regulated area, the employer shall ensure that employees remove all gross contamination and debris from their protective clothing.

(ii) The employer shall ensure that employees remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers.

(iii) The employer shall ensure that employees do not remove their respirators in the equipment room.

(iv) The employer shall ensure that employees shower prior to entering the clean room. When taking a shower, employees shall be fully wetted, including the face and hair, prior to removing their respirators.

(v) The employer shall ensure that, after showering, employees enter the clean room before changing into street clothes.

(g) Decontamination area for personnel shall not be used for the transportation of asbestos debris.

(h) Waste load-out procedure. The waste load-out area as required by WAC 296-62-07723(7) 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.

[Statutory Authority: Chapter 49.17 RCW. 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) Upon written or oral request, a copy of the written report required in WAC 296-62-07707 and 296-65-020 shall be given to the collective bargaining representatives or employee representatives of any employee who may be exposed to any asbestos or asbestos-containing material. A copy of the written report shall be posted conspicuously at the location where employees report to work.

(2) Warning signs.

(a) Warning signs shall be provided and displayed at each regulated area. 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) The warning signs required by (a) of this subsection shall bear the following information:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

(3) Warning labels.

(a) Warning labels shall 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. Where feasible, installed asbestos products shall contain a visible label.

(b) Labels shall be printed in large, bold letters on a contrasting background.

(c) The labels shall comply with the requirements of WAC 296-62-05411, and shall include the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
AVOID BREATHING AIRBORNE ASBESTOS FIBERS

(d) Where minerals to be labeled are only tremolite, anthophyllite, or actinolite, the employer may replace the term "asbestos" with the appropriate mineral name.

(4) Material safety data sheets. Employers who are manufacturers or importers of asbestos, or asbestos products shall comply with the requirements regarding development of material safety data sheets as specified in WAC 296-62-05413, except as provided by subsection (5) of this section.

(5) The provisions for labels required by subsection (3) of this section or for material safety data sheets required by subsection (4) 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 action level and/or excursion limit will be released; or

(b) Asbestos is present in a product in concentrations less than 0.1 percent by weight.

(6) Employee information and training.

(a) The employer shall institute a training program for all employees who are exposed to airborne concentrations of asbestos at or above the action level and/or excursion limit and ensure their participation in the program.

(b) Training shall 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.

(c) The training program shall be conducted in a manner which the employee is able to understand. The employer shall ensure that each employee is informed of the following:

(i) The health effects associated with asbestos;

(ii) The relationship between smoking and exposure to asbestos in producing lung cancer;

(iii) Methods of recognizing asbestos and the quantity, location, manner of use, release, and storage of asbestos and the specific nature of operations which could result in exposure to asbestos;

(iv) The engineering controls and work practices associated with the employee's job assignment;

(v) 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, personal protective equipment to be used, and waste disposal procedures, and any necessary instructions in the use of these controls and procedures;

(vi) The purpose, proper use, and limitations of respirators and protective clothing;

(vii) The purpose and a description of the medical surveillance program required by WAC 296-62-07725; and

(viii) The content of this standard, including appendices.

(d) 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.

(ii) The employer shall provide, upon request, all materials relating to the employee information and training program to the director.

(7) Certification.

(a) All individuals working or supervising asbestos projects, as defined in WAC 296-65-003(4) shall be certified as required by WAC 296-65-010, 296-65-012, and 296-65-030.

(b) In cases excepted under WAC 296-65-030 (2) and (3), all employees shall be trained according to subsection (6) of this section, regardless of their exposure levels.

[Statutory Authority: Chapter 49.17 RCW. 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 296-62-07723 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 wherever 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.

[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 action level and/or excursion limit. Exception. Employers in the construction industry shall institute a medical surveillance program for all employees engaged in work involving levels of asbestos at or above the action level for thirty or more days per year, or who are required by this section to wear negative-pressure respirators.

(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 action level and/or excursion limit.

(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; 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 asbestos 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 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: Chapter 49.17 RCW. 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)(c), 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.

[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 296-62-07731 Dates. (1) The requirements of the asbestos standard issued in May 1973, as amended, and published in WAC 296-62-07517, remain in effect until compliance is achieved with the parallel provisions of WAC 296-62-077 through 296-62-07753.

(2) Start-up dates. All obligations of WAC 296-62-077 through 296-62-07753 commence on the effective date except as follows:

(a) Hygiene and lunchroom facilities. Changerooms, showers, lavatories, and lunchroom facilities shall be constructed and in use no later than July 20, 1987. However, if as part of the compliance plan for a fixed facility as opposed to mobile or construction type activities it is predicted by an independent engineering firm that engineering controls and work practices will reduce exposures below the time weighted average and/or excursion limit by July 20, 1988, for affected employees, then such facilities need not be completed until one year after the engineering controls are completed, if such controls have not in fact succeeded in reducing exposure to below the permissible exposure limits.

(b) Compliance program. Written compliance programs required by WAC 296-62-07713(2) as a result of initial monitoring shall be completed and available for inspection and copying as soon as possible but no later than July 20, 1987.

(c) Methods of compliance. The engineering and work practice controls as required by WAC 296-62-07713(1) shall be implemented as soon as possible but no later than July 20, 1988.

[Statutory Authority: Chapter 49.17 RCW. 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.]

WAC 296-62-07733 Appendices. (1) The following appendices to this chapter are mandatory.

(a) WAC 296-62-07735, Appendix A—WISHA reference method—Mandatory.

(b) WAC 296-62-07739, Appendix C—Qualitative and quantitative fit testing procedures—Mandatory.

(c) WAC 296-62-07741, Appendix D—Medical questionnaires—Mandatory.

(d) WAC 296-62-07743, Appendix E—Interpretation and classification of chest roentgenograms—Mandatory.

(2) The following appendices to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

(a) WAC 296-62-07737, Appendix B—Detailed procedure for asbestos sampling and analysis—Nonmandatory.

(b) WAC 296-62-07745, Appendix F—Work practices and engineering controls for automotive brake repair operations—Nonmandatory.

(c) WAC 296-62-07747, Appendix G—Substance technical information for asbestos—Nonmandatory.

(d) WAC 296-62-07749, Appendix H—Medical surveillance guidelines for asbestos—Nonmandatory.

(e) WAC 296-62-07751, Appendix I—Work practices and engineering controls for major asbestos removal, renovation, and demolition operations—Nonmandatory.

(f) WAC 296-62-07753, Appendix J—Work practices and engineering controls for small-scale, short-duration asbestos renovation and maintenance activities—Nonmandatory.

[Statutory Authority: Chapter 49.17 RCW. 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 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 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 recognized by the department, for collecting and analyzing samples.

(1) Sampling and analytical procedure.

(a) The sampling medium for air samples shall be mixed cellulose ester filter membranes. These shall be designated by the manufacturer as suitable for asbestos counting. See below for rejection of blanks.

(b) The preferred collection device shall be 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.

(c) An air flow rate between 0.5 liter/min and 4.0 liters/min shall 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 shall be selected.

(d) Where possible, a sufficient air volume for each air sample shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 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 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. The blank results shall be averaged and subtracted from the analytical results before reporting. Any samples represented by a blank having a fiber count in excess of seven fibers/one hundred fields shall be rejected.

(l) The samples shall 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) In the absence of other information, count all particles as asbestos 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 shall receive a count of one. Fibers crossing the boundary once, having one end within the circle, shall 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) For a 25mm filter, count enough graticule fields to yield one hundred fibers by counting a minimum of twenty fields. If less than ten fibers are found after counting one hundred fields and the sample air volume is less than sixty liters, count a total number of fields calculated from the following formulas:

$N = 6000/V$ For TWA Determination (QL = 0.085)
$N = 2400/V$ For Ceiling Determinations (QL = 0.21)

Where N = Number of fields counted on a 25mm filter
V = Air volume of sample in liters
QL = Limit of reliable quantification in fibers/cc for the NIOSH 7400 method

Note: Filter samples (25mm) with air volumes of less than thirty liters will have decreased analytical accuracy and precision and should be avoided.

(vi) For a 37mm filter, count enough graticule fields to yield one hundred fibers by counting a minimum of twenty fields. If less than one hundred fibers are found after counting one hundred fields and the sample air volume is less than one hundred thirty–three liters, count a total number of fields calculated from the following formulas:

$N = 13300/V$ For TWA Determination (QL = 0.085)
$N = 5320/V$ For Ceiling Determinations (QL = 0.21)

Where N = Number of fields counted on a 37mm filter
V = Air volume of sample in liters
QL = Limit of reliable quantification in fibers/cc

Note: Filter samples (37mm) with air volumes of less than seventy liters will have decreased analytical accuracy and precision and should be avoided.

(n) Blind recounts shall 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 shall 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 shall include all laboratories and shall also evaluate the laboratory-to-laboratory variability.

(b) Interlaboratory program. Each laboratory analyzing asbestos 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 shall 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 shall 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.

(c) All individuals performing asbestos analysis must have taken the NIOSH course for sampling and evaluating airborne asbestos 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 shall be evaluated and the microscope shall be replaced, as necessary.

(e) Current results of these quality assurance programs shall be posted in each laboratory to keep the microscopists informed.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07735, filed 11/30/87. Statutory 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. This appendix contains a detailed procedure for sampling and analysis and includes those critical elements specified in WAC 296-62-07735, Appendix A. Employers are not required to use this procedure, but they are required to use Appendix A. The purpose of Appendix B is to provide a detailed step-by-step sampling and analysis procedure that conforms to the elements specified in WAC 296-62-07735, Appendix A. Since this procedure may also standardize the analysis and reduce variability, WISHA encourages employers to use this appendix.

Asbestos Sampling and Analysis Method

Technique: Microscopy, phase contrast.
Analyte: Fibers (manual count).
Sample preparation: Acetone/triacetin method.
Calibration: Phase-shift detection limit about three degrees.
Range: One hundred to one thousand three hundred fibers/mm^2filter area.
Estimated limit of detection: Seven fibers/mm^2filter area.
Sampler: Filter (0.8-1.2 um mixed cellulose ester membrane, 25-mm diameter).
Flow rate: 0.5 L/min to 4.0 L/min (25-mm cassette) 1.0 L/min to 4.0 L/min (37-mm cassette).
Sample volume: Adjust to obtain one hundred to one thousand three hundred fibers/mm^2.
Shipment: Routine.
Sample stability: Indefinite.
Blanks: Ten percent of samples (minimum two).
Standard analytical error: 0.25.

Applicability: The working range is 0.02 f/cc (1920-L air sample) to 1.25 f/cc (400-L air sample). The method gives an index of airborne asbestos fibers but may be used for other materials such as fibrous glass by inserting suitable parameters into the counting rules. The method does not differentiate between asbestos and other fibers. Asbestos fibers less than ca. 0.25 um diameter will not be detected by this method.

Interferences: Any other airborne fiber may interfere since all particles meeting the counting criteria are counted. Chain-like particles may appear fibrous. High levels of nonfibrous dust particles may obscure fibers in the field of view and raise the detection limit.

(1) Reagents.

(a) Acetone.

(b) Triacetin (glycerol triacetate), reagent grade.

Special precautions: Acetone is an extremely flammable liquid and precautions must be taken not to ignite it. Heating of acetone must be done in a ventilated laboratory fume hood using a flameless, spark-free heat source.

(2) Equipment.

(a) Collection device: 25-mm cassette with 50-mm electrically conductive extension cowl with cellulose ester filter, 0.8 to 1.2 mm pore size and backup pad.

Note: Analyze representative filters for fiber background before use and discard the filter lot if more than five fibers/one hundred fields are found.

(b) Personal sampling pump, greater than or equal to 0.5 L/min. with flexible connecting tubing.

(c) Microscope, phase contrast, with green or blue filter, 8 to 10 X eyepiece, and 40 to 45 X phase objective (total magnification ca. 400 X); numerical aperture = 0.65 to 0.75.

(d) Slides, glass, single-frosted, precleaned, 25 x 75 mm.

(e) Cover slips, 25 x 25 mm, No. 1 1/2 unless otherwise specified by microscope manufacturer.

(f) Knife, No. 1 surgical steel, curved blade.

(g) Tweezers.

(h) Flask, Guth-type, insulated neck, 250 to 500 mL (with single-hole rubber stopper and elbow-jointed glass tubing, 16 to 22 cm long).

(i) Hotplate, spark-free, stirring type; heating mantle; or infrared lamp and magnetic stirrer.

(j) Syringe, hypodermic, with 22-gauge needle.

(k) Graticule, Walton-Beckett type with 100 um diameter circular field at the specimen plane (area = 0.00785 mm^2), (Type G-22).

Note: The graticule is custom-made for each microscope.

(l) HSE/NPL phase contrast test slide, Mark II.

(m) Telescope, ocular phase-ring centering.

(n) Stage micrometer (0.01 mm divisions).

(3) Sampling.

(a) Calibrate each personal sampling pump with a representative sampler in line.

(b) Fasten the sampler to the worker's lapel as close as possible to the worker's mouth. Remove the top cover

from the end of the cowl extension (open face) and orient face down. Wrap the joint between the extender and the monitor's body with shrink tape to prevent air leaks.

(c) Submit at least two blanks (or ten percent of the total samples, whichever is greater) for each set of samples. Remove the caps from the field blank cassettes and store the caps and cassettes in a clean area (bag or box) during the sampling period. Replace the caps in the cassettes when sampling is completed.

(d) Sample at 0.5 L/min or greater. Do not exceed 1 mg total dust loading on the filter. Adjust sampling flow rate, Q (L/min), and time to produce a fiber density, E (fibers/mm^2), of one hundred to one thousand three hundred fibers/mm^2 (3.85 x 10^4 to 5 x 10^5 fibers per 25–mm filter with effective collection area (A_c=385 mm^2)) for optimum counting precision (see subsection (7)(a) of this section). Calculate the minimum sampling time, T (minutes) at the action level (one–half of the current standard), L (f/cc) of the fibrous aerosol being sampled:

$$T = \frac{(A_c)(E)}{(Q)(L)10^3}$$

(e) Remove the field monitor at the end of sampling, replace the plastic top cover and small end caps, and store the monitor.

(f) Ship the samples in a rigid container with sufficient packing material to prevent jostling or damage.

Note: Do not use polystyrene foam in the shipping container because of electrostatic forces which may cause fiber loss from the sample filter.

(4) Sample preparation.

Note: The object is to produce samples with a smooth (nongrainy) background in a medium with a refractive index equal to or less than 1.46. The method below collapses the filter for easier focusing and produces permanent mounts which are useful for quality control and interlaboratory comparison. Other mounting techniques meeting the above criteria may also be used, e.g., the nonpermanent field mounting technique used in P & CAM 239.

(a) Ensure that the glass slides and cover slips are free of dust and fibers.

(b) Place 40 to 60 ml of acetone into a Guth–type flask. Stopper the flask with a single–hole rubber stopper through which a glass tube extends 5 to 8 cm into the flask. The portion of the glass tube that exits the top of the stopper (8 to ten cm) is bent downward in an elbow that makes an angle of twenty to thirty degrees with the horizontal.

(c) Place the flask in a stirring hotplate or wrap in a heating mantle. Heat the acetone gradually to its boiling temperature (ca. 58°C).

Caution: The acetone vapor must be generated in a ventilated fume hood away from all open flames and spark sources. Alternate heating methods can be used, providing no open flame or sparks are present.

(d) Mount either the whole sample filter or a wedge cut from the sample filter on a clean glass slide.

(i) Cut wedges of ca. twenty–five percent of the filter area with a curved–blade steel surgical knife using a rocking motion to prevent tearing.

(ii) Place the filter or wedge, dust slide up, on the slide. Static electricity will usually keep the filter on the slide until it is cleared.

(iii) Hold the glass slide supporting the filter approximately 1 to 2 cm from the glass tube port where the acetone vapor is escaping from the heated flask. The acetone vapor stream should cause a condensation spot on the glass slide ca. 2 to 3 cm in diameter. Move the glass slide gently in the vapor stream. The filter should clear in two to five seconds. If the filter curls, distorts, or is otherwise rendered unusable, the vapor stream is probably not strong enough. Periodically wipe the outlet port with tissue to prevent liquid acetone dripping onto the filter.

(iv) Using the hypodermic syringe with a 22–gauge needle, place one to two drops of triacetin on the filter. Gently lower a clean 25–mm square cover slip down onto the filter at a slight angle to reduce the possibility of forming bubbles. If too many bubbles form or the amount of triacetin is insufficient, the cover slip may become detached within a few hours.

(v) Glue the edges of the cover slip to the glass slide using a lacquer or nail polish.

Note: If clearing is slow, the slide preparation may be heated on a hotplate (surface temperature 50°C) for fifteen minutes to hasten clearing. Counting may proceed immediately after clearing and mounting are completed.

(5) Calibration and quality control.

(a) Calibration of the Walton–Beckett graticule. The diameter, d_c(mm), of the circular counting area and the disc diameter must be specified when ordering the graticule.

(i) Insert any available graticule into the eyepiece and focus so that the graticule lines are sharp and clear.

(ii) Set the appropriate interpupillary distance and, if applicable, reset the binocular head adjustment so that the magnification remains constant.

(iii) Install the 40 to 45 X phase objective.

(iv) Place a stage micrometer on the microscope object stage and focus the microscope on the graduated lines.

(v) Measure the magnified grid length, L_o(um) using the stage micrometer.

(vi) Remove the graticule from the microscope and measure its actual grid length, L_a(mm). This can best be accomplished by using a stage fitted with verniers.

(vii) Calculate the circle diameter, d_c(mm), for the Walton–Beckett graticule:

$$d_c = \frac{La \times D}{L_o}$$

Example: If L_o = 108 um, L_a = 2.93 mm and D = 100 um, then d_c = 2.71 mm.

(viii) Check the field diameter, D (acceptable range 100 mm ± 2 mm) with a stage micrometer upon receipt of the graticule from the manufacturer. Determine field area (mm^2).

(b) Microscope adjustments. Follow the manufacturer's instructions and also the following:

(i) Adjust the light source for even illumination across the field of view at the condenser iris.

Note: Kohler illumination is preferred, where available.

(ii) Focus on the particulate material to be examined.

(iii) Make sure that the field iris is in focus, centered on the sample, and open only enough to fully illuminate the field of view.

(iv) Use the telescope ocular supplied by the manufacturer to ensure that the phase rings (annular diaphragm and phase–shifting elements) are concentric.

(c) Check the phase–shift detection limit of the microscope periodically.

(i) Remove the HSE/NPL phase–contrast test slide from its shipping container and center it under the phase objective.

(ii) Bring the blocks of grooved lines into focus.

Note: The slide consists of seven sets of grooves (ca. 20 grooves to each block) in descending order of visibility from sets one to seven. The requirements for 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 to seven must be invisible. Sets four and five must be at least partially visible but may vary slightly in visibility between microscopes. A microscope which 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 quality deteriorates, clean the microscope optics and, if the problem persists, consult the microscope manufacturer.

(d) Quality control of fiber counts.

(i) Prepare and count field blanks along with the field samples. Report the counts on each blank. Calculate the mean of the field blank counts and subtract this value from each sample count before reporting the results.

Note 1: The identity of the blank filters should be unknown to the counter until all counts have been completed.

Note 2: If a field blank yields fiber counts greater than seven fibers/one hundred fields, report possible contamination of the samples.

(ii) Perform blind recounts by the same counter on ten percent of filters counted (slides relabeled by a person other than the counter).

(e) Use the following test to determine whether a pair of counts on the same filter should be rejected because of possible bias. This statistic estimates the counting repeatability at the ninety–five percent confidence level. Discard the sample if the difference between the two counts exceeds $2.77(F)s_r$, where F = average of the two fiber counts and S_r = relative standard deviation, which should be derived by each laboratory based on historical in–house data.

Note: If a pair of counts is rejected as a result of this test, recount the remaining samples in the set and test the new counts against the first counts. Discard all rejected paired counts.

(f) Enroll each new counter in a training course that compares performance of counters on a variety of samples using this procedure.

Note: To ensure good reproducibility, all laboratories engaged in asbestos counting are required to participate in the proficiency analytical testing (PAT) program and should routinely participate with other asbestos fiber counting laboratories in the exchange of field samples to compare performance of counters.

(6) Measurement.

(a) Place the slide on the mechanical stage of the calibrated microscope with the center of the filter under the objective lens. Focus the microscope on the plane of the filter.

(b) Regularly check phase–ring alignment and Kohler illumination.

(c) The following are the counting rules:

(i) Count only fibers 5 um or longer in length. Measure the length of curved fibers along the curve.

(ii) Count only fibers with a length–to–width ratio equal to or greater than three to one.

(iii) For fibers that cross the boundary of the graticule field, do the following:

(A) Count any fiber 5 um or longer in length that lies entirely within the graticule area.

(B) Count as one–half fiber any fiber with only one end lying within the graticule area.

(C) Do not count any fiber that crosses the graticule boundary more than once.

(D) Reject and do not count all other fibers.

(iv) Count bundles of fibers as one fiber unless individual fibers can be identified by observing both ends of a fiber.

(v) For a 25mm filter, count enough graticule fields to yield one hundred fibers by counting a minimum of twenty fields. If less than ten fibers are found after counting one hundred fields and the sample air volume is less than sixty liters, count a total number of fields calculated from the following formulas:

$N = 6000/V$ For TWA Determination (QL = 0.085)
$N = 2400/V$ For Ceiling Determinations (QL = 0.21)

Where N = Number of fields counted on a 25mm filter
V = Air volume of sample in liters
QL = Limit of reliable quantification in fibers/cc for the NIOSH 7400 method

Note: Filter samples (25mm) with air volumes of less than thirty liters will have decreased analytical accuracy and precision and should be avoided.

(vi) For a 37mm filter, count enough graticule fields to yield one hundred fibers by counting a minimum of twenty fields. If less than one hundred fibers are found after counting one hundred fields and the sample air volume is less than one hundred thirty–three liters, count a total number of fields calculated from the following formulas:

$N = 13300/V$ For TWA Determination (QL = 0.085)
$N = 5320/V$ For Ceiling Determinations (QL = 0.21)

Where N = Number of fields counted on a 37mm filter
V = Air volume of sample in liters
QL = Limit of reliable quantification in fibers/cc

Note: Filter samples (37mm) with air volumes of less than seventy liters will have decreased analytical accuracy and precision and should be avoided.

(d) Start counting from one end of the filter and progress along a radial line to the other end, shift either up or down on the filter, and continue in the reverse direction. Select fields randomly by looking away from the eyepiece briefly while advancing the mechanical stage.

When an agglomerate covers ca. 1/6 or more of the field of view, reject the field and select another. Do not report rejected fields in the number of total fields counted.

Note: When counting a field, continuously scan a range of focal planes by moving the fine focus knob to detect very fine fibers which have become embedded in the filter. The small-diameter fibers will be very faint but are an important contribution to the total count.

(7) Calculations.

(a) Calculate and report fiber density on the filter, E (fibers/mm^2); by dividing the total fiber count, F; minus the mean field blank count, B, by the number of fields, n; and the field area, A_f(0.00785 mm^2 for a properly calibrated Walton-Beckett graticule):

$$E = \frac{(F/n_f)-(B/n_b)}{(A_f)} \text{ fibers/mm}^2$$

Where: n_f = number of fields in submission sample

n_b = number of fields in blank sample

(b) Calculate the concentration, C (f/cc), of fibers in the air volume sampled, V (L), using the effective collection area of the filter, A_c(385 mm^2 for a 25-mm filter):

$$C = \frac{(E)(Ac)}{V(10^3)}$$

Note: Periodically check and adjust the value of A_c, if necessary.

Bulk sample collection and analysis.

Bulk samples should be collected as specified in Appendix G, Section 1 of the United States Environmental Protection Agency (EPA) publication No. 560/5-85-024 (June 1985) entitled *Guidance for Controlling Asbestos-Containing Materials in Buildings.*

Analysis of the samples should be conducted by polarizing light microscopy in a qualified laboratory. In certain cases, x-ray diffraction may be required to confirm the presence of asbestos. Qualified laboratories must be participants in the EPA bulk asbestos quality assurance program or other bulk asbestos quality assurance program recognized by the department.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07737, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07737, filed 4/27/87.]

WAC 296-62-07739 Appendix C--Qualitative and quantitative fit testing procedures--Mandatory. (1) Qualitative fit test protocols.

(a) Isoamyl acetate protocol.

(i) Odor threshold screening:

(A) Three one-liter glass jars with metal lids (e.g., Mason or Ball jars) are required.

(B) Odor free water (e.g., distilled or spring water) at approximately 25°C shall be used for the solutions.

(C) The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding one cc of pure IAA to eight hundred cc of odor free water in a one-liter jar and shaking for thirty seconds. This solution shall be prepared new at least weekly.

(D) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but shall not be connected to the same recirculating ventilation system.

(E) The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into five hundred cc of odor free water using a clean dropper or pipette. Shake for thirty seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

(F) A test blank is prepared in a third jar by adding five hundred cc of odor free water.

(G) The odor test and test blank jars shall be labelled one and two for jar identification. If the labels are put on the lids they can be periodically peeled, dried off and switched to maintain the integrity of the test.

(H) The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e., one and two): "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."

(I) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

(J) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test may not be used.

(K) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

(ii) Respirator selection.

(A) The test subject shall be allowed to pick the most comfortable respirator from a selection including respirators of various sizes from different manufacturers. The selection shall include at least five sizes of elastomeric half facepieces, from at least two manufacturers.

(B) The selection process shall be conducted in a room separate from the fit-test chamber to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.

(C) The test subject should understand that the employee is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape and, if fit properly and used properly will provide adequate protection.

(D) The test subject holds each facepiece up to the face and eliminates those which obviously do not give a comfortable fit. Normally, selection will begin with a half-mask and if a good fit cannot be found, the subject will be asked to test the full facepiece respirators. (A

small percentage of users will not be able to wear any half-mask.)

(E) The more comfortable facepieces are noted; the most comfortable mask is donned and worn at least five minutes to assess comfort. All donning and adjustments of the facepiece shall be performed by the test subject without assistance from the test conductor or other person. Assistance in assessing comfort can be given by discussing the points in (a)(ii)(F) of this subsection. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

(F) Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

(I) Positioning of mask on nose.

(II) Room for eye protection.

(III) Room to talk.

(IV) Positioning mask on face and cheeks.

(G) The following criteria shall be used to help determine the adequacy of the respirator fit:

(I) Chin properly placed.

(II) Strap tension.

(III) Fit across nose bridge.

(IV) Distance from nose to chin.

(V) Tendency to slip.

(VI) Self-observation in mirror.

(H) The test subject shall conduct the conventional negative and positive-pressure fit checks before conducting the negative- or positive-pressure test the subject shall be told to "seat" the mask by rapidly moving the head from side-to-side and up and down, while taking a few deep breaths.

(I) The test subject is now ready for fit testing.

(J) After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried.

(K) The employee shall be given the opportunity to select a different facepiece and be retested if the chosen facepiece becomes increasingly uncomfortable at any time.

(iii) Fit test.

(A) The fit test chamber shall be similar to a clear fifty-five gallon drum liner suspended inverted over a two-foot diameter frame, so that the top of the chamber is about six inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

(B) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

(C) After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(D) A copy of the following test exercises and "rainbow passage" shall be taped to the inside of the test chamber:

Test exercises.

(I) Breathe normally.

(II) Breathe deeply. Be certain breaths are deep and regular.

(III) Turn head all the way from one side to the other. Inhale on each side. Be certain movement is complete. Do not bump the respirator against the shoulders.

(IV) Nod head up and down. Inhale when head is in the full up position (looking toward ceiling). Be certain motions are complete and made about every second. Do not bump the respirator on the chest.

(V) Talking. Talk aloud and slowly for several minutes. The following paragraph is called the "rainbow passage." Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

(VI) Jogging in place.

(VII) Breathe normally.

"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.

(E) Each test subject shall wear the respirator for at least ten minutes before starting the fit test.

(F) Upon entering the test chamber, the test subject shall be given a six-inch by five-inch piece of paper towel or other porous absorbent single ply material, folded in half and wetted with three-quarters of one cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

(G) Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of cooperation, the purpose for the head exercises, or to demonstrate some of the exercises.

(H) Each exercise described in (D) of this subsection shall be performed for at least one minute.

(I) If at any time during the test, the subject detects the banana-like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(J) If the test is failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, and again begin the procedure described in (b)(iii)(D) through (H) of this subsection. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about five minutes before

retesting. Odor sensitivity will usually have returned by this time.

(K) If a person cannot pass the fit test described above wearing a half–mask respirator from the available selection, full facepiece models must be used.

(L) When a respirator is found that passes the test, the subject breaks the faceseal and takes a breath before exiting the chamber. This is to assure that the reason the test subject is not smelling the IAA is the good fit of the respirator facepiece seal and not olfactory fatigue.

(M) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. To keep the area from becoming contaminated, the used towels shall be kept in a self–sealing bag so there is no significant IAA concentration buildup in the test chamber during subsequent tests.

(N) At least two facepieces shall be selected for the IAA test protocol. The test subject shall be given the opportunity to wear them for one week to choose the one which is more comfortable to wear.

(O) Persons who have successfully passed this fit test with a half–mask respirator may be assigned the use of the test respirator in atmospheres with up to 2 f/cc of airborne asbestos.

(P) The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

(Q) If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive–pressure respirator such as powered air–purifying respirators, supplied–air respirator, or self–contained breathing apparatus.

(R) If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

(S) Qualitative fit testing shall be repeated at least every six months.

(T) In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has a:

(I) Weight change of twenty pounds or more,

(II) Significant facial scarring in the area of the facepiece seal,

(III) Significant dental changes; i.e., multiple extractions without prosthesis, or acquiring dentures,

(IV) Reconstructive or cosmetic surgery, or

(V) Any other condition that may interfere with facepiece sealing.

(iv) Recordkeeping.

A summary of all test results shall be maintained in each office for three years. The summary shall include:

(A) Name of test subject.

(B) Date of testing.

(C) Name of the test conductor.

(D) Respirators selected (indicate manufacturer, model, size and approval number).

(E) Testing agent.

(b) Saccharin solution aerosol protocol.

(i) Respirator selection. Respirators shall be selected as described in (a)(ii) of this subsection (respirator selection), except that each respirator shall be equipped with a particulate filter.

(ii) Taste threshold screening.

(A) An enclosure about head and shoulders shall be used for threshold screening (to determine if the individual can taste saccharin) and for fit testing. The enclosure shall be approximately twelve inches in diameter by fourteen inches tall with at least the front clear to allow free movement of the head when a respirator is worn.

(B) The test enclosure shall have a three–quarter inch hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(C) The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

(D) During the threshold screening test, the test subject shall don the test enclosure and breathe with open mouth with tongue extended.

(E) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(F) The threshold check solution consists of 0.83 grams of sodium saccharin, USP in water. It can be prepared by putting 1 cc of the test solution (see (b)(iii)(G) of this subsection) in one hundred cc of water.

(G) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then is released and allowed to fully expand.

(H) Ten squeezes of the nebulizer bulb are repeated rapidly and then the test subject is asked whether the saccharin can be tasted.

(I) If the first response is negative, ten more squeezes of the nebulizer bulb are repeated rapidly and the test subject is again asked whether the saccharin can be tasted.

(J) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin can be tasted.

(K) The test conductor will take note of the number of squeezes required to elicit a taste response.

(L) If the saccharin is not tasted after thirty squeezes ((b)(ii)(J) of this subsection), the saccharin fit test cannot be performed on the test subject.

(M) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(N) Correct use of the nebulizer means that approximately 1 cc of liquid is used at a time in the nebulizer body.

(O) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least every four hours.

(iii) Fit test.

(A) The test subject shall don and adjust the respirator without the assistance from any person.

(B) The fit test uses the same enclosure described in (b)(ii) of this subsection.

(C) Each test subject shall wear the respirator for at least ten minutes before starting the fit test.

(D) The test subject shall don the enclosure while wearing the respirator selected in (a)(ii) of this subsection. This respirator shall be properly adjusted and equipped with a particulate filter.

(E) The test subject may not eat, drink, (except plain water), or chew gum for fifteen minutes before the test.

(F) A second DeVilbiss Model 40 Inhalation Medication Nebulizer is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(G) The fit test solution is prepared by adding eighty-three grams of sodium saccharin to one hundred cc of warm water.

(H) As before, the test subject shall breathe with mouth open and tongue extended.

(I) The nubulizer is inserted into the hole in the front of the enclosure and the fit test solution is sprayed into the enclosure using the same technique as for the taste threshold screening and the same number of squeezes required to elicit a taste response in the screening. (See (b)(ii)(H) through (J) of this subsection.)

(J) After generation of the aerosol read the following instructions to the test subject. The test subject shall perform the exercises for one minute each.

(I) Breathe normally.

(II) Breathe deeply. Be certain breaths are deep and regular.

(III) Turn head all the way from one side to the other. Be certain movement is complete. Inhale on each side. Do not bump the respirator against the shoulders.

(IV) Nod head up and down. Be certain motions are complete. Inhale when head is in the full up position (when looking toward the ceiling). Do not bump the respirator on the chest.

(V) Talking. Talk aloud and slowly for several minutes. The following paragraph is called the "rainbow passage." Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

(VI) Jogging in place.

(VII) Breathe normally.

"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 his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

(K) At the beginning of each exercise, the aerosol concentration shall be replenished using one-half the number of squeezes as initially described in (b)(iii)(I) of this subsection.

(L) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected.

(M) If the saccharin is detected the fit is deemed unsatisfactory and a different respirator shall be tried.

(N) At least two facepieces shall be selected by the saccharin test protocol. The test subject shall be given the opportunity to wear them for one week to choose the one which is more comfortable to wear.

(O) Successful completion of the test protocol shall allow the use of the half mask tested respirator in contaminated atmospheres up to 2 f/cc of asbestos. In other words this protocol may be used to assign protection factors no higher than ten.

(P) The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

(Q) If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as powered air-purifying respirators, supplied-air respirator, or self-contained breathing apparatus.

(R) If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

(S) Qualitative fit testing shall be repeated at least every six months.

(T) In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has a:

(I) Weight change of twenty pounds or more,

(II) Significant facial scarring in the area of the facepiece seal,

(III) Significant dental changes; i.e., multiple extractions without prosthesis, or acquiring dentures,

(IV) Reconstructive or cosmetic surgery, or

(V) Any other condition that may interfere with facepiece sealing.

(iv) Recordkeeping.

A summary of all test results shall be maintained in each office for three years. The summary shall include:

(A) Name of test subject.

(B) Date of testing.

(C) Name of test conductor.

(D) Respirators selected (indicate manufacturer, model, size and approval number).

(E) Testing agent.

(c) Irritant fume protocol.

(i) Respirator selection.

Respirators shall be selected as described in (a)(ii) of this subsection, except that each respirator shall be equipped with a high-efficiency cartridge.

(ii) Fit test.

(A) The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize the subject with the characteristic odor.

(B) The test subject shall properly don the respirator selected as above, and wear it for at least ten minutes before starting the fit test.

(C) The test conductor shall review this protocol with the test subject before testing.

(D) The test subject shall perform the conventional positive pressure and negative pressure fit checks (see ANSI Z88.2 1980). Failure of either check shall be cause to select an alternate respirator.

(E) Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part #5645, or equivalent. Attach a short length of tubing to one end of the smoke tube. Attach the other end of the smoke tube to a low pressure air pump set to deliver two hundred milliliters per minute.

(F) Advise the test subject that the smoke can be irritating to the eyes and instruct the subject to keep the eyes closed while the test is performed.

(G) The test conductor shall direct the stream of irritant smoke from the tube towards the faceseal area of the test subject. The person conducting the test shall begin with the tube at least twelve inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

(H) The test subject shall be instructed to do the following exercises while the respirator is being challenged by the smoke. Each exercise shall be performed for one minute.

(I) Breathe normally.

(II) Breathe deeply. Be certain breaths are deep and regular.

(III) Turn head all the way from one side to the other. Be certain movement is complete. Inhale on each side. Do not bump the respirator against the shoulders.

(IV) Nod head up and down. Be certain motions are complete and made every second. Inhale when head is in the full up position (looking toward ceiling). Do not bump the respirator against the chest.

(V) Talking. Talk aloud and slowly for several minutes. The following paragraph is called the "rainbow passage." Repeating it after the test conductor (keeping eyes closed) will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

"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 his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

(VI) Jogging in place.

(VII) Breathe normally.

(I) The test subject shall indicate to the test conductor if the irritant smoke is detected. If smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.

(J) Each test subject passing the smoke test (i.e., without detecting the smoke) shall be given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. Failure to evoke a response shall void the fit test.

(K) This fit test protocol, (c)(ii)(D), (I), and (J) of this subsection, shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agents.

(L) At least two facepieces shall be selected by the irritant fume test protocol. The test subject shall be given the opportunity to wear them for one week to choose the one which is more comfortable to wear.

(M) Respirators successfully tested by the protocol may be used in contaminated atmospheres up to 2 f/cc of asbestos.

(N) The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

(O) If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as powered air-purifying respirators, supplied-air respirator, or self-contained breathing apparatus.

(P) If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

(Q) Qualitative fit testing shall be repeated at least every six months.

(R) In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has a:

(I) Weight change of twenty pounds or more,

(II) Significant facial scarring in the area of the facepiece seal,

(III) Significant dental changes; i.e., multiple extractions without prosthesis, or acquiring dentures,

(IV) Reconstructive or cosmetic surgery, or

(V) Any other condition that may interfere with facepiece sealing.

(iii) Recordkeeping.

A summary of all test results shall be maintained in each office for three years. The summary shall include:

(A) Name of test subject.

(B) Date of testing.

(C) Name of test conductor.

(D) Respirators selected (indicate manufacturer, model, size and approval number).

(E) Testing agent.

(2) Quantitative fit test procedures.

(a) General.

(i) The method applies to the negative-pressure nonpowered air-purifying respirators only.

(ii) The employer shall assign one individual who shall assume the full responsibility for implementing the respirator quantitative fit test program.

(b) Definition.

(i) "Quantitative fit test" means the measurement of the effectiveness of a respirator seal in excluding the ambient atmosphere. The test is performed by dividing the measured concentration of challenge agent in a test chamber by the measured concentration of the challenge agent inside the respirator facepiece when the normal air-purifying element has been replaced by an essentially perfect purifying element.

(ii) "Challenge agent" means the air contaminant introduced into a test chamber so that its concentration inside and outside the respirator may be compared.

(iii) "Test subject" means the person wearing the respirator for quantitative fit testing.

(iv) "Normal standing position" means standing erect and straight with arms down along the sides and looking straight ahead.

(v) "Fit factor" means the ratio of challenge agent concentration outside with respect to the inside of a respirator inlet covering (facepiece or enclosure).

(c) Apparatus.

(i) Instrumentation. Corn oil, sodium chloride or other appropriate aerosol generation, dilution, and measurement systems shall be used for quantitative fit test.

(ii) Test chamber. The test chamber shall be large enough to permit all test subjects to freely perform all required exercises without distributing the challenge agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the challenge agent is effectively isolated from the ambient air yet uniform in concentration throughout the chamber.

(iii) When testing air-purifying respirators, the respirator shall be equipped with a cartridge or canister approved for removal of the test agent, or with a high efficiency particulate filter. Only approved assemblies shall be tested.

(iv) The sampling instrument shall be selected so that a strip chart record may be made of the test showing the rise and fall of challenge agent concentration with each inspiration and expiration at fit factors of at least two thousand.

(v) The combination of substitute air-purifying elements (if any), challenge agent, and challenge agent concentration in the test chamber shall be such that the test subject is not exposed in excess of PEL to the challenge agent at any time during the testing process.

(vi) The sampling port on the test specimen respirator shall be placed and constructed so that there is no detectable leak around the port, a free air flow is allowed into the sampling line at all times and so there is no interference with the fit or performance of the respirator.

(vii) The test chamber and test set-up shall permit the person administering the test to observe one test subject inside the chamber during the test.

(viii) The equipment generating the challenge atmosphere shall maintain the concentration of challenge agent constant within a ten percent variation for the duration of the test.

(ix) The time lag (interval between an event and its being recorded on the strip chart) of the instrumentation may not exceed two seconds.

(x) The tubing for the test chamber atmosphere and for the respirator sampling port shall be the same diameter, length and material. It shall be kept as short as possible. The smallest diameter tubing recommended by the manufacturer shall be used.

(xi) The exhaust flow from the test chamber shall pass through a high-efficiency filter before release to the room.

(xii) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed fifty percent.

(d) Procedural requirements.

(i) The fitting of half-mask respirators should be started with those having multiple sizes and a variety of interchangeable cartridges and canisters such as the MSA Comfo II-M, North M, Survivair M, A-O M, or Scott-M. Use either of the tests outlined below to assure that the facepiece is properly adjusted.

(A) Positive pressure test. With the exhaust port(s) blocked, the negative pressure of slight inhalation should remain constant for several seconds.

(B) Negative pressure test. With the intake port(s) blocked, the negative pressure slight inhalation should remain constant for several seconds.

(ii) After a facepiece is adjusted, the test subject shall wear the facepiece for at least five minutes before conducting a qualitative test by using either of the methods described below and using the exercise regime described in (e)(i) through (v) of this subsection.

(A) Isoamyl acetate test. When using organic vapor cartridges, the test subject who can smell the odor should be unable to detect the odor of isoamyl acetate squirted into the air near the most vulnerable portions of the facepiece seal. In a location which is separated from the test area, the test subject shall be instructed to close her/his eyes during the test period. A combination cartridge or canister with organic vapor and high-efficiency filters shall be used when available for the particular mask being tested. The test subject shall be given an opportunity to smell the odor of isoamyl acetate before the test is conducted.

(B) Irritant fume test. When using high-efficiency filters, the test subject should be unable to detect the odor of irritant fume (stannic chloride or titanium tetrachloride ventilation smoke tubes) squirted into the air near the most vulnerable portions of the facepiece seal. The test subject shall be instructed to close her/his eyes during the test period.

(iii) The test subject may enter the quantitative testing chamber only if she or he has obtained a satisfactory fit as stated in (d)(ii) of this subsection.

(iv) Before the subject enters the test chamber, a reasonably stable challenge agent concentration shall be measured in the test chamber.

(v) Immediately after the subject enters the test chamber, the challenge agent concentration inside the

respirator shall be measured to ensure that the peak penetration does not exceed five percent for a half–mask and one percent for a full facepiece.

(vi) A stable challenge agent concentration shall be obtained prior to the actual start of testing.

(A) Respirator restraining straps may not be overtightened for testing. The straps shall be adjusted by the wearer to give a reasonably comfortable fit typical of normal use.

(e) Exercise regime. Prior to entering the test chamber, the test subject shall be given complete instructions as to her/his part in the test procedures. The test subject shall perform the following exercises, in the order given, for each independent test.

(i) Normal breathing (NB). In the normal standing position, without talking, the subject shall breathe normally for at least one minute.

(ii) Deep breathing (DB). In the normal standing position the subject shall do deep breathing for at least one minute pausing so as not to hyperventilate.

(iii) Turning head side to side (SS). Standing in place the subject shall slowly turn his/her head from side between the extreme positions to each side. The head shall be held at each extreme position for at least five seconds. Perform for at least three complete cycles.

(iv) Moving head up and down (UD). Standing in place, the subject shall slowly move his/her head up and down between the extreme position straight up and the extreme position straight down. The head shall be held at each extreme position for at least five seconds. Perform for at least three complete cycles.

(v) Reading (R). The test subject (keeping eyes closed) shall repeat after the test conductor the "rainbow passage" at the end of this section. The subject shall talk slowly and aloud so as to be heard clearly by the test conductor or monitor. The test subject shall read the "rainbow passage" at the end of this section.

(vi) Grimace (G). The test subject shall grimace, smile, frown, and generally contort the face using the facial muscles. Continue for at least fifteen seconds.

(vii) Bend over and touch toes (B). The test subject shall bend at the waist and touch toes and return to upright position. Repeat for at least thirty seconds.

(viii) Jogging in place (J). The test subject shall perform jog in place for at least thirty seconds.

(ix) Normal breathing (NB). Same as exercise (e)(i) of this subsection.

"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) The test shall be terminated whenever any single peak penetration exceeds five percent for half–masks and one percent for full facepieces. The test subject may be refitted and retested. If two of the three required tests are terminated, the fit shall be deemed inadequate.

(g) Calculation of fit factors.

(i) The fit factor is determined by dividing the average challenge agent concentration in the test chamber by the average challenge agent concentration inside the respirator facepiece for the test exercise.

(ii) The average test chamber concentration is the arithmetic average of the test chamber concentration at the beginning and at the end of the test.

(iii) The average peak concentration of the challenge agent inside the respirator shall be the arithmetic average peak concentrations for each of the nine exercises of the test which are computed as the arithmetic average of the peak concentrations found for each breath during the exercise.

(iv) The average peak concentration for an exercise may be determined graphically if there is not a great variation in the peak concentrations during a single exercise.

(h) Interpretation of test results. The fit factor measured by the quantitative fit testing shall be the lowest of the three fit factors resulting from three independent tests.

(i) Other requirements.

(i) The test subject shall not be permitted to wear a half–mask or full facepiece mask if the minimum fit factor of one hundred or one thousand, respectively, cannot be obtained. If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive–pressure respirator such as powered air–purifying respirators, supplied–air respirator, or self–contained breathing apparatus.

(ii) The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

(iii) If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

(iv) The test subject shall be given the opportunity to wear the assigned respirator for one week. If the respirator does not provide a satisfactory fit during actual use, the test subject may request another QNFT which shall be performed immediately.

(v) A respirator fit factor card shall be issued to the test subject with the following information:

(A) Name.

(B) Date of fit test.

(C) Fit factor obtained for each manufacturer, model and approval number of respirator tested.

(D) Name and signature of the person that conducted the test.

(vi) Filters used for qualitative or quantitative fit testing shall be replaced weekly, whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media. Organic vapor cartridges/canisters shall be replaced daily

or sooner if there is any indication of breakthrough by the test agent.

(j) In addition, because the sealing of the respirator may be affected, quantitative fit testing shall be repeated immediately when the test subject has a:

(i) Weight change of twenty pounds or more,

(ii) Significant facial scarring in the area of the facepiece seal,

(iii) Significant dental changes; i.e., multiple extractions without prosthesis, or acquiring dentures,

(iv) Reconstructive or cosmetic surgery, or

(v) Any other condition that may interfere with facepiece sealing.

(k) Recordkeeping.

A summary of all test results shall be maintained for three years. The summary shall include:

(i) Name of test subject.

(ii) Date of testing.

(iii) Name of the test conductor.

(iv) Fit factors obtained from every respirator tested (indicate manufacturer, model, size and approval number).

[Statutory Authority: Chapter 49.17 WAC. 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.]

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 above the action level, 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)

12. Place of birth _____

13. Sex 1. Male ___ 2. Female ___

14. What is your marital status? 1. Single ___ 2. Married ___ 3. Widowed ___ 4. Separated/ Divorced ___

15. Race 1. White ___ 2. Black ___ 3. Asian ___ 4. Hispanic ___ 5. Indian ___ 6. Other ___

16. What is the highest grade completed in school? _____
(For example 12 years is completion of high school)

OCCUPATIONAL HISTORY

17A. 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:

		YES	NO
E.	In a mine?	☐	☐
F.	In a quarry?	☐	☐
G.	In a foundry?	☐	☐
H.	In a pottery?	☐	☐
I.	In a cotton, flax or hemp mill?	☐	☐
J.	With asbestos?	☐	☐

18. PAST MEDICAL HISTORY

	YES	NO
A. Do you consider yourself to be in good health?	☐	☐
If "NO" state reason _____		
B. Have you any defect in vision?	☐	☐
If "YES" state nature of defect _____		
C. Have you any hearing defect?	☐	☐
If "YES" state nature of defect _____		

D. Are you suffering from or have you ever suffered from:

a. Epilepsy (or fits, seizures, convulsions)?	☐	☐
b. Rheumatic fever?	☐	☐
c. Kidney disease?	☐	☐
d. Bladder disease?	☐	☐
e. Diabetes?	☐	☐
f. Jaundice?	☐	☐

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 at death ___ Don't know			___ Age if living ___ Age at death ___ Don't know		

H. Please specify cause of death _____

COUGH

32A. Do you usually have a cough? (Count a cough with first smoke or on first going out of doors. Exclude clearing of throat.) (If no, skip to question 32C.) 1. Yes ___ 2. No ___

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? (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.) — 1. Yes ___ 2. No ___

IF YES TO 39A:

B. Do you now smoke cigarettes (as of one month ago)? — 1. Yes ___ 2. No ___ 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 ___ 2. Married ___ 3. Widowed ___ 4. Separated/ Divorced ___

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:

	Yes or No	Further Comment on Positive Answers
Asthma	___	
Bronchitis	___	
Hay fever	___	
Other allergies	___	
Pneumonia	___	
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: Chapter 49.17 WAC. 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 WAC. 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 repair operations--Nonmandatory. This appendix is intended as guidance for employers in the automotive brake and clutch repair industry who wish to reduce their employees' asbestos exposures during repair operations to levels below the new standard's action level (0.1 f/cc). WISHA believes that employers in this industry sector are likely to be able to reduce their employees' exposures to asbestos by employing the engineering and work practice controls described in subsections (1) and (2) of this section. Those employers who choose to use these controls and who achieve exposures below the action level will thus be able to avoid any burden that might be

imposed by complying with such requirements as medical surveillance, recordkeeping, training, respiratory protection, and regulated areas, which are triggered when employee exposures exceed the action level or permissible exposure limits.

Asbestos exposure in the automotive brake and clutch repair industry occurs primarily during the replacement of clutch plates and brake pads, shoes, and linings. Asbestos fibers may become airborne when an automotive mechanic removes the asbestos–containing residue that has been deposited as brakes and clutches wear. Employee exposures to asbestos occur during the cleaning of the brake drum or clutch housing.

WISHA believes that employers engaged in brake repair operations who implement any of the work practices and engineering controls described in subsections (1) and (2) of this section may be able to reduce their employees' exposures to levels below the action level (0.1 fiber/cc). These control methods and the relevant record evidence on these and other methods are described in the following sections.

(1) Enclosed cylinder/HEPA vacuum system method.

The enclosed cylinder–vacuum system used in one of the facilities visited by representatives of the National Institute for Occupational Safety and Health (NIOSH) during a health hazard evaluation of brake repair facilities consists of three components:

(a) A wheel–shaped cylinder designed to cover and enclose the wheel assembly;

(b) A compressed–air hose and nozzle that fits into a port in the cylinder; and

(c) A HEPA–filtered vacuum used to evacuate airborne dust generated within the cylinder by the compressed air.

To operate the system, the brake assembly is enclosed in a cylinder that has viewing ports to provide visibility and cotton sleeves through which the mechanic can handle the brake assembly parts. The cylinder effectively isolates asbestos dust in the drum from the mechanic's breathing zone. One company manufactures the brake assembly isolation cylinder. The cylinder is equipped with built–in compressed–air guns and a connection for a vacuum cleaner equipped with a high efficiency particulate air (HEPA) filter. This type of filter is capable of removing all particles greater than 0.3 microns from the air. When the vacuum cleaner's filter is full, it must be replaced according to the manufacturer's instruction, and appropriate HEPA–filtered dual cartridge respirators should be worn during the process. The filter of the vacuum cleaner is assumed to be contaminated with asbestos fibers and should be handled carefully, wetted with a fine mist of water, placed immediately in a labelled plastic bag, and disposed of properly. When the cylinder is in place around the brake assembly and the HEPA vacuum is connected, compressed air is blown into the cylinder to loosen the residue from the brake assembly parts. The vacuum then evacuates the loosened material from within the cylinder, capturing the airborne material on the HEPA filter.

The HEPA vacuum system can be disconnected from the brake assembly isolation cylinder when the cylinder is not being used. The HEPA vacuum can then be used for clutch facing work, grinding, or other routine cleaning.

(2) Compressed air/solvent system method.

A compressed–air hose fitted at the end with a bottle of solvent can be used to loosen the asbestos–containing residue and to capture the resulting airborne particles in the solvent mist. The mechanic should begin spraying the asbestos–contaminated parts with the solvent at a sufficient distance to ensure that the asbestos particles are not dislodged by the velocity of the solvent spray. After the asbestos particles are thoroughly wetted, the spray may be brought closer to the parts and the parts may be sprayed as necessary to remove grease and other material. The automotive parts sprayed with the mist are then wiped with a rag, which must then be disposed of appropriately. Rags should be placed in a labelled plastic bag or other container while they are still wet. This ensures that the asbestos fibers will not become airborne after the brake and clutch parts have been cleaned. (If cleanup rags are laundered rather than disposed of, they must be washed using methods appropriate for the laundering of asbestos–contaminated materials.)

WISHA believes that a variant of this compressed–air/solvent mist process offers advantages over the compressed–air/solvent mist technique discussed above, both in terms of costs and employee protection. The variant involves the use of spray cans filled with any of several solvent cleaners commercially available from auto supply stores. Spray cans of solvent are inexpensive, readily available, and easy to use. These cans will also save time, because no solvent delivery system has to be assembled, i.e., no compressed–air hose/mister ensemble. OSHA believes that a spray can will deliver solvent to the parts to be cleaned with considerably less force than the alternative compressed–air delivery system described above, and will thus generate fewer airborne asbestos fibers than the compressed–air method. The agency therefore believes that the exposure levels of automotive repair mechanics using the spray can/solvent mist process will be even lower than the exposures reported by NIOSH for the compressed–air/solvent mist system (0.08 f/cc).

(3) Information on the effectiveness of various control measures.

The amount of airborne asbestos generated during brake and clutch repair operations depends on the work practices and engineering controls used during the repair or removal activity.

(a) Prohibited methods.

The use of compressed air to blow the asbestos–containing residue off the surface of the brake drum removes the residue effectively but simultaneously produces an airborne cloud of asbestos fibers. According to NIOSH, the peak exposures of mechanics using this technique were as high as fifteen fibers/cc, and eight–hour TWA exposures ranged from 0.03 to 0.19 f/cc.

Dr. William J. Nicholson of the Mount Sinai School of Medicine cited data from Knight and Hickish (1970) that indicated that the concentration of asbestos ranged

from 0.84 to 5.35 f/cc over a sixty-minute sampling period when compressed air was being used to blow out the asbestos-containing residue from the brake drum. In the same study, a peak concentration of eighty-seven f/cc was measured for a few seconds during brake cleaning performed with compressed air. Rohl et al. (1976) measured area concentrations (of unspecified duration) within three to five feet of operations involving the cleaning of brakes with compressed air and obtained readings ranging from 6.6 to 29.8 f/cc. Because of the high exposure levels that result from cleaning brake and clutch parts using compressed air, WISHA has prohibited this practice in the revised standard.

(b) Ineffective methods.

When dry brushing was used to remove the asbestos-containing residue from the brake drums and wheel assemblies, peak exposures measured by NIOSH ranged from 0.61 to 0.81 f/cc, while eight-hour TWA levels were at the new standard's permissible exposure limit (PEL) of 0.2 f/cc. Rohl and his colleagues collected area samples one to three feet from a brake cleaning operation being performed with a dry brush, and measured concentrations ranging from 1.3 to 3.6 f/cc; however, sampling times and TWA concentrations were not presented in the Rohl et al. study.

When a brush wetted with water, gasoline, or Stoddart solvent was used to clean the asbestos-containing residue from the affected parts, exposure levels (eight-hour TWAs) measured by NIOSH also exceeded the new 0.2 f/cc PEL, and peak exposures ranged as high as 2.62 f/cc.

(c) Preferred methods.

Use of an engineering control system involving a cylinder that completely encloses the brake shoe assembly and a high efficiency particulate air (HEPA) filter-equipped vacuum produced eight-hour TWA employee exposures of 0.01 f/cc and peak exposures ranging from nondetectable to 0.07 f/cc. (Because this system achieved exposure levels below the standard's action level, it is described in detail above.) Data collected by the Mount Sinai Medical Center for Nilfisk of America, Inc., the manufacturer of the brake assembly enclosure system, showed that for two of three operations sampled, the exposure of mechanics to airborne asbestos fibers was nondetectable. For the third operator sampled by Mt. Sinai researchers, the exposure was 0.5 f/cc, which the authors attributed to asbestos that had contaminated the operator's clothing in the course of previous brake repair operations performed without the enclosed cylinder/vacuum system.

Some automotive repair facilities use a compressed-air hose to apply a solvent mist to remove the asbestos-containing residue from the brake drums before repair. The NIOSH data indicated that mechanics employing this method experienced exposures (eight-hour TWAs) of 0.8 f/cc, with peaks of 0.25 to 0.68 f/cc. This technique, and a variant of it, that WISHA believes is both less costly and more effective in reducing employee exposures, is described in greater detail in subsections (1) and (2) of this section.

(4) Summary.

In conclusion, WISHA believes that it is likely that employers in the brake and clutch repair industry will be able to avail themselves of the action level trigger built into the revised standard if they conscientiously employ one of the three control methods described above: The enclosed cylinder/HEPA vacuum system, the compressed air/solvent method, or the spray can/solvent mist system.

[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 breatheable 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 materials 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 0.2 fibers per cubic centimeter of air (0.2 f/cc) averaged over the eight-hour workday (time weighted average), or 0.1 fibers per cubic centimeter of air (0.1 f/cc) during any fifteen 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 0.2 fibers per cubic centimeter of air (0.2 f/cc) as an eight-hour time weighted average and/or 1.0 fiber per cubic centimeter (1 f/cc) during any 15 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 2 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 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: 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. 87-10-008 (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 peretoneal misothelioma, 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 action level (0.1 fiber per cubic centimeter of air). 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 (FEV_1).

(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: Chapter 49.17 RCW. 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 major asbestos removal, renovation, and demolition operations––Nonmandatory. This is a nonmandatory appendix designed to provide

guidelines to assist employers in complying with the requirements of WAC 296-62-077 through 296-62-07753. Specifically, this appendix describes the equipment, methods, and procedures that should be used in major asbestos removal projects conducted to abate a recognized asbestos hazard or in preparation for building renovation or demolition. These projects require the construction of negative-pressure temporary enclosures to contain the asbestos material and to prevent the exposure of bystanders and other employees at the worksite. WAC 296-62-07712 of the standard requires that " _____ Whenever feasible, the employer shall establish negative-pressure enclosures before commencing asbestos removal, demolition, or renovation operations." Employers should also be aware that, when conducting asbestos removal projects, they may be required under the National Emissions Standards for Hazardous Air Pollutants (NESHAPS), 40 CFR Part 61, Subpart M, or EPA regulations under the Clean Water Act.

(1) Introduction. Construction of a negative-pressure enclosure is a simple but time-consuming process that requires careful preparation and execution; however, if the procedures below are followed, contractors should be assured of achieving a temporary barricade that will protect employees and others outside the enclosure from exposure to asbestos and minimize to the extent possible the exposure of asbestos workers inside the barrier as well.

The equipment and materials required to construct these barriers are readily available and easily installed and used. In addition to an enclosure around the removal site, the standard requires employers to provide hygiene facilities that ensure that their asbestos contaminated employees do not leave the worksite with asbestos on their persons or clothing; the construction of these facilities is also described below. The steps in the process of preparing the asbestos removal site, building the enclosure, constructing hygiene facilities, removing the asbestos-containing material, and restoring the site include:

(a) Planning the removal project;
(b) Procuring the necessary materials and equipment;
(c) Preparing the work area;
(d) Removing the asbestos-containing material;
(e) Cleaning the work area; and
(f) Disposing of the asbestos-containing waste.

(2) Planning the removal project. The planning of an asbestos removal project is critical to completing the project safely and cost-effectively. A written asbestos removal plan should be prepared that describes the equipment and procedures that will be used throughout the project. The asbestos abatement plan will aid not only in executing the project but also in complying with the reporting requirements of the USEPA asbestos regulations (40 CFR 61, Subpart M), which call for specific information such as a description of control methods and control equipment to be used and the disposal sites the contractor proposes to use to dispose of the asbestos-containing materials.

The asbestos abatement plan should contain the following information:

(a) A physical description of the work area;
(b) A description of the approximate amount of material to be removed;
(c) A schedule for turning off and sealing existing ventilation systems;
(d) Personnel hygiene procedures;
(e) Labeling procedures;
(f) A description of personal protective equipment and clothing to be worn by employees;
(g) A description of the local exhaust ventilation systems to be used;
(h) A description of work practices to be observed by employees;
(i) A description of the methods to be used to remove the asbestos-containing material;
(j) The wetting agent to be used;
(k) A description of the sealant to be used at the end of the project;
(l) An air monitoring plan;
(m) A description of the method to be used to transport waste material; and
(n) The location of the dump site.

(3) 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 material, some equipment and materials are common to most asbestos removal operations. Equipment and materials that should be available at the beginning of each project are: (a) Rolls of polyethylene sheeting; (b) rolls of gray duct tape or clear plastic tape; (c) HEPA-filtered vacuum(s); (d) HEPA-filtered portable ventilation system(s); (e) a wetting agent; (f) an airless sprayer; (g) a portable shower unit; (h) appropriate respirators; (i) disposable coveralls; (j) signs and labels; (k) preprinted disposal bags; and (l) a manometer or pressure gauge.

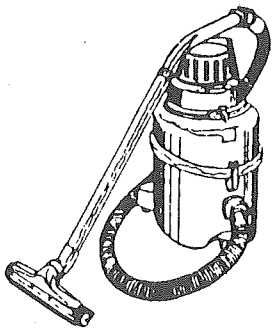
(a) and (b) Rolls of polyethylene plastic and tape. Rolls of polyethylene plastic (6 mil in thickness) should be available to construct the asbestos removal enclosure and to seal windows, doors, ventilation systems, wall penetrations, and ceilings and floors in the work area. Gray duct tape or clear plastic tape should be used to seal the edges of the plastic and to seal any holes in the plastic enclosure. Polyethylene plastic sheeting can be purchased in rolls up to twelve to twenty feet in width and up to one hundred feet in length.

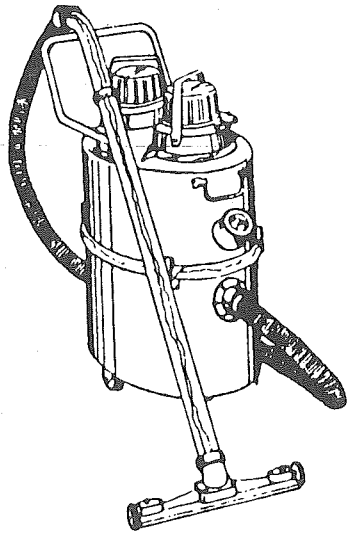
(c) HEPA-filtered vacuum. A HEPA-filtered vacuum is essential for cleaning the work area after the asbestos has been removed. Such vacuums are designed to be used with a HEPA (high-efficiency particular air) filter, which is capable of removing 99.97 percent of the asbestos particles from the air. Various sizes and capacities of HEPA vacuums are available. One manufacturer produces three models that range in capacity from five and one-quarter gallons to seventeen gallons (see Figure I-1). All of these models are portable, and all have long hoses capable of reaching out-of-the-way places, such as areas above ceiling tiles, behind pipes, etc.

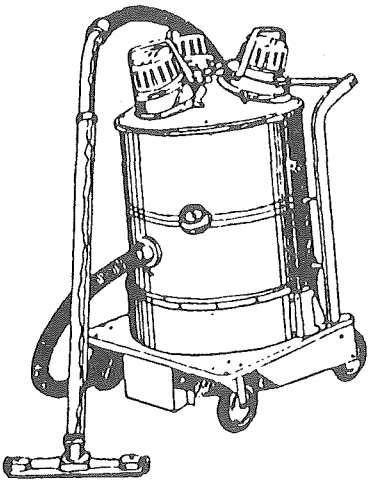
(d) Exhaust air filtration system. A portable ventilation system is necessary to create a negative-pressure within the asbestos removal enclosure. Such units are

equipped with a HEPA filter and are designed to exhaust and clean the air inside the enclosure before exhausting it to the outside of the enclosure (see Figure I–2). Systems are available from several manufacturers. One supplier has two ventilation units that range in capacity from six hundred cubic feet per minute (CFM) to one thousand seven hundred CFM. According to the manufacturer's literature, these units filter particles of 0.3 micron in size with an efficiency of 99.99 percent. The number and capacity of units required to ventilate an enclosure depend on the size of the area to be ventilated.

Figure I–1. HEPA–filtered vacuums

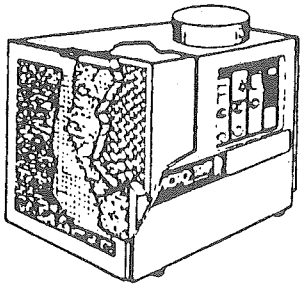






Source: Product Catalog, Asbestos Control Technologies, Inc., Maple Shade, N.J., 1985

Figure I–2. Portable exhaust ventilation system with HEPA filter



Source: Product Catalog, Asbestos Control Technologies, Inc., Maple Shade, N.J., 1985

(e) Wetting agents. Wetting agents (surfactants) are added to water (which is then called amended water) and used to soak asbestos–containing materials; amended water penetrates more effectively than plain water and permits more thorough soaking of the asbestos–containing materials. Wetting the asbestos–containing material reduces the number of fibers that will break free and become airborne when the asbestos–containing material is handled or otherwise disturbed. Asbestos–containing materials should be thoroughly soaked before removal is attempted; the dislodged material should feel spongy to the touch. Wetting agents are generally prepared by mixing one to three ounces of wetting agent to five gallons of water.

One type of asbestos, amosite, is relatively resistant to soaking, either with plain or amended water. The work practices of choice when working with amosite–containing material are to soak the material as much as possible and then to bag it for disposal immediately after removal, so that the material has no time to dry and be ground into smaller particles that are more likely to liberate airborne asbestos.

In a very limited number of situations, it may not be possible to wet the asbestos-containing material before removing it. Examples of such rare situations are: (i) Removal of asbestos material from a "live" electrical box that was oversprayed with the material when the rest of the area was sprayed with asbestos-containing coating; and (ii) removing asbestos-containing insulation from a live steam pipe. In both of these situations, the preferred approach would be to turn off the electricity or steam, respectively, to permit wet removal methods to be used. However, where removal work must be performed during working hours, i.e., when normal operations cannot be disrupted, the asbestos-containing material must be removed dry. Immediate bagging is then the only method of minimizing the amount of airborne asbestos generated.

(f) Airless sprayer. Airless sprayers are used to apply amended water to asbestos-containing materials. Airless sprayers allow the amended water to be applied in a fine spray that minimizes the release of asbestos fibers by reducing the impact of the spray on the material to be removed. Airless sprayers are inexpensive and readily available.

(g) Portable shower. Unless the site has available a permanent shower facility that is contiguous to the removal area, a portable shower system is necessary to permit employees to clean themselves after exposure to asbestos and to remove any asbestos contamination from their hair and bodies. Taking a shower prevents employees from leaving the work area with asbestos on their clothes and thus prevents the spread of asbestos contamination to areas outside the asbestos removal area. This measure also protects members of the families of asbestos workers from possible exposure to asbestos. Showers should be supplied with warm water and a drain. A shower water filtration system to filter asbestos fibers from the shower water is recommended. Portable shower units are readily available, inexpensive, and easy to install and transport.

(h) Respirators. Employees involved in asbestos removal projects should be provided with appropriate NIOSH-approved respirators. Selection of the appropriate respirator should be based on the concentration of asbestos fibers in the work area. If the concentration of asbestos fibers is unknown, employees should be provided with respirators that will provide protection against the highest concentration of asbestos fibers that can reasonably be expected to exist in the work area. For all work within an enclosure, employees should wear supplied air respirators (see WAC 296-62-07715(3)).

(i) Disposable coveralls. Employees involved in asbestos removal operations should be provided with disposable impervious coveralls that are equipped with head and foot covers. Such coveralls are typically made of Tyvek.[1] The coverall has a zipper front and elastic wrists and ankles.

(j) Signs and labels. Before work begins, a supply of signs to demarcate the entrance to the work area should be obtained. Signs are available that have the wording required by the final WISHA standard. The required labels are also commercially available as press-on labels and preprinted on the 6-mil polyethylene plastic bags used to dispose of asbestos-containing waste material.

(4) Preparing the work area. Preparation for constructing negative-pressure enclosures should begin with the removal of all movable objects from the work area, e.g., desks, chairs, rugs, and light fixtures, to ensure that these objects do not become contaminated with asbestos. When objects or surfaces are contaminated or are suspected of being contaminated, they should be vacuumed with a HEPA vacuum and cleaned with amended water, unless they are made of material that will be damaged by the wetting agent; wiping with plain water is recommended in those cases where amended water will damage the object. Before the asbestos removal work begins, objects that cannot be removed from the work area should be covered with a 6-mil-thick polyethylene plastic sheeting that is securely taped with duct tape or plastic tape to achieve an air-tight seal around the object.

(5) Constructing the enclosure. When all objects have either been removed from the work area or covered with plastic, all penetrations of the floor, walls, and ceiling should be sealed with 6-mil polyethylene plastic and tape to prevent airborne asbestos from escaping into areas outside the work area or from lodging in cracks around the penetrations. Penetrations that require sealing are typically found around electrical conduits, telephone wires, and water supply and drain pipes. A single entrance to be used for access and egress to the work area should be selected, and all other doors and windows should be sealed with tape or be covered with 6-mil polyethylene plastic sheeting and securely taped. Covering windows and unnecessary doors with a layer of polyethylene before covering the walls provides a second layer of protection and saves time in installation because it reduces the number of edges that must be cut and taped. All other surfaces such as support columns, ledges, pipes, and other surfaces should also be covered with polyethylene plastic sheeting and taped before the walls themselves are completely covered with sheeting.

Next a thin layer of spray adhesive should be sprayed along the top of all walls surrounding the enclosed work area, close to the wall-ceiling interface, and a layer of polyethylene plastic sheeting should be stuck to this adhesive and taped. The entire inside surfaces of all wall areas are covered in this manner, and the sheeting over the walls is extended across the floor area until it meets in the center of the area, where it is taped to form a single layer of material encasing the entire room except for the ceiling. A final layer of plastic sheeting is then laid across the plastic-covered floor area and up the walls to a level of two feet or so; this layer provides a second protective layer of plastic sheeting over the floor, which can then be removed and disposed of easily after the asbestos-containing material that has dropped to the floor has been bagged and removed.

(6) Building hygiene facilities. WAC 296-62-07719 mandates that employers involved in asbestos removal, demolition, or renovation operations provide their employees with hygiene facilities to be used to decontaminate asbestos-exposed workers, equipment,

and clothing before such employees leave the work area. These decontamination facilities consist of:

(a) A clean change room;

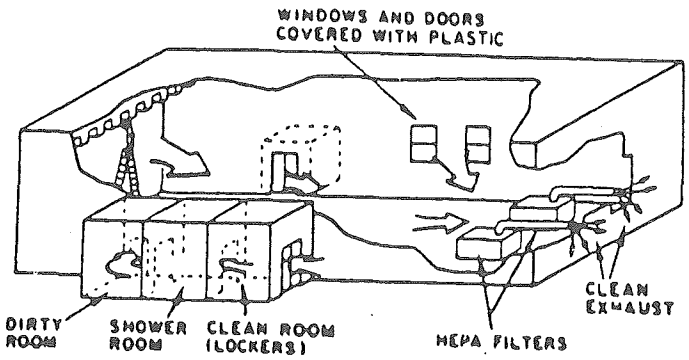
(b) A shower; and

(c) An equipment room.

The clean change room is an area in which employees remove their street clothes and don their respirators and disposable protective clothing. The clean room should have hooks on the wall or be equipped with lockers for the storage of workers' clothing and personal articles. Extra disposable coveralls and towels can also be stored in the clean change room.

The shower should be contiguous with both the clean and dirty change room (see Figure I–3) and should be used by all workers leaving the work area. The shower should also be used to clean asbestos–contaminated equipment and materials, such as the outsides of asbestos waste bags and hand tools used in the removal process.

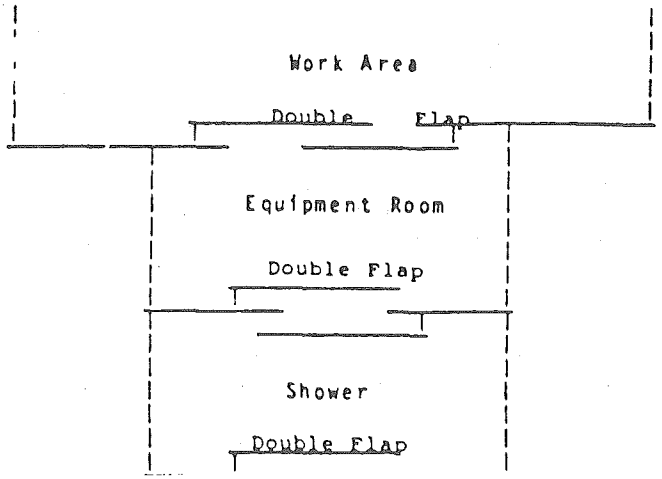
Figure I–3. Cutaway view of enclosure and hygiene facilities



Source: EPA 1985. Asbestos Waste Management Guidance (EPA/530 SW–85–007)

The equipment room (also called the dirty change room) is the area where workers remove their protective coveralls and where equipment that is to be used in the work area can be stored. The equipment room should be lined with 6–mil–thick polyethylene plastic sheeting in the same way as was done in the work area enclosure. Two layers of 6–mil polyethylene plastic sheeting that are not taped together from a double flap or barrier between the equipment room and the work area and between the shower and the clean change room (see Figure I–4).

Figure I–4. Typical hygiene facility layout



When feasible, the clean change room, shower, and equipment room should be contiguous and adjacent to the negative–pressure enclosure surrounding the removal area. In the overwhelming number of cases, hygiene facilities can be built contiguous to the negative–pressure enclosure. In some cases, however, hygiene facilities may have to be located on another floor of the building where removal of asbestos–containing materials is taking place. In these instances, the hygiene facilities can in effect be made to be contiguous to the work area by constructing a polyethylene plastic "tunnel" from the work area to the hygiene facilities. Such a tunnel can be made even in cases where the hygiene facilities are located several floors above or below the work area; the tunnel begins with a double flap door at the enclosure, extends through the exit from the floor, continues down the necessary number of flights of stairs and goes through a double flap entrance to the hygiene facilities, which have been prepared as described above. The tunnel is constructed of two–inch by four–inch lumber or aluminum struts and covered with 6–mil–thick polyethylene plastic sheeting.

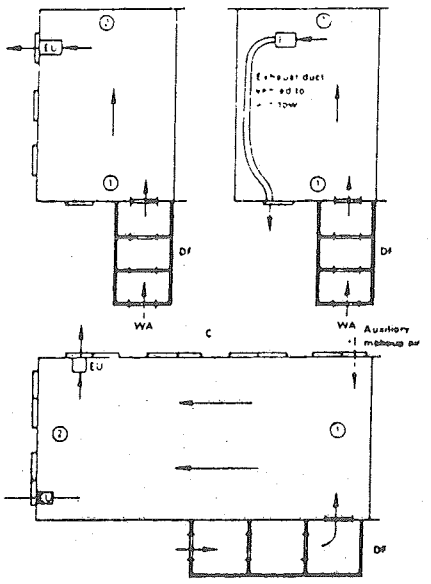
In the rare instances when there is not enough space to permit any hygiene facilities to be built at the worksite, employees should be directed to change into a clean disposable worksuit immediately after exiting the enclosure (without removing their respirators) and to proceed immediately to the shower. Alternatively, employees could be directed to vacuum their disposable coveralls with a HEPA–filtered vacuum before proceeding to a shower located a distance from the enclosure.

The clean room, shower, and equipment room must be sealed completely to ensure that the sole source of air flow through these areas originates from uncontaminated areas outside the asbestos removal, demolition, or renovation enclosure. The shower must be drained properly after each use to ensure that contaminated water is not released to uncontaminated areas. If waste water is inadvertently released, it should be cleaned up as soon as possible to prevent any asbestos in the water from drying and becoming airborne in areas outside the work area.

(7) Establishing negative–pressure within the enclosure. After construction of the enclosure is completed, a ventilation system(s) should be installed to create a negative–pressure within the enclosure with respect to the area outside the enclosure. Such ventilation systems must be equipped with HEPA filters to prevent the release of asbestos fibers to the environment outside the enclosure and should be operated twenty–four hours per day during the entire project until the final cleanup is completed and the results of final air samples are received from the laboratory. A sufficient amount of air should be exhausted to create a pressure of –0.02 inches of water within the enclosure with respect to the area outside the enclosure.

These ventilation systems should exhaust the HEPA–filtered clean air outside the building in which the asbestos removal, demolition, or renovation is taking place (see Figure I–5). If access to the outside is not available, the ventilation system can exhaust the HEPA–filtered asbestos–free air to an area within the building that is as far away as possible from the enclosure. Care should be taken to ensure that the clean air is released either to an asbestos–free area or in such a way as not to disturb any asbestos–containing materials.

Figure I–5. Examples of negative–pressure systems. DF, decontamination facility; EU, exhaust unit; WA, worker access; A, single–room work area with multiple windows; B, single–room work area with single window near entrance; C, large single–room work area with windows and auxiliary makeup air source (dotted arrow). Arrows denote direction of air flow. Circled numbers indicate progression of removal sequence.



Source: EPA 1985. Guidance for Controlling Asbestos–Containing Materials in Buildings (EPA 560/5–85–024)

A manometer or pressure gauge for measuring the negative pressure within the enclosure should be installed and should be monitored frequently throughout all work shifts during which asbestos removal, demolition, or renovation takes place. Several types of manometers and pressure gauges are available for this purpose.

All asbestos removal, renovation, and demolition operations should have a program for monitoring the concentration of airborne asbestos and employee exposures to asbestos. Area samples should be collected inside the enclosure (approximately four samples for five thousand square feet of enclosure area). At least two samples should be collected outside the work area, one at the entrance to the clean change room and one at the exhaust of the portable ventilation system. In addition, several breathing zone samples should be collected from those workers who can reasonably be expected to have the highest potential exposure to asbestos.

(8) Removing asbestos materials. Employers involved in asbestos removal, demolition, or renovation operations designate a competent person to:

(a) Set up the enclosure;

(b) Ensure the integrity of the enclosure;

(c) Control entry to and exit from the enclosure;

(d) Supervise all employee exposure monitoring required by this section;

(e) Ensure the use of protective clothing and equipment;

(f) Ensure that employees are trained in the use of engineering controls, work practices, and personal protective equipment;

(g) Ensure the use of hygiene facilities and the observance of proper decontamination procedures; and

(h) Ensure that engineering controls are functioning properly.

The competent person will generally be a certified industrial hygienist, an industrial hygienist with training and experience in the handling of asbestos, or a person who has such training and experience as a result of on–the–job training and experience.

Ensuring the integrity of the enclosure is accomplished by inspecting the enclosure before asbestos removal work begins and prior to each work shift throughout the entire period work is being conducted in the enclosure. The inspection should be conducted by locating all areas where air might escape from the enclosure; this is best accomplished by running a hand over all seams in the plastic enclosure to ensure that no seams are ripped and the tape is securely in place.

The competent person should also ensure that all unauthorized personnel do not enter the enclosure and that all employees and other personnel who enter the enclosure have the proper protective clothing and equipment. He or she should also ensure that all employees and other personnel who enter the enclosure use the hygiene facilities and observe the proper decontamination procedures (described below).

Proper work practices are necessary during asbestos removal, demolition, and renovation to ensure that the concentration of asbestos fibers inside the enclosure remains as low as possible. One of the most important work practices is to wet the asbestos–containing material

before it is disturbed. After the asbestos–containing material is thoroughly wetted, it should be removed by scraping (as in the case of sprayed–on or troweled–on ceiling material) or removed by cutting the metal bands or wire mesh that support the asbestos–containing material on boilers or pipes. Any residue that remains on the surface of the object from which asbestos is being removed should be wire brushed and wet wiped.

Bagging asbestos waste material promptly after its removal is another work practice control that is effective in reducing the airborne concentration of asbestos within the enclosure. Whenever possible, the asbestos should be removed and placed directly into bags for disposal rather than dropping the material to the floor and picking up all of the material when the removal is complete. If a significant amount of time elapses between the time that the material is removed and the time it is bagged, the asbestos material is likely to dry out and generate asbestos–laden dust when it is disturbed by people working within the enclosure. Any asbestos–contaminated supplies and equipment that cannot be decontaminated should be disposed of in prelabeled bags; items in this category include plastic sheeting, disposable work clothing, respirator cartridges, and contaminated wash water.

A checklist is one of the most effective methods of ensuring adequate surveillance of the integrity of the asbestos removal enclosure. Such a checklist is shown in Figure I–6. Filling out the checklist at the beginning of each shift in which asbestos removal is being performed will serve to document that all the necessary precautions will be taken during the asbestos removal work. The checklist contains entries for ensuring that:

The work area enclosure is complete;

The negative–pressure system is in operation;

Necessary signs and labels are used;

Asbestos Removal, Renovation, and Demolition Checklist

Date _____ Location _____

Supervisor _____ Project # _____

Work Area (sq. ft.) _____

	Yes	No
I. Work site barrier		
Floor covered	___	___
Walls covered	___	___
Area ventilation off	___	___
All edges sealed	___	___
Penetrations sealed	___	___
Entry curtains	___	___
II. Negative air pressure		
HEPA Vac ____ Ventilation system ____		
Constant operation	___	___
Negative pressure achieved	___	___
III. Signs		
Work area entrance	___	___
Bags labeled	___	___
IV. Work practices		
Removed material promptly bagged	___	___
Material worked wet	___	___
HEPA vacuum used	___	___
No smoking	___	___
No eating, drinking	___	___
Work area cleaned after completion	___	___
Personnel decontaminated each departure	___	___
V. Protective equipment		
Disposable clothing used one time	___	___
Proper NIOSH–approved respirators	___	___
VII. Showers		
On site	___	___
Functioning	___	___
Soap and towels	___	___
Used by all personnel	___	___

Figure I–6. Checklist

Appropriate work practices are used;

Necessary protective clothing and equipment are used; and

Appropriate decontamination procedures are being followed.

(9) Cleaning the work area. After all of the asbestos–containing material is removed and bagged, the entire work area should be cleaned until it is free of all visible asbestos dust. All surfaces from which asbestos has been removed should be cleaned by wire brushing the surfaces, HEPA vacuuming these surfaces, and wiping them with amended water. The inside of the plastic enclosure should be vacuumed with a HEPA vacuum and wet wiped until there is no visible dust in the enclosure. Particular attention should be given to small horizontal surfaces such as pipes, electrical conduits, lights, and support tracks for drop ceilings. All such surfaces should be free of visible dust before the final air samples are collected.

Additional sampling should be conducted inside the enclosure after the cleanup of the work area has been completed. Approximately four area samples should be collected for each five thousand square feet of enclosure area. The enclosure should not be dismantled unless the final samples show asbestos concentrations of less than the action level.

A clearance checklist is an effective method of ensuring that all surfaces are adequately cleaned and the enclosure is ready to be dismantled. Figure I–7 shows a checklist that can be used during the final inspection phase of asbestos abatement, removal, or renovation operations.

Final Inspection of Asbestos Removal, Renovation, and Demolition Projects

Date: _____

Project: _____

Location: _____

Building: _____

CHECKLIST:

Residual dust on:	Yes	No		Yes	No
a. Floor	___	___	e. Horizontal surfaces	___	___
b. Horizontal surfaces	___	___	f. Pipes	___	___
c. Pipes	___	___	g. Ducts	___	___
d. Ventilation equipment	___	___	h. Register	___	___
			i. Lights	___	___

FIELD NOTES:
Record any problems encountered here.

FINAL AIR SAMPLE RESULTS: _____

Figure I-7. Clearance Checklist

[1] Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07751, filed 11/30/87.]

WAC 296-62-07753 Appendix J--Work practices and engineering controls for small-scale, short-duration asbestos renovation and maintenance activities--Nonmandatory. This appendix is not mandatory, in that employers may choose to comply with all of the requirements of WISHA's standard for occupational exposure to asbestos during construction activities, WAC 296-62-077 through 296-62-07753. However, employers wishing to be exempted from the requirements of WAC 296-62-07712 shall comply with the provisions of this appendix when performing small-scale, short-duration renovation or maintenance operations. WISHA anticipates that employers in the electrical, carpentry, utility, plumbing, and interior construction trades may wish to avail themselves of the final standard's exemptions for small-scale, short-duration renovation and maintenance activities.

(1) Definition of small-scale, short-duration activities. For the purposes of this appendix, small-scale, short-duration renovation and maintenance activities are tasks such as, but not limited to:

Removal of asbestos-containing insulation on pipes;

Removal of small quantities of asbestos-containing insulation on beams or above ceilings;

Replacement of an asbestos-containing gasket on a valve;

Installation or removal of a small section of drywall;

Installation of electrical conduits through or proximate to asbestos-containing materials.

Evidence in the record suggests that the use of certain engineering and work practice controls is capable of reducing employee exposures to asbestos to levels below the action level (0.1 f/cc). Several controls and work practices, used either singly or in combination, can be employed effectively to reduce asbestos exposures during small maintenance and renovation operations. These include:

Wet methods;

Removal methods;

Use of glove bags;

Removal of entire asbestos insulated pipes or structures;

Use of mini-enclosures;

Enclosure of asbestos materials; and

Maintenance programs.

This appendix describes these controls and work practices in detail.

(2) Preparation of the area before renovation or maintenance activities. The first step in preparing to perform a small-scale, short-duration asbestos renovation or maintenance task, regardless of the abatement method that will be used, is the removal from the work area of all objects that are movable to protect them from asbestos contamination. Objects that cannot be removed must be covered completely with a 6-mil-thick polyethylene plastic sheeting before the task begins. If objects have already been contaminated, they should be thoroughly cleaned with a high-efficiency particulate air (HEPA) filtered vacuum or be wet wiped before they are removed from the work area or completely encased in the plastic.

(3) Wet methods. Whenever feasible, and regardless of the abatement method to be used (e.g., removal, enclosure, use of glove bags), wet methods must be used during small-scale, short-duration maintenance and renovation activities that involve disturbing asbestos-containing materials. Handling asbestos materials wet is one of the most reliable methods of ensuring that asbestos fibers do not become airborne, and this practice should therefore be used whenever feasible. Wet methods can be used in the great majority of workplace situations. Only in cases where asbestos work must be performed on live electrical equipment, on live steam lines, or in other areas where water will seriously damage materials or equipment may dry removal be performed. Amended water or another wetting agent should be applied by means of an airless sprayer to minimize the extent to which the asbestos-containing material is disturbed.

Asbestos-containing materials should be wetted from the initiation of the maintenance or renovation operation and wetting agents should be used continually throughout the work period to ensure that any dry asbestos-containing material exposed in the course of the work is wet and remains wet until final disposal.

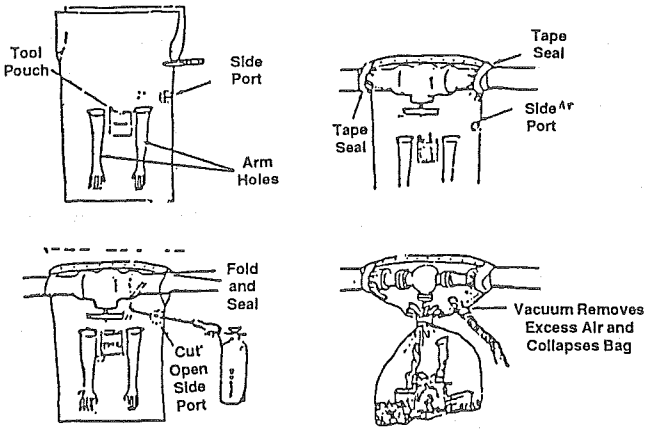
(4) Removal of small amount of asbestos-containing materials. Several methods can be used to remove small amounts of asbestos-containing materials during small-scale, short-duration renovation or maintenance tasks. These include the use of glove bags, the removal of an entire asbestos-covered pipe or structure, and the construction of mini-enclosures. The procedures that employers must use for each of these operations if they wish to avail themselves of the final rule's exemptions are described in the following subsections.

(5) Glove bags. The use of glove bags to enclose the work area during small-scale, short-duration maintenance or renovation activities will result in employee exposures to asbestos that are below the action level of 0.1 f/cc. This appendix provides requirements for glove bag procedures to be followed by employers wishing to avail themselves of the standard's exemptions for each activities. WISHA has determined that the use of these procedures will reduce the eight-hour time-weighted average (TWA) exposures of employees involved in these work operations to levels below the action level and

will thus provide a degree of employee protection equivalent to that provided by compliance with all provisions of the final rule.

(a) Glove bag installation. Glove bags are approximately forty–inch–wide times sixty–four–inch–long bags fitted with arms through which the work can be performed (see Figure J–1(A)). When properly installed and used, they permit workers to remain completely isolated from the asbestos material removed or replaced inside the bag. Glove bags can thus provide a flexible, easily installed, and quickly dismantled temporary small work area enclosure that is ideal for small–scale asbestos renovation or maintenance jobs.

Figure J–1. Diagrams showing proper use of glove bags in small–scale, short–duration maintenance and renovation operations



These bags are single use control devices that are disposed of at the end of each job. The bags are made of transparent 6–mil–thick polyethylene plastic with arms made of material such as Tyvek* (the same material used to make the disposable protective suits used in major asbestos removal, renovation, and demolition operations and in protective gloves). Glove bags are readily available from safety supply stores or specialty asbestos removal supply houses. Glove bags come prelabeled with the asbestos warning label prescribed by WISHA and EPA for bags used to dispose of asbestos waste.

(b) Glove bag equipment and supplies. Supplies and materials that are necessary to use glove bags effectively include:

(i) Tape to seal the glove bag to the area from which asbestos is to be removed;

(ii) Amended water or other wetting agents;

(iii) An airless sprayer for the application of the wetting agent;

(iv) Bridging encapsulant (a paste–like substance for coating asbestos) to seal the rough edges of any asbestos–containing materials that remain within the glove bag at the points of attachment after the rest of the asbestos has been removed;

(v) Tools such as razor knives, nips, and wire brushes (or other tools suitable for cutting wire, etc.);

(vi) A HEPA filter–equipped vacuum for evacuating the glove bag (to minimize the release of asbestos fibers) during removal of the bag from the work area and for cleaning any material that may have escaped during the installation of the glove bag; and

(vii) HEPA–equipped cartridge respirators for use by the employees involved in the removal of asbestos with the glove bag.

(c) Glove bag work practices. The proper use of glove bags requires the following steps:

(i) Glove bags must be installed so that they completely cover the pipe or other structure where asbestos work is to be done. Glove bags are installed by cutting the sides of the glove bag to fit the size of the pipe from which asbestos is to be removed. The glove bag is attached to the pipe by folding the open edges together and securely sealing them with tape. All openings in the glove bag must be sealed with duct tape or equivalent material. The bottom seam of the glove bag must also be sealed with duct tape or equivalent to prevent any leakage from the bag that may result from a defect in the bottom seam (Figure J–1(B)).

(ii) The employee who is performing the asbestos removal with the glove bag must don a half–mask dual–cartridge HEPA–equipped respirator; respirators and protective clothing should be worn by employees who are in close contact with the glove bag and who may thus be exposed as a result of small gaps in the seams of the bag or holes punched through the bag by a razor knife or a piece of wire mesh.

(iii) The removed asbestos material from the pipe or other surface that has fallen into the enclosed bag must be thoroughly wetted with a wetting agent (applied with an airless sprayer through the precut port provided in most glove bags or applied through a small hole cut in the bag) (Figure J–1(C)).

(iv) Once the asbestos material has been thoroughly wetted, it can be removed from the pipe, beam or other surface. The choice of tool to use to remove the asbestos–containing material depends on the type of material to be removed. Asbestos–containing materials are generally covered with painted canvas and/or wire mesh. Painted canvas can be cut with a razor knife and peeled away from the asbestos–containing material underneath. Once the canvas has been peeled away, the asbestos–containing material underneath may be dry, in which case it should be resprayed with a wetting agent to ensure that it generates as little dust as possible when removed. If the asbestos–containing material is covered with wire mesh, the mesh should be cut with nips, tin snips, or other appropriate tool and removed.

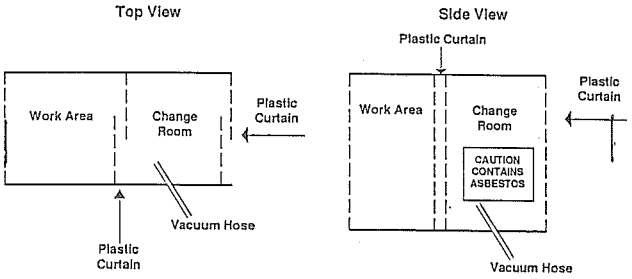
A wetting agent must then be used to spray any layer of dry material that is exposed beneath the mesh, the surface of the stripped underlying structure, and the inside of the glove bag.

(v) After removal of the layer of asbestos–containing material, the pipe or surface from which asbestos has been removed must be thoroughly cleaned with a wire brush and wet wiped with a wetting agent until no traces of the asbestos–containing material can be seen.

(vi) Any asbestos–containing insulation edges that have been exposed as a result of the removal or maintenance activity must be encapsulated with bridging encapsulant to ensure that the edges do not release asbestos fibers to the atmosphere after the glove bag has been removed.

(vii) When the asbestos removal and encapsulation have been completed, a vacuum hose from a HEPA–filtered vacuum must be inserted into the glove bag through the port to remove any air in the bag that may contain asbestos fibers. When the air has been removed from the bag, the bag should be squeezed tightly (as close to the top as possible), twisted, and sealed with tape, to keep the asbestos materials safely in the bottom of the bag. The HEPA vacuum can then be removed from the bag and the glove bag itself can be removed from the work area to be disposed of properly (Figure J–1(D)).

Figure J–2. Schematic of mini–enclosure



(6) Mini–enclosures. In some instances, such as removal of asbestos from a small ventilation system or from a short length of duct, a glove bag may not be either large enough or of the proper shape to enclose the work area. In such cases, a mini–enclosure can be built around the area where small–scale, short–duration asbestos maintenance or renovation work is to be performed (Figure J–2). Such an enclosure should be constructed of 6–mil–thick polyethylene plastic sheeting and can be small enough to restrict entry to the asbestos work area to one worker.

For example, a mini–enclosure can be built in a small utility closet when asbestos–containing duct covering is to be removed. The enclosure is constructed by:

(a) Affixing plastic sheeting to the walls with spray adhesive and tape;

(b) Covering the floor with plastic and sealing the plastic covering the floor to the plastic on the walls;

(c) Sealing any penetrations such as pipes or electrical conduits with tape; and

(d) Constructing a small change room (approximately three feet square) made of 6–mil–thick polyethylene plastic supported by two–inch by four–inch lumber (the plastic should be attached to the lumber supports with staples or spray adhesive and tape).

The change room should be contiguous to the mini–enclosure, and is necessary to allow the worker to vacuum off his protective coveralls and remove them before leaving the work area. While inside the enclosure, the worker should wear Tyvek[1] disposable coveralls and 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.

(7) Removal of entire structures. When pipes are insulated with asbestos–containing materials, removal of the entire pipe may be more protective, easier, and more cost–effective than stripping the asbestos insulation from the pipe. Before such a pipe is cut, the asbestos–containing insulation must be wrapped with 6–mil polyethylene plastic and securely sealed with duct tape or equivalent. This plastic covering will prevent asbestos fibers from becoming airborne as a result of the vibration created by the power saws used to cut the pipe. If possible, the pipes should be cut at locations that are not insulated to avoid disturbing the asbestos. If a pipe is completely insulated with asbestos–containing materials, small sections should be stripped using the glove–bag method described above before the pipe is cut at the stripped sections.

(8) Enclosure. The decision to enclose rather than remove asbestos–containing material from an area depends on the building owner's preference, i.e., for removal or containment. Owners consider such factors as cost effectiveness, the physical configuration of the work area, and the amount of traffic in the area when determining which abatement method to use.

If the owner chooses to enclose the structure rather than to remove the asbestos–containing material insulating it, a solid structure (airtight walls and ceilings) must be built around the asbestos covered pipe or structure to prevent the release of asbestos–containing materials into the area beyond the enclosure and to prevent disturbing these materials by casual contact during future maintenance operations.

Such a permanent (i.e., for the life of the building) enclosure should be built of new construction materials and should be impact resistant and airtight. Enclosure walls should be made of tongue–and–groove boards, boards with spine joints, or gypsum boards having taped seams. The underlying structure must be able to support the weight of the enclosure. (Suspended ceilings with laid in panels do not provide airtight enclosures and should not be used to enclose structures covered with asbestos–containing materials.) All joints between the walls and ceiling of the enclosure should be caulked to prevent the escape of asbestos fibers. During the installation of enclosures, tools that are used (such as drills or rivet tools) should be equipped with HEPA–filtered vacuums. Before constructing the enclosure, all electrical conduits, telephone lines, recessed lights, and pipes in the area to be enclosed should be moved to ensure that

the enclosure will not have to be reopened later for routine or emergency maintenance. If such lights or other equipment cannot be moved to a new location for logistic reasons, or if moving them will disturb the asbestos–containing materials, removal rather than enclosure of the asbestos–containing materials is the appropriate control method to use.

(9) Maintenance program. An asbestos maintenance program must be initiated in all facilities that have asbestos–containing materials. Such a program should include:

Development of an inventory of all asbestos–containing materials in the facility;

Periodic examination of all asbestos–containing materials to detect deterioration;

Written procedures for handling asbestos materials during the performance of small–scale, short–duration maintenance and renovation activities;

Written procedures for asbestos disposal; and

Written procedures for dealing with asbestos–related emergencies.

Members of the building's maintenance engineering staff (electricians, heating/air conditioning engineers, plumbers, etc.) who may be required to handle asbestos–containing materials should be trained in safe procedures. Such training should include at a minimum:

Information regarding types of asbestos and its various uses and forms;

Information on the health effects associated with asbestos exposure;

Descriptions of the proper methods of handling asbestos–containing materials; and

Information on the use of HEPA–equipped dual cartridge respiratory and other personal protection during maintenance activities.

(10) Prohibited activities. The training program for the maintenance engineering staff should describe methods of handling asbestos–containing materials as well as routine maintenance activities that are prohibited when asbestos–containing materials are involved. For example, maintenance staff employees should be instructed:

Not to drill holes in asbestos–containing materials;

Not to hang plants or pictures on structures covered with asbestos–containing materials;

Not to sand asbestos–containing floor tile;

Not to damage asbestos–containing materials while moving furniture or other objects;

Not to install curtains, drapes, or dividers in such a way that they damage asbestos–containing materials;

Not to dust floors, ceilings, moldings or other surfaces in asbestos–contaminated environments with a dry brush or sweep with a dry broom;

Not to use an ordinary vacuum to clean up asbestos–containing debris;

Not to remove ceiling tiles below asbestos–containing materials without wearing the proper respiratory protection, clearing the area of other people, and observing asbestos removal waste disposal procedures;

Not to remove ventilation system filters dry; and

Not to shake ventilation system filters.

* Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

[1] Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

[Statutory Authority: Chapter 49.17 RCW. 89–21–018 (Order 89–10), § 296–62–07753, filed 10/10/89, effective 11/24/89; 87–24–051 (Order 87–24), § 296–62–07753, filed 11/30/87.]

WAC 296–62–07761 Nonasbestiform tremolite, anthophyllite, and actinolite. (1) Definitions. For the purpose of this section:

(a) "Department" means the department of labor and industries.

(b) "Director" means the director of the department of labor and industries or his/her authorized representatives.

(c) "Employee exposure" means that exposure to airborne tremolite, anthophyllite, actinolite, or a combination of these minerals that would occur if the employee were not using respiratory protective equipment.

(d) "Fiber" means a particulate form of tremolite, anthophyllite, or actinolite, five micrometers or longer, with a length–to–diameter ratio of at least three to one.

(e) "Tremolite, anthophyllite, or actinolite" means the nonasbestos form of these minerals, and any of these minerals that have been chemically treated and/or altered.

(2) Permissible exposure to airborne concentrations of tremolite, anthophyllite, and actinolite fibers including any combination of these minerals.

(a) The eight–hour time–weighted average airborne concentration of tremolite, anthophyllite, and actinolite fibers to which any employee may be exposed shall not exceed two fibers per cubic centimeter of air, as determined by the method prescribed in subsection (5) of this section.

(b) Ceiling concentration. No employee shall be exposed at any time to an airborne concentration of tremolite, anthophyllite, and actinolite fibers in excess of ten fibers per cubic centimeter of air, as determined by the method prescribed in subsection (5) of this section.

(3) Methods of compliance.

(a) Engineering methods.

(i) Engineering controls. Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in subsection (2) of this section.

(ii) Local exhaust ventilation. Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2–1971, which is incorporated by reference herein.

(iii) Particular tools. All hand–operated and power–operated tools which may produce or release tremolite, anthophyllite, and actinolite fibers in excess of the exposure limits prescribed in subsection (2) of this section, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with (a)(ii) of this subsection.

(b) Work practices.

(i) Wet methods. Insofar as practicable, tremolite, anthophyllite, and actinolite shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in subsection (2) of this section, unless the usefulness of the product would be diminished thereby.

(ii) Particular products and operations. No tremolite, anthophyllite, and actinolite cement, mortar, coating, grout, plaster, or similar material containing tremolite, anthophyllite, and actinolite shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne tremolite, anthophyllite, and actinolite fibers in excess of the limits prescribed in subsection (2) of this section.

(iii) Spraying, demolition, or removal. Employees engaged in the spraying of tremolite, anthophyllite, and actinolite, the removal, or demolition of pipes, structures, or equipment covered or insulated with tremolite, anthophyllite, and actinolite, and in the removal or demolition of tremolite, anthophyllite, and actinolite insulation or coverings shall be provided with Type "C" supplied air respiratory equipment and with special clothing in accordance with subsection (4)(c) of this section.

(4) Personal protective equipment.

(a) Compliance with the exposure limits prescribed by subsection (2) of this section may not be achieved by the use of respirators or shift rotation of employees except:

(i) During the time period necessary to install the engineering controls and to institute the work practices required by subsection (3) of this section.

(ii) In work situations in which the methods prescribed in subsection (3) of this section are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentration of tremolite, anthophyllite, and actinolite fibers below the limits prescribed by subsection (2) of this section; or

(iii) In emergencies.

(iv) Where both respirators and personnel rotation are allowed by (a)(i), (ii), or (iii) of this subsection, and both are practicable, personnel rotation shall be preferred and used.

(b) Where a respirator is permitted by (a)(i), (ii), or (iii) of this subsection, it shall comply with the applicable provisions of WAC 296-62-071.

(i) Respirator selection. The employer shall select, provide, and ensure the use of respirators, at no cost to the employees, in accordance with the respirator protection factors listed in Table 1 of this section.

(ii) Establishment of a respirator program.

(A) The employer shall establish a respirator program in accordance with the requirements of chapter 296-62 WAC.

(B) No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his/her use of a respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he/she is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he/she had just prior to such transfer, if such a different position is available.

(c) Special clothing: The employer shall provide at no cost, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to an airborne concentration of tremolite, anthophyllite, and actinolite fibers, which exceeds 2 f/cc.

(d) Change rooms:

(i) At any place of employment exposed to an airborne concentration of tremolite, anthophyllite, and actinolite fibers in excess of the exposure limits prescribed in subsection (2) of this section, the employer shall provide change rooms for employees.

(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his/her work clothes.

(iii) Laundering:

(A) Laundering of tremolite, anthophyllite, and actinolite contaminated clothing shall be done so as to prevent the release of airborne fibers in excess of the exposure limits prescribed in subsection (2) of this section.

(B) Any employer who gives contaminated clothing to another person for laundering shall inform such person of the requirement in (d) of this subsection to effectively prevent the release of airborne tremolite, anthophyllite, and actinolite fibers in excess of the exposure limits prescribed in subsection (2) of this section.

(C) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with subsection (7)(b) of this section.

(5) Method of measurement. All determinations of airborne concentrations of tremolite, anthophyllite, and actinolite fibers shall be made by the membrane filter method at 400–450 X (magnification) four millimeter objective with phase contrast illumination.

(6) Monitoring.

(a) Initial determinations. Every employer shall cause every place of employment where tremolite, anthophyllite, and actinolite fibers are released to be monitored in such a way as to determine whether every employee's exposure to tremolite, anthophyllite, and actinolite fibers is below the limits prescribed in subsection (2) of this section. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with subsection (3) of this section.

(b) Personal monitoring.

(i) Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of

the eight-hour time-weighted average airborne concentration and of the ceiling concentration of tremolite, anthophyllite, and actinolite fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by (a) of this subsection, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees. In no case shall the sampling be done at intervals greater than six months for employees whose exposure to tremolite, anthophyllite, and actinolite may reasonably be foreseen to exceed the limits prescribed by subsection (2) of this section.

(c) Environmental monitoring.

(i) Samples shall be collected from areas of a work environment which are representative of the airborne concentration of tremolite, anthophyllite, and actinolite fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the eight-hour time-weighted average airborne concentration and of the ceiling concentration of tremolite, anthophyllite, and actinolite fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by (a) of this subsection, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than six months for employees whose exposures to tremolite, anthophyllite, and actinolite may reasonably be foreseen to exceed the exposure limits prescribed in subsection (2) of this section.

(d) Employee observation of monitoring. Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this subsection and shall have access to the records thereof.

(7) Caution signs and labels.

(a) Caution signs.

(i) Posting. Caution signs shall be provided and displayed at each location where airborne concentrations of tremolite, anthophyllite, and actinolite fibers are reasonably expected to be released or where airborne concentrations of tremolite, anthophyllite, and actinolite fibers may be in excess of the exposure limits prescribed in subsection (2) of this section. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing airborne tremolite, anthophyllite, and actinolite fibers.

(ii) Sign specifications. The warning signs required by (a)(i) of this subsection shall conform to the requirements of 20" X 14" vertical format signs specified in WAC 296-24-14007(4) and to this subsection. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this subdivision.

Legend	Notation
Tremolite, anthophyllite, and actinolite	1" Sans Serif, Gothic or Block.
Dust hazard	3/4" Sans Serif, Gothic or Block.
Avoid breathing dust	1/4" Gothic.
Wear assigned protective equipment	1/4" Gothic.
Do not remain in area unless your work requires it	1/4" Gothic.
Breathing tremolite, anthophyllite, and actinolite fibers may be hazardous to your health	14 point Gothic.

Spacing between lines shall be at least equal to the height of the upper of any two lines.

(b) Caution labels.

(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing tremolite, anthophyllite, and actinolite fibers, or to their containers, except that no label is required where fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne fibers will be released.

(ii) Label specifications. The caution labels required by (b)(i) of this subsection shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state:

CAUTION

Contains Tremolite, Anthophyllite, or Actinolite Fibers

Avoid Creating Dust

Breathing Tremolite, Anthophyllite, or Actinolite Fibers May Cause

Serious Bodily Harm

(8) Housekeeping.

(a) Cleaning. All external surfaces in any place of employment shall be maintained free of accumulations of tremolite, anthophyllite, and actinolite fibers.

(b) Waste disposal. Tremolite, anthophyllite, and actinolite waste, scrap, debris, bags, containers, equipment, and contaminated clothing, consigned for disposal, shall be collected and disposed of in sealed impermeable bags at least 6 mils in thickness, or other closed, impermeable containers.

(c) Deterioration. Friable tremolite, anthophyllite, or actinolite and friable tremolite, anthophyllite, or actinolite containing material which has become damaged or deteriorated shall be repaired, enclosed, encapsulated, or removed.

(9) Recordkeeping.

(a) Exposure records. Every employer shall maintain records of any personal or environmental monitoring required by subsection (6) of this section. Records shall be maintained for a period of at least thirty years and shall be made available upon request to the director of the department of labor and industries.

(b) Access. Employee exposure 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 WAC 296-62-05213 through 296-62-05217.

(c) Employee notification. Any employee found to have been exposed at any time to an airborne concentration of tremolite, anthophyllite, or actinolite fibers in excess of the limits prescribed in subsection (2) of this section shall be notified in writing of the exposure as soon as practicable but not later than five days of the finding. The employee shall also be timely notified of the corrective action being taken.

(10) Medical examinations.

(a) General. The employer shall provide or make available at his/her cost, medical examinations relative to exposure to tremolite, anthophyllite, or actinolite required by this section.

(b) Preplacement. The employer shall provide or make available to each of his/her employees, within thirty calendar days following his/her first employment in an occupation exposed to an airborne concentration of tremolite, anthophyllite, or actinolite fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior fourteen by seventeen inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at one second ($FEV_{1.0}$).

(c) Annual examinations. Every employer shall provide or make available on an annual basis, comprehensive medical examinations to each of his/her employees engaged in occupations exposed to airborne concentrations of tremolite, anthophyllite, and actinolite fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior fourteen by seventeen inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at one second ($FEV_{1.0}$).

(d) Termination of employment. The employer shall provide, or make available, within thirty calendar days before or after the termination of employment of any employee engaged in an occupation exposed to an airborne concentration of tremolite, anthophyllite, or actinolite fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior fourteen by seventeen inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at one second ($FEV_{1.0}$).

(e) Recent examinations. No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this subsection within the past one-year period.

(f) Medical records.

(i) Maintenance. Employers of employees examined pursuant to this subsection shall cause to be maintained complete and accurate records of all such medical examinations. Records shall be retained by employers for at least thirty years.

(ii) Access. Records of the medical examinations required by this subsection shall be provided upon request to employees, designated representative and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209 and WAC 296-62-05213 through 296-62-05217. These records shall also be provided upon request to the director of the department of labor and industries. Any physician who conducts a medical examination required by this subsection shall furnish to the employer of the examined employee all the information specifically required by this subsection, and any other medical information related to occupational exposure to tremolite, anthophyllite, and actinolite fibers.

TABLE 1--RESPIRATORY PROTECTION FOR TREMOLITE, ANTHOPHYLLITE, AND ACTINOLITE FIBERS

CONCENTRATION OF TREMOLITE, ANTHOPHYLLITE, ACTINOLITE, OR A COMBINATION OF THESE MINERALS	REQUIRED RESPIRATOR[a]
Not in excess of 2 f/cc.	1. Half-mask, air-purifying respirator equipped with high-efficiency cartridge filters.[b]
Not in excess of 10 f/cc.	1. Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 20 f/cc	1. Any powered air-purifying respirator equipped with high-efficiency filters. 2. Any supplied-air respirator operated in continuous flow mode.
Not in excess of 200 f/cc.	1. Full facepiece supplied-air respirator operated in pressure demand mode.
Greater than 200 f/cc or unknown concentration.	1. Full facepiece supplied-air respirator operated in pressure-demand mode equipped with either an auxiliary positive pressure self-contained breathing apparatus or a HEPA filter. 2. Full facepiece positive-pressure self-contained breathing apparatus (SCBA).

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.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07761, filed 11/30/87.]

PART J--BIOLOGICAL AND PHYSICAL 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 296-62-090 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.]

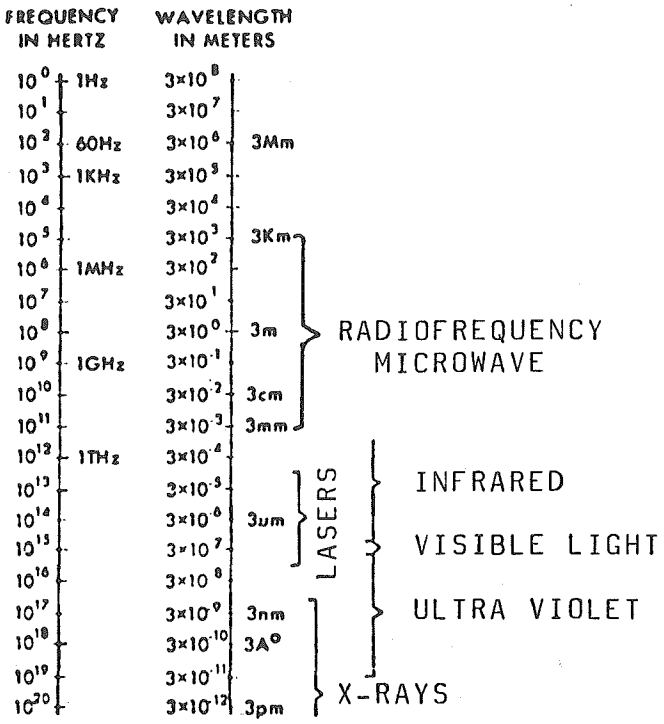
WAC 296-62-09001 Definitions. (1) "Physical agents" shall mean, but are not limited to: Illumination, ionizing radiation, nonionizing radiation, pressure, vibration, temperature and humidity, and noise.

(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	970×10^6	670
0.0001	720×10^6	500
0.005	820×10^6	570
0.02	400×10^6	280
0.1	120×10^6	80
0.5	43×10^6	30
1.0	26×10^6	18
2.5	29×10^6	20
5.0	26×10^6	18

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.)
7.5	24×10^6	17
10	24×10^6	17
10 to 30	14×10^6	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 2.2×10^{12} disintegrations per minute (dpm).

(i) One millicurie (mCi) = 10^{-3}Ci
(ii) One microcurie (uCi) = 10^{-6}Ci
(iii) One nanocurie (nCi) = 10^{-9}Ci
(iv) One picocurie (pCi) = 10^{-12}Ci

(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 exposure 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.

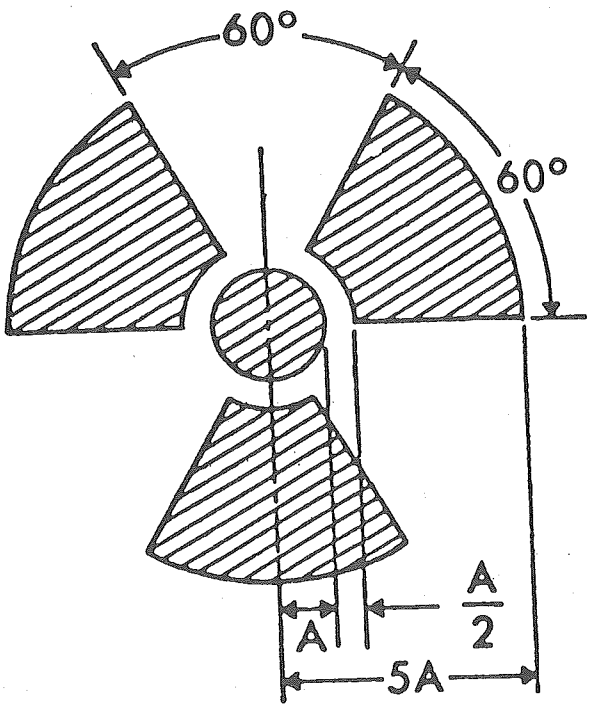


FIGURE G-10

(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 frequenting 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 occupied 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.

(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

(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. Occular 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 milliwatt/sq. centimeter for periods greater than 10^3 seconds (approximately 16 minutes) and for exposure times less than 103 seconds shall not exceed one Joules/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.

$$E_{eff} = \Sigma \text{ (E–Lambda) (S–Lambda) (Delta–Lambda)}$$

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 $\mu W/cm^2$.

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
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} ($\mu W/cm^2$)
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 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

Shade No.	Maximum Ultraviolet Transmission			
	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.

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: 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.]

WAC 296-62-09007 Pressure. (1) Workmen 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 regulations for scuba diving." 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.

[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.