Title 402 WAC
RADIATION CONTROL AGENCY

Chapters

Reviser's note: Some of these rules were previously filed by the then department of health on October 26, 1966. The department of social and health services is designated as the state radiation control agency by RCW 70.98.050.

DISPOSITION OF CHAPTERS FORMERLY CODIFIED IN THIS TITLE

Chapter 402-20
LICENSING OF RADIATION SOURCES

402-20-010 Purpose and scope. [Order 1084, § 402-20-010, filed 1/14/76; Order 1, § 402-20-010, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see chapters 402-19, 402-21, and 402-22 WAC.

402-20-020 Types of licenses. [Order 1084, § 402-20-020, filed 1/14/76; Order 1, § 402-20-020, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-19-220.

402-20-030 General licenses—Source material. [Order 1095, § 402-20-030, filed 2/6/76; Order 1, § 402-20-030, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-21-030.

402-20-040 General licenses*—Radioactive material other than source material. [Order 1095, § 402-20-040, filed 2/6/76; Order 708, § 402-20-040, filed 8/24/72; Order 1, § 402-20-040, filed 7/2/71; Order 1, § 402-20-040, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-21-050.

402-20-050 Filing application for specific licenses. [Order 1084, § 402-20-050, filed 1/14/76; Order 1, § 402-20-050, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-22-020.

402-20-060 General requirements for the issuance of specific licenses. [Order 1084, § 402-20-060, filed 1/14/76; Order 1, § 402-20-060, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-22-040.

402-20-070 Special requirements for issuance of certain specific licenses for radioactive material. [Order 1084, § 402-20-070, filed 1/14/76; Order 708, § 402-20-070, filed 8/24/72; Order 1, § 402-20-070, filed 7/2/71; Order 1, § 402-20-070, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-22-070.

402-20-073 Special requirements for specific licenses of broad scope. [Order 1084, § 402-20-073, filed 1/14/76.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-22-090.

402-20-076 Special requirements for a specific license to manufacture, assemble, repair, or distribute commodities, products, or devices which contain radioactive material. [Order 1084, § 402-20-076, filed 1/14/76.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-22-110.

402-20-080 Issuance of specific licenses. [Order 1084, § 402-20-080, filed 1/14/76; Order 1, § 402-20-080, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-22-045.

402-20-090 Specific terms and conditions of licenses. [Order 1084, § 402-20-090, filed 1/14/76; Order 1, § 402-20-090, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see chapters 402-21 and 402-22 WAC.

402-20-100 Expiration of licenses. [Order 1084, § 402-20-100, filed 1/14/76; Order 1, § 402-20-100, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 79-12-073 (Order 1459), filed 11/30/79, effective 1/1/80. Statutory Authority: RCW 70.98.080. Later promulgation, see WAC 402-22-050.

Chapter 402–10 WAC
STATEMENT OF PHILOSOPHY

WAC 402–10–010 Statement of philosophy. In accordance with the recommendations of the Environmental Protection Agency, formerly the Federal Radiation Council, approved by the President of the United States of America, persons engaged in activities under licenses issued by the Washington State Department of Social and Health Services pursuant to the Atomic Energy Act of 1954, as amended, shall, in addition to complying with the requirements set forth in chapter 402–24 WAC, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. Such persons should make particular efforts to keep the radiation exposure of an embryo or fetus as low as is reasonably achievable during the entire gestation period as recommended by the National Council on Radiation Protection and Measurements. The term "as low as is reasonably achievable" means as low as is readily achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety and in relation to the utilization of nuclear energy, ionizing radiation, and radioactive materials in the public interest. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), §

402-10-010, filed 12/8/80; Order 1095, § 402-10-010, filed 2/6/76.]

Chapter 402-12 WAC
GENERAL PROVISIONS

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

402-12-020 Effective date. [Order 1, § 402-12-020, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1095, filed 2/6/76.

402-12-060 Units of radiation dose. [Order 1, § 402-12-060, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1095, filed 2/6/76.

402-12-070 Units of radioactivity. [Order 1, § 402-12-070, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1095, filed 2/6/76.

402-12-110 Exemptions from registration and licensing. [Order 1, § 402-12-110, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1095, filed 2/6/76. Later promulgation, see WAC 402-12-125 (part).

402-12-120 Exemptions from requirements of these regulations. [Order 1, § 402-12-120, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1095, filed 2/6/76. Later promulgation, see WAC 402-12-125 (part).

WAC 402-12-010 Authority. Rules and regulations set forth herein are adopted pursuant to the provisions of chapter 70.98 RCW. [Order 1095, § 402-12-010, filed 2/6/76; Order 1, § 402-12-010, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-030 Purpose. It is the purpose of these regulations to state such requirements as shall be applied in the use of all radiation, radiation machines, and radioactive materials to ensure the maximum protection of the public health and the maximum safety to all persons at, or in the vicinity of, the place of use, storage, or disposal thereof. These regulations are intended to be consistent with the best use of radiation machines and radioactive materials. [Order 1095, § 402-12-030, filed 2/6/76; Order 1, § 402-12-030, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-040 Scope. Except as otherwise specifically provided, these regulations apply to all persons who receive, possess, use, transfer, own or acquire any source of radiation, provided, however, that nothing in these regulations shall apply to any person to the extent such person is subject to regulation by the U.S. Nuclear Regulatory Commission.*

NOTE:

*Attention is directed to the fact that regulation by the State of source material, byproduct material, and special nuclear material in quantities not sufficient to form a critical mass is subject to the provisions of the agreement between the State and the U.S. Nuclear Regulatory Commission and to Part 150 of the Commission's regulations (10 CFR Part 150).

[Order 1095, § 402-12-040, filed 2/6/76; Order 1, § 402-12-040, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-050 Definitions. As used in these regulations, these terms have the definitions set forth below. Additional definitions used only in a certain part will be found in that part.

(1) "Accelerator produced material" means any material made radioactive by exposing it in a particle accelerator.

(2) "Act" means Nuclear Energy and Radiation Legislation chapter 70.98 RCW.

(3) "Agreement State" means any state with which the United States Nuclear Regulatory Commission has entered into an effective agreement under section 274 b. of the Atomic Energy Act of 1954, as amended (73 Stat. 689).

(4) "Airborne radioactive material" means any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors, or gases.

(5) "Airborne radioactivity area" means (a) any room, enclosure, or operating area in which airborne radioactive material exists in concentrations in excess of the amounts specified in Appendix A, Table I, Column 1 of chapter 402-24 WAC Part D; or (b) any room, enclosure, or operating area in which airborne radioactive material exists 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 WAC 402-24-220, Appendix A, Table I, Column 1.

(6) "Byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

(7) "Calendar quarter" means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be so arranged such that no day is included in more than one calendar quarter and no day in any one year is omitted from inclusion within a calendar quarter. No licensee or registrant shall change the method observed by him of determining calendar quarters for purposes of these regulations except at the beginning of a calendar year.

(8) "CFR" means Code of Federal Register.

(9) "Controlled area." See "Restricted area."

(10) "Curie" means a unit of measurement of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 3.7×10^{10} transformations per second (tps). Commonly used submultiples of the curie are the millicurie and the microcurie. One millicurie (mCi) = 0.001 curie = 3.7×10^{7} tps. One microcurie (uCi) = 0.000001 curie = 3.7×10^{4} tps. One picocurie (pCi) = 10^{-12} Ci. One nanocurie (nCi) = 10^{-9} Ci.

(11) "Department" means the Department of Social and Health Services which has been designated as the State Radiation Control Agency.

(12) "Depleted uranium" means the source material uranium in which the isotope uranium–235 is less than 0.711 weight percent of the total uranium present. Depleted uranium does not include special nuclear material.

(13) "Dose" as used in these regulations shall mean absorbed dose or dose equivalent as appropriate.

(a) "Absorbed dose" is the energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The special unit of absorbed dose is the rad. (See rad.)

(b) "Dose equivalent" is a quantity that expresses on a common scale for all radiation a measure of the postulated effect on a given organ. It is defined as the absorbed dose in rads times certain modifying factors. The unit of dose equivalent is the rem. (See rem.)

(14) "Dose commitment" means the total radiation dose to a part of the body that will result from retention in the body of radioactive material. For purposes of estimating the dose commitment, it is assumed that from the time of intake the period of exposure to retained material will not exceed fifty years.

(15) "Exposure" means the quotient of dQ by dm where "dQ" is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having "dm" are completely stopped in air. (The special unit of exposure is the roentgen (R).)*

NOTE:

*When not underlined [italicized] as above the term 'exposure' has a more general meaning in these regulations.

(16) "Exposure rate" means the exposure per unit of time, such as R/min., mR/h, etc.

(17) "Former United States Atomic Energy Commission (AEC) or United States Nuclear Regulatory Commission (NRC) licensed facilities" means nuclear reactors, nuclear fuel reprocessing plants, uranium enrichment plants, or critical mass experimental facilities where AEC or NRC licenses have been terminated.

(18) "Healing arts" means the disciplines of medicine, dentistry, osteopathy, chiropractic, podiatry, and veterinary medicine.

(19) "High radiation area" means any area, accessible to individuals, 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 millirems.

(20) "Human use" means the intentional, internal or external administration of radiation or radioactive material to human beings.

(21) "IND" means investigatory new drug for which an exemption has been claimed under the United States Food, Drug and Cosmetic Act.

(22) "Individual" means any human being.

(23) "Inspection" means an official examination or observation by the department including but not limited to, tests, surveys, and monitoring to determine compliance with rules, regulations, orders, requirements and conditions of the department.

(24) "Irretrievable source" means any sealed source containing licensed material which is pulled off or not connected to the wireline downhole and for which all reasonable effort at recovery, as determined by the department, has been expended.

(25) "License" means a license issued by the department in accordance with the regulations adopted by the department.

(26) "Licensee" means any person who is licensed by the department in accordance with these regulations and the act.

(27) "Licensing state" means any state with regulations equivalent to the suggested state regulations for control of radiation relating to, and an effective program for, the regulatory control of NARM.

(28) "NARM" means any naturally occurring or accelerator–produced radioactive material except source material.

(29) "Natural radioactivity" means radioactivity of naturally occurring nuclides.

(30) "NDA" means a New Drug Application which has been submitted to the United States Food and Drug Administration.

(31) "Occupational dose" means exposure of an individual to radiation in a restricted area; or in the course of employment in which the individual's duties involve exposure to radiation; provided, that occupational dose shall not be deemed to include any exposure of an individual to radiation for the purpose of diagnosis or therapy of such individual.

(32) "Ore refineries" mean all processors of a radioactive material ore.

(33) "Particle accelerator" means any machine capable of accelerating electrons, protons, neuterons, or other charged particles in a vacuum and of discharging the resultant particulate or other radiation into a medium at energies usually in excess of 1 MeV.

(34) "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this state, any other state or political subdivision or agency thereof, and any legal successor, representative, agent or agency of the foregoing.

(35) "Personal supervision" means supervision such that the supervisor is physically present at the facility and in such proximity that contact can be maintained and immediate assistance given as required.

(36) "Personnel monitoring equipment" means devices (e.g., film badges, pocket dosimeters, and thermoluminescent dosimeters) designed to be worn or carried by an individual for the purpose of estimating the dose received by the individual.

(37) "Pharmacist" means an individual licensed by this state to compound and dispense drugs, and poisons.

(38) "Physician" means an individual licensed by this state to dispense drugs in the practice of medicine.

(39) "Practitioner" means an individual licensed by the state in the practice of a healing art (i.e., physician, dentist, podiatrist, chiropractor, etc.).

(40) "Rad" means the special unit of absorbed dose. One rad equals one hundredth of a joule per kilogram of material; for example, if tissue is the material of interest, then 1 rad equals 100 ergs per gram of tissue.

(41) "Radiation" means ionizing radiation, i.e., gamma rays and X-rays, alpha and beta particles, high speed electrons, and other nuclear particles.

(42) "Radiation area" means any area, accessible to individuals, 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 5 millirems, or in any 5 consecutive days a dose in excess of 100 millirems.

(43) "Radiation machine" means any device capable of producing ionizing radiation except those which produce radiation only from radioactive material.

(44) "Radiation safety officer" means one who has the knowledge and responsibility to apply appropriate radiation protection regulations.

(45) "Radiation source." See "Source of radiation."

(46) "Radioactive material" means any material (solid, liquid, or gas) which emits radiation spontaneously.

(47) "Radioactivity" means the transformation of unstable atomic nuclei by the emission of radiation.

(48) "Registrable item" means any radiation machine except those exempted by RCW 70.98.180 or exempted by the department pursuant to the authority of RCW 70.98.080.

(49) "Registrant" means any person who owns or possesses and administratively controls an X-ray system and is required by the provisions in chapters 402-12 and 402-16 WAC to register with this department.

(50) "Registration" means registration with the department in accordance with the regulations adopted by the department.

(51) "Regulations of the U.S. Department of Transportation" means the regulations in 49 CFR Parts 170-189, 14 CFR Part 103, and 46 CFR Part 146.

(52) "Rem" means a measure of the dose of any radiation to body tissue in terms of its estimated biological effect relative to a dose received from an exposure to one roentgen (R) of X-rays. (One millirem (mrem) = 0.001 rem.) For the purpose of these regulations, any of the following is considered to be equivalent to a dose of one rem:

(a) An exposure of 1 R of x, or gamma radiation;

(b) A dose of 1 rad due to x, gamma, or beta radiation;

(c) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye.

(d) A dose of 0.1 rad due to neutrons or high energy protons.*

NOTE:

*If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron absorbed dose in rads, one rem of neutron radiation may, for purposes of these regulations, be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there exists 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 one rem may be estimated from the following table:

Neutron Flux Dose Equivalents

Neutron energy (MeV)	Number of neutrons per square centimeter for a dose equivalent of 1 rem (neutrons/cm^2)	Average flux density to deliver 100 millirems in 40 hours (neutrons/cm^2 per second)
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
7.5	24×10^6	17
10.0	24×10^6	17
10 to 30	14×10^6	10

(53) "Research and development" means: (1) theoretical analysis, exploration, or experimentation; or (2) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes. Research and development does not include the internal or external administration of radiation or radioactive material to human beings.

(54) "Restricted area" (controlled area) means any area the access to which is controlled by the licensee or registrant for purposes of protection of individuals from exposure to radiation and radioactive material. "Restricted area" shall not include any areas used for residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area.

(55) "Roentgen" (R) means the special unit of exposure. One roentgen equals 2.58×10^4 coulombs/kilogram of air (see "Exposure").

(56) "Sealed source" means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions which are likely to be encountered in normal use and handling.

(57) "Source material" means: (1) uranium or thorium, or any combination thereof, in any physical or chemical form, or (2) ores which contain by weight one-

twentieth of one percent (0.05 percent) or more of (i) uranium, (ii) thorium, or (iii) any combination thereof. Source material does not include special nuclear material.

(58) "Source of radiation" means any radioactive material, or any device or equipment emitting or capable of producing ionizing radiation.

(59) "Special form." See WAC 402-12-210.

(60) "Special nuclear material in quantities not sufficient to form a critical mass" means uranium enriched in the isotope U-235 in quantities not exceeding 350 grams of contained U-235; uranium-233 in quantities not exceeding 200 grams; or any combination of them in accordance with the following formula: For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified above for the same kind of special nuclear material. The sum of such ratios for all of the kinds of special nuclear material in combination shall not exceed "1" (i.e., unity). For example, the following quantities in combination would not exceed the limitation and are within the formula:

$$\frac{175(\text{grams contained U-235})}{350} + \frac{50(\text{grams U-233})}{200} + \frac{50(\text{grams Pu})}{200} < 1$$

(61) "Source container" means a device in which sealed sources are transported or stored.

(62) "Survey" means an evaluation of the production, use, release, disposal, and/or presence of sources of radiation under a specific set of conditions to determine actual or potential radiation hazards. When appropriate, such evaluation includes, but is not limited to, tests, physical examinations and measurements of levels of radiation or concentration of radioactive material present.

(63) "Test" means a method for determining the characteristics or condition of sources of radiation or components thereof.

(64) "These regulations" mean all parts of "Rules and Regulations for Radiation Protection" of the state of Washington.

(65) "Transport group." See WAC 402-12-200(2).

(66) "Type A Quantity." See WAC 402-24-125.

(67) "Type B Quantity" means a quantity the aggregate radioactivity of which does not exceed as follows:

Transport Group	Quantity in Curies
I	20
II	20
III	200
IV	200
V	5,000
VI and VII	50,000
Special Form	5,000

(68) "Uncontrolled area." See "unrestricted area."

(69) "United States Department of Energy" means the Department of Energy established by Public Law 95-91, August 4, 1977, 91 Stat. 565, 42 U.S.C. 7101 et seq., to the extent that the department exercises functions formerly vested in the United States Atomic Energy Commission, its chairman, members, officers and components and transferred to the United States Energy Research and Development Administration and to the Administrator thereof pursuant to sections 104(b), (c) and (d) of the Energy Reorganization Act of 1974 (Public Law 93-438, October 11, 1974, 88 Stat. 1233 at 1237, effective January 19, 1975) and retransferred to the Secretary of Energy pursuant to section 301(a) of the Department of Energy Organization Act (Public Law 95-91, August 4, 1977, 91 Stat. 565 at 577-578, 42 U.S.C. 7151, effective October 1, 1977.)

(70) "Unrefined and unprocessed ore" means ore in its natural form prior to any processing, such as grinding, roasting, beneficiating, or refining.

(71) "Unrestricted area" (uncontrolled area) means any area access to which is not controlled by the licensee or registrant for purposes of protection of individuals from exposure to radiation and radioactive material, and any area used for residential quarters.

(72) "Waste handling licensees" mean persons licensed to receive and store radioactive wastes prior to disposal and/or persons licensed to dispose of radioactive waste.

(73) "Worker" means an individual engaged in work under a license or registration issued by the department and controlled by a licensee or registrant, but does not include the licensee or registrant. If students of age 18 years or older are subjected routinely to work involving radiation, then the students are considered to be occupational workers. Individuals of less than 18 years of age shall meet the requirements of WAC 402-24-035. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-12-050, filed 12/8/80; Order 1095, § 402-12-050, filed 2/6/76; Order 708, § 402-12-050, filed 8/24/72; Order 1, § 402-12-050, filed 7/2/71; Order 1, § 402-12-050, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-080 Records. (1) Each licensee or registrant shall maintain records relating to the receipt, use, storage, transfer, or disposal of radiation sources, and such other records as the department may require which will permit the determination of the extent of occupational and public exposure from such radiation sources. Copies of these records shall be submitted to the department on request. These requirements are subject to such exemptions as may be provided by department rules.

(2) In accordance with the Public Disclosure Act, the department shall make available to each licensee and/or registrant departmental records pertaining to that licensee or registrant, at his/her written request. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-12-080, filed 12/8/80; Order 1095, §

402-12-080, filed 2/6/76; Order 1, § 402-12-080, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-090 Inspections. (1) Each licensee and/or registrant shall afford the department at all reasonable times opportunity to inspect sources of radiation and the premises and facilities wherein such sources of radiation are used or stored.

(2) Each licensee and/or registrant shall make available to the department for inspection, upon reasonable notice, records maintained pursuant to these regulations.

(3) In accordance with the Public Disclosure Act, the department shall make available to each licensee and/or registrant a copy of every inspection report written which covers any inspection of the licensee's and/or registrant's source of radiation, records, premises, or facilities. Copies of these inspection records shall be submitted to the licensee or registrant by the department upon the receipt of the written request of the licensee and/or registrant. [Statutory Authority: RCW 70.98-.050. 81-01-011 (Order 1570), § 402-12-090, filed 12/8/80; Order 1095, § 402-12-090, filed 2/6/76; Order 1, § 402-12-090, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-100 Tests and surveys. (1) Each licensee and registrant shall perform upon instructions from the department or shall permit the department to perform such reasonable tests and surveys as the department deems appropriate or necessary including, but not limited to, tests and surveys of:

(a) Sources of radiation;

(b) Facilities wherein sources of radiation are used or stored;

(c) Radiation detection and monitoring instruments; and

(d) Other equipment and devices used in connection with utilization or storage of licensed or registered sources of radiation.

(2) In accordance with the Public Disclosure Act, the department shall provide to the licensee and/or registrant copies of all tests and surveys conducted on the licensee's and/or registrant's sources of radiation, upon written request of the licensee and/or registrant. The department shall acknowledge the receipt of the request in a timely manner by telephone or letter. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-12-100, filed 12/8/80; Order 1095, § 402-12-100, filed 2/6/76; Order 1, § 402-12-100, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-125 Exemptions. (1) The department may, upon application therefor or upon its own initiative, grant such exemptions or exceptions from the requirements of these regulations as it determines are authorized by law and will not result in undue hazard to public health and safety or property.

(2) Any U.S. Department of Energy contractor or subcontractor and any U.S. Nuclear Regulatory Commission contractor or subcontractor of the following categories operating within this state is exempt from these regulations to the extent that such contractor or subcontractor under his contract receives, possesses, uses, transfers or acquires sources of radiation:

(a) Prime contractors performing work for the Department of Energy at U.S. Government-owned or controlled sites, including the transportation of sources of radiation to or from such sites and the performance of contract services during temporary interruptions of such transportation;

(b) Prime contractors of the Department of Energy performing research in, or development, manufacture, storage, testing or transportation of, atomic weapons or components thereof;

(c) Prime contractors of the Department of Energy using or operating nuclear reactors or other nuclear devices in a United States Government-owned vehicle or vessel; and

(d) Any other prime contractor or subcontractor of the Department of Energy or of the Nuclear Regulatory Commission when the state and the Nuclear Regulatory Commission jointly determine (i) that the exemption of the prime contractor or subcontractor is authorized by law, and (ii) that under the terms of the contract or subcontract, there is adequate assurance that the work thereunder can be accomplished without undue risk to the public health and safety. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-12-125, filed 12/8/80; Order 1095, § 402-12-125, filed 2/6/76.]

WAC 402-12-130 Violations. An injunction or other court order may be obtained prohibiting any violation of any provision of the Act or any regulation or order issued thereunder. Any person who violates any provision of the Act or any regulation or order issued thereunder may be guilty of a gross misdemeanor and upon conviction, may be punished by fine or imprisonment or both, as provided by law. [Order 1095, § 402-12-130, filed 2/6/76; Order 1, § 402-12-130, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-140 Impounding. Sources of radiation shall be subject to impounding pursuant to RCW 70.98-.160. [Order 1095, § 402-12-140, filed 2/6/76; Order 1, § 402-12-140, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-12-150 Prohibited uses. (1) Hand-held fluoroscopic screens shall not be used.

(2) Shoe-fitting fluoroscopic devices shall not be used. [Order 1095, § 402-12-150, filed 2/6/76.]

WAC 402-12-160 Communications. All communications and reports concerning these regulations, and applications filed thereunder, should be addressed to the Department of Social and Health Services, Radiation Control Section, Mail Stop LD-11, Olympia, Washington 98504. The emergency telephone number in Seattle, is 206-682-5327 or 206 (NUCLEAR). [Statutory Authority: RCW 70.98.050. 81-01-011 (Order

1570), § 402-12-160, filed 12/8/80; Order 1095, § 402-12-160, filed 2/6/76.]

WAC 402-12-170 Additional requirements. The department may, by rule, regulation, or order, impose upon any licensee or registrant such requirements in addition to those established in these regulations as it deems appropriate or necessary to minimize danger to public health and safety or property. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-12-170, filed 12/8/80; Order 1095, § 402-12-170, filed 2/6/76.]

WAC 402-12-200 Appendix A--Information on transportation. (1) *Transport Grouping of Radionuclides.*

Element[1]	Radionuclide[2]	Group
Actinium (89)	Ac-277	I
	Ac-228	I
Americium (95)	Am-241	I
	Am-243	I
Antimony (51)	Sb-122	IV
	Sb-124	III
	Sb-125	III
Argon (18)	Ar-37	VI
	Ar-41	II
	Ar-41 (uncompressed)[3]	V
Arsenic (33)	As-73	IV
	As-74	IV
	As-76	IV
	As-77	IV
Astatine (85)	At-211	III
Barium (56)	Ba-131	IV
	Ba-133	II
	Ba-140	III
Berkelium (97)	Bk-249	I
Beryllium (4)	Be-7	IV
Bismuth (83)	Bi-206	IV
	Bi-207	III
	Bi-210	II
	Bi-212	III
Bromine (35)	Br-82	IV
Cadmium (48)	Cd-109	IV
	Cd-115m	III
	Cd-115	IV
Calcium (20)	Ca-45	IV
	Ca-47	IV
Californium (98)	Cf-249	I
	Cf-250	I
	Cf-252	I
Carbon (6)	C-14	IV
Cerium (58)	Ce-141	IV
	Ce-143	IV
	Ce-144	III
Cesium (55)	Cs-131	IV
	Cs-134m	III
	Cs-134	III
	Cs-135	IV
	Cs-136	IV
	Cs-137	III
Chlorine (17)	Cl-36	III
	Cl-38	IV
Chromium (24)	Cr-51	IV
Cobalt (27)	Co-56	III
	Co-57	IV
	Co-58m	IV
	Co-58	IV
	Co-60	III
Copper (29)	Cu-64	IV
Curium (96)	Cm-242	I
	Cm-243	I
	Cm-244	I
	Cm-245	I
	Cm-246	I
Dysprosium (66)	Dy-154	III
	Dy-165	IV
	Dy-166	IV
Erbium (68)	Er-169	IV
	Er-171	IV
Europium (63)	Eu-150	III
	Eu-152m	IV
	Eu-152	III
	Eu-154	II
	Eu-155	IV
Fluorine (9)	F-18	IV
Gadolinium (64)	Gd-153	IV
	Gd-159	IV
Gallium (31)	Ga-67	III
	Ga-72	IV
Germanium (32)	Ge-71	IV
Gold (79)	Au-193	III
	Au-194	III
	Au-195	III
	Au-196	IV
	Au-198	IV
	Au-199	IV
Hafnium (72)	Hf-181	IV
Holmiun (67)	Ho-166	IV
Hydrogen (1)	H-3 (see tritium)	
Indium (49)	In-113m	III
	In-114m	III
	In-115m	IV
	In-115	IV
Iodine (53)	I-124	III
	I-125	III
	I-126	III
	I-129	III
	I-131	III
	I-132	IV
	I-133	III
	I-134	IV
	I-135	IV
Iridium (77)	Ir-190	IV
	Ir-192	III

Element[1]	Radionuclide[2]	Group
	Ir–194	IV
Iron (26)	Fe–55	IV
	Fe–59	IV
Krypton (36)	Kr–85m	III
	Kr–85m (uncompressed)[3]	V
	Kr–85	III
	Kr–85 (uncompressed)[3]	VI
	Kr–87	II
	Kr–87 (uncompressed)[3]	V
Lanthanum (57)	La–140	IV
Lead (32)	Pb–203	IV
	Pb–210	II
	Pb–212	II
Lutetium (71)	Lu–172	III
	Lu–177	IV
Magnesium (12)	Mg–28	III
Manganese (25)	Mn–52	IV
	Mn–54	IV
	Mn–56	IV
Mercury (80)	Hg–197m	IV
	Hg–197	IV
	Hg–203	IV
Mixed fission products (MFP)		II
Molybdenum (42)	Mo–99	IV
Neodymium (60)	Nd–147	IV
	Nd–149	IV
Neptunium (93)	Np–237	I
	Np–239	I
Nickel (28)	Ni–56	III
	Ni–59	IV
	Ni–63	IV
	Ni–65	IV
Niobium (41)	Nb–93m	IV
	Nb–95	IV
	Nb–97	IV
Osmium (76)	Os–185	IV
	Os–191m	IV
	Os–191	IV
	Os–193	IV
Palladium (46)	Pd–103	IV
	Pd–109	IV
Phosphorus (15)	P–32	IV
Platinum (78)	Pt–191	IV
	Pt–193	IV
	Pt–193m	IV
	Pt–197m	IV
	Pt–197	IV
Plutonium (94)	Pu–238 (F)	I
	Pu–239 (F)	I
	Pu–240	I
	Pu–241 (F)	I
	Pu–242	I
Polonium (84)	Po–210	I
Potassium (19)	K–42	IV
	K–43	III
Praseodymium (59)	Pr–142	IV
	Pr–143	IV
Promethium (61)	Pm–147	IV
	Pm–149	IV
Protactinium (91)	Pa–230	I
	Pa–231	I
	Pa–233	II
Radium (88)	Ra–223	II
	Ra–224	II
	Ra–226	I
	Ra–228	I
Radon (86)	Rn–220	IV
	Rn–222	II
Rhenium (75)	Re–183	IV
	Re–186	IV
	Re–187	IV
	Re–188	IV
	Re–Natural	IV
Rhodium (45)	Rh–103m	IV
	Rh–105	IV
Rubidium (37)	Rb–86	IV
	Rb–87	IV
	Rb–Natural	IV
Ruthenium (44)	Ru–97	IV
	Ru–103	IV
	Ru–105	IV
	Ru–106	III
Samarium (62)	Sm–145	III
	Sm–147	III
	Sm–151	IV
	Sm–153	IV
Scandium (21)	Sc–46	III
	Sc–47	IV
	Sc–48	IV
Selenium (34)	Se–75	IV
Silicon (14)	Si–31	IV
Silver (47)	Ag–105	IV
	Ag–110m	III
	Ag–111	IV
Sodium (11)	Na–22	III
	Na–24	IV
Strontium (38)	Sr–85m	IV
	Sr–85	IV
	Sr–89	III
	Sr–90	II
	Sr–91	III
	Sr–92	IV
Sulfur (16)	S–35	IV
Tantalum (73)	Ta–182	III
Technetium (43)	Tc–96m	IV
	Tc–96	IV
	Tc–97	IV
	Tc–97m	IV
	Tc–99m	IV
	Tc–99	IV
Tellurium (52)	Te–125m	IV

Element[1]	Radionuclide[2]	Group
	Te–127m	IV
	Te–127	IV
	Te–129m	III
	Te–129	IV
	Te–131m	III
	Te–132	IV
Terbium (65)	Tb–160	III
Thallium (81)	Tl–200	IV
	Tl–201	IV
	Tl–202	IV
	Tl–204	III
Thorium (90)	Th–227	II
	Th–228	I
	Th–230	I
	Th–231	I
	Th–232	III
	Th–234	II
	Th–Natural	III
Thulium (69)	Tm–168	III
	Tm–170	III
	Tm–171	IV
Tin (50)	Sn–113	IV
	Sn–117m	III
	Sn–121	III
	Sn–125	IV
Tritium (1)	H–3	IV
	H–3(as a gas, as luminous paint, or absorbed on solid material)	VII
Tungsten (74)	W–181	IV
	W–185	IV
	W–187	IV
Uranium (92)	U–230	II
	U–232	I
	U–233 (F)	II
	U–234	II
	U–235 (F)	III
	U–236	II
	U–238	III
	U–Natural	III
	U–Enriched (F)	III
	U–Depleted	III
Vanadium (23)	V–48	IV
	V–49	III
Xenon (54)	Xe–125	III
	Xe–131m	III
	Xe–131m (uncompressed)[3]	III
	Xe–133	III
	Xe–133 (uncompressed)[3]	VI
	Xe–135	II
	Xe–135 (uncompressed)[3]	V
Ytterbium (70)	Yb–175	IV
Yttrium (39)	Y–88	III
	Y–90	IV
	Y–91m	III
	Y–91	III
	Y–92	IV
	Y–93	IV
Zinc (30)	Zn–65	IV
	Zn–69m	IV
	Zn–69	IV
Zirconium (40)	Zr–93	IV
	Zr–95	III
	Zr–97	IV

NOTES:

[1]Atomic number shown in parentheses.
[2]Atomic mass number shown after the element symbol.
[3]Uncompressed means at a pressure not exceeding one atmosphere.
m Metastable state.
(F)Fissile material.

(2) "*Transport group*" means any one of seven groups into which radionuclides in normal form are classified, according to their radiotoxicity and their relative potential hazard in transport, in WAC 402–12–200, Appendix A above.

(a) Any radionuclide not specifically listed in one of the groups in WAC 402–12–200, Appendix A above shall be assigned to one of the groups in accordance with the following table:

Radionuclide	Radioactive Half-life		
	0 to 1000 day	1000 days to 10^6 years	Over 10^6 years
Atomic No. 1–81	Group III	Group II	Group III
Atomic No. 82 & over	Group I	Group I	Group III

(b) For mixtures of radionuclides the following shall apply:

(i) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.

(ii) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.

(iii) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

(iv) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except that if a radionuclide "X" has a half–life longer than that of that first member and an activity greater than that of any other member, including the first, at any time during transportation, the transport group of the nuclide "X" and the activity of the mixture shall be the maximum activity of that nuclide "X" during transportation. [Order 1095, § 402–12–200, filed 2/6/76.]

WAC 402–12–210 Appendix B--Information on transportation special form licensed material. (1) "*Special form*" means any of the following physical forms of licensed material of any transport group:

(a) The material is in solid form having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters; does not melt, sublime, or ignite in air at a temperature of 1,000 degrees Fahrenheit; will not shatter or crumble if subjected to the percussion test described in WAC 402–12–210, Appendix B of this part; and is not dissolved or converted into dispersible form to the extent of more than 0.005 percent by weight by immersion for one week in water at 68 degrees Fahrenheit or in air at 86 degrees Fahrenheit; or

(b) The material is securely contained in a capsule having no dimension less than 0.5 millimeter or at least one dimension greater than five millimeters, which will retain its contents if subjected to the tests prescribed in WAC 402–12–210 Appendix B of this part; and which is constructed of materials which do not melt, sublime, or ignite in air at 1,475 degrees Fahrenheit, and do not dissolve, or convert into dispersible form, to the extent of more than 0.005 percent by weight by immersion for one week in water at 68 degrees Fahrenheit or in air at 86 degrees Fahrenheit.

(2) *Tests for Special Form Licensed Material.*

(a) Free Drop – A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.

(b) Percussion – Impact of the flat circular end of a 1 inch diameter steel rod weighing 3 pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than 1 inch thick, supported by a smooth essentially unyielding surface.

(c) Heating – Heating in air to a temperature of 1,475 degrees Fahrenheit and remaining at that temperature for a period of 10 minutes.

(d) Immersion – Immersion for 24 hours in water at room temperature. The water shall be at pH 6–pH 8, with a maximum conductivity of 10 microohms per centimeter. [Order 1095, § 402–12–210, filed 2/6/76.]

WAC 402–12–250 Appendix C--The international system of units (SI). This appendix does not contain any regulations, but is included for informational purposes only.

The Metric Conversion Act of 1975 (PL 94–168) urges the increasing awareness and use of the International System of Units (SI). This appendix is included to acquaint licensees and/or registrants with selected terms of SI units. Future revisions to Title 402 WAC may use these units.

(1) *Absorbed dose.* The unit of absorbed dose is the gray (Gy) which is equal to 1 joule per kilogram. One rad is equal to 1 x 10^{-2} gray. A submultiple is the milligray (mGy).

(2) *Dose equivalent.* The unit of dose equivalent is the sievert (Sv) which is equal to 1 joule per kilogram as modified by the quality factor. One rem is equal to 1 x 10^{-2} sievert. A submultiple is the millisievert (mSv).

(3) *Exposure.* The unit of exposure is the coulombs per kilogram (C/kg). One roentgen is equal to 2.58 x 10^{-4} coulombs per kilogram of dry air. Multiples of this unit are the millicoulomb per kilogram (mC/kg) and the microcoulomb per kilogram (uC/kg) of dry air at standard temperature and pressure.

(4) *Radioactivity.* The unit of measurement of radioactivity is the becquerel (Bq) and is equal to one transformation per second. One curie is equal to 3.7 x 10^{10} becquerels. Multiples are megabecquerel (MBq) and gigabecquerel (GBq). [Statutory Authority: RCW 70-.98.050. 81–01–011 (Order 1570), § 402–12–250, filed 12/8/80.]

Chapter 402–16 WAC
REGISTRATION OF RADIATION SOURCES

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

402–16–010	Purpose. [Order 1, § 402–16–010, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402–16–210.
402–16–020	Registration. [Order 1, § 402–16–020, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402–16–230 (part).
402–16–030	Renewal of registration. [Order 1, § 402–16–030, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76.
402–16–040	Registration form. [Order 1, § 402–16–040, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402–16–230 (part).
402–16–050	Separate locations. [Order 1, § 402–16–050, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by

Order 1084, filed 1/14/76. Later promulgation, see WAC 402-16-240.

402-16-060 Report of change——Theft, loss, accident, or disposal. [Order 1, § 402-16-060, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402-16-250.

402-16-070 Registration shall not imply approval. [Order 1, § 402-16-070, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402-16-260.

402-16-080 Registration information confidential. [Order 1, § 402-16-080, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76.

402-16-090 Vendor obligation. [Order 1, § 402-16-090, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402-16-270.

402-16-100 Exemptions from registration. [Order 1, § 402-16-100, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402-16-220.

402-16-110 Persons with out-of-state registrable items. [Order 1, § 402-16-110, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402-16-280.

WAC 402-16-210 Purpose and scope. (1) This chapter provides for the registration of radiation machine facilities.

(2) For purposes of chapter 402-16 of these regulations, "facility" means the location at which one or more radiation machines are installed and/or located within one building, vehicle, or under one roof and are under the same administrative control.

(3) In addition to the requirements of this chapter, all registrants are subject to the applicable provisions of other parts of these regulations. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-210, filed 12/8/80; Order 1084, § 402-16-210, filed 1/14/76. Formerly WAC 402-16-010.]

WAC 402-16-220 Exemptions. (1) Electronic equipment that produces radiation incidental to its operation for other purposes is exempt from the registration and notification requirements of this part, providing the dose equivalent rate averaged over an area of 10 square centimeters does not exceed 0.5 mrem per hour at 5 cm from any accessible surface of such equipment.

(2) Radiation machines while in transit or storage incident thereto are exempt from the requirements of this part.

(3) Domestic television receivers are exempt from the requirements of this chapter. [Order 1084, § 402-16-220, filed 1/14/76. Formerly WAC 402-16-100.]

WAC 402-16-230 Application for registration of radiation machine facilities. Each person having a radiation machine facility shall apply for registration of such facility with the department within thirty days following the effective date of these regulations or thereafter thirty days after the initial operations of a radiation machine facility. Application for registration shall be completed on forms furnished by the department or on similar forms and containing all the information required by the department form and accompanying instructions. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-230, filed 12/8/80; Order 1084, § 402-16-230, filed 1/14/76. Formerly WAC 402-16-020 and 402-16-040.]

WAC 402-16-232 Issuance of notice of registration. Upon a determination that an application meets WAC 402-16-230 of the registration regulations, the department shall issue a notice of registration. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-232, filed 12/8/80.]

WAC 402-16-234 Expiration of notice of registration. Except as provided by WAC 402-16-238(2) each notice of registration shall expire at the end of the day on the date stated therein. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-234, filed 12/8/80.]

WAC 402-16-238 Renewal of notice of registration. (1) Application for renewal of registration shall be filed in accordance with WAC 402-16-230 at least thirty days prior to the expiration date.

(2) In any case in which a registrant not less than thirty days prior to the expiration of his existing notice of registration has filed an application in proper form for renewal, such existing notice of registration shall not expire until the application status has been determined by the department. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-238, filed 12/8/80.]

WAC 402-16-240 Separate locations. A single registration form may be used to include several facilities provided such facilities are under the ownership or administrative control of the registrant and are within one small geographic complex. Where, as a routine part of the normal conduct of business, registrable items are moved between or among such locations, the registrant will so indicate at the time of registration. Each registrant shall name one or more designated persons, preferably one for each location where the registrant is not normally present, who may be contacted by the department with respect to the requirements for registration. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-240, filed 12/8/80; Order 1084, § 402-16-240, filed 1/14/76. Formerly WAC 402-16-050.]

WAC 402-16-250 Report of changes. The registrant shall notify the department in writing before making any change which would render the information contained in the Application for Registration and/or Notice of Registration no longer accurate. Notifications shall be sent to Radiation Control Section, Mail Stop LD-11, Olympia, WA 98504. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-250, filed 12/8/80; Order 1084, § 402-16-250, filed 1/14/76. Formerly WAC 402-16-060.]

WAC 402-16-260 Approval not implied. No person shall refer, in any advertisement, to the fact that a facility is registered with the Department pursuant to the provisions of WAC 402-16-230 and so as to imply that any activity under such registration has been approved by the Department. [Order 1084, § 402-16-260, filed 1/14/76. Formerly WAC 402-16-070.]

WAC 402-16-270 Transferor, assembler, or installer obligation. (1) Any person who sells, leases, transfers, lends, disposes, assembles, or installs radiation machines in this state shall notify the department within thirty days of:

(a) The name and address of persons who have received these machines;

(b) The manufacturer, model, and serial number of the master control of each radiation machine transferred; and

(c) The date of transfer of each radiation machine.

(2) No person shall make, sell, lease, transfer, lend or install radiation machines or the accessories used in connection with such machines unless such accessories and equipment, when properly placed in operation and properly used, will meet the requirements of these regulations. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-270, filed 12/8/80; Order 1084, § 402-16-270, filed 1/14/76. Formerly WAC 402-16-090.]

WAC 402-16-280 Out-of-state radiation machines. (1) Whenever any radiation machine is to be brought into the state, for any temporary use, the person proposing to bring such machine into the state shall give written notice to the department at least three working days before such machine is to be used in the state. The notice shall include the type of radiation machine; the nature, duration, and scope of use; and the exact location(s) where the radiation machine is to be used. If for a specific case the three working-day period would impose an undue hardship, the person may, upon application to the department, obtain permission to proceed sooner.

(2) In addition the out-of-state person shall:

(a) Comply with all applicable regulations of the department.

(b) Supply the department such other information as the department may reasonably request.

(c) Not operate within the state on a temporary basis in excess of one hundred eighty calendar days per year. If operation in excess of one hundred eighty calendar days is desired, standard registration procedures are required (see WAC 402-16-230). [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-16-280, filed 12/8/80; Order 1084, § 402-16-280, filed 1/14/76. Formerly WAC 402-16-110.]

Chapter 402-19 WAC
REQUIREMENTS OF GENERAL APPLICABILITY TO LICENSING OF RADIOACTIVE MATERIAL

WAC

WAC 402-19-010 Purpose and scope. (1) This chapter prescribes rules governing licensing of radioactive material. No person shall receive, possess, use, transfer, own or acquire radioactive material except as authorized in a specific or general license issued pursuant to chapters 402-21 or 402-22 WAC or as otherwise provided in this chapter.

(2) In addition to the requirements of this chapter, or chapters 402-21 or 402-22 WAC, all licensees are subject to the requirements of chapters 402-12, 402-24, and 402-48 WAC. Licensees engaged in industrial radiographic operations are subject to the requirements of chapter 402-36 WAC, licensees using sealed sources in the healing arts are subject to the requirements of chapter 402-32 WAC, and licensees owning or operating uranium or thorium mills and associated mill tailings are subject to the requirements of chapter 402-52 WAC. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-010, filed 11/30/79, effective 1/1/80. Formerly chapter 402-20 WAC.]

WAC 402-19-190 Exemptions. (1) *Source material.*

(a) Any person is exempt from this chapter and chapters 402-21 and 402-22 WAC to the extent that such person receives, possesses, uses, owns, or transfers source material in any chemical mixture, compound, solution or alloy in which the source material is by weight less than 1/20 of one percent (0.05 percent) of the mixture, compound, solution, or alloy.

(b) Any person is exempt from this chapter and chapters 402-21 and 402-22 WAC to the extent that such person receives, possesses, uses or transfers unrefined and unprocessed ore containing source material: *Provided*, That, except as authorized in a specific license, such person shall not refine or process such ore.

(c) Any person is exempt from this chapter and chapters 402-21 and 402-22 WAC to the extent that such person receives, possesses, uses or transfers:

(i) Any quantities of thorium contained in:

(A) Incandescent gas mantles;

(B) Vacuum tubes;

(C) Welding rods;

(D) Electric lamps for illuminating purposes provided that each lamp does not contain more than fifty milligrams of thorium;

(E) Germicidal lamps, sunlamps and lamps for outdoor or industrial lighting provided that each lamp does not contain more than two grams of thorium;

(F) Rare earth metals and compounds, mixtures, and products containing not more than 0.25 percent by weight thorium, uranium, or any combination of these; or

(G) Personnel neutron dosimeters, provided each dosimeter does not contain more than 50 milligrams of thorium;

(ii) Source material contained in the following products:

(A) Glazed ceramic tableware: *Provided*, That the glaze contains not more than twenty percent by weight source material;

(B) Glassware, glass enamel and glass enamel frit containing not more than ten percent by weight source material, but not including commercially manufactured glass brick, pane glass, ceramic tile or other glass, glass enamel or ceramic used in construction; or

(C) Piezoelectric ceramic containing not more than two percent by weight source material;

(iii) Photographic film, negatives and prints containing uranium or thorium;

(iv) Any finished product or part fabricated of, or containing, tungsten–thorium or magnesium–thorium alloys: *Provided*, That the thorium content of the alloy does not exceed four percent by weight and that the exemption contained in this subparagraph shall not be deemed to authorize the chemical, physical or metallurgical treatment or processing of any such product or part;

(v) Depleted uranium contained in counterweights installed in aircraft, rockets, projectiles and missiles, or stored or handled in connection with installation or removal of such counterweights, provided that:

(A) The counterweights are manufactured in accordance with a specific license issued by the United States Nuclear Regulatory Commission authorizing distribution by the licensee pursuant to 10 CFR Part 40;

(B) Each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM"*;

(C) Each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED"*; and

(D) The exemption contained in this subparagraph shall not be deemed to authorize the chemical, physical or metallurgical treatment or processing of any such counterweight other than repair or restoration of any plating or other covering;

*NOTE: The requirements specified in WAC 402–19–190(1)(c)(v)(B) and (C) need not be met by counterweights manufactured prior to December 31, 1969: *Provided*, That such counterweights are impressed with the legend, "CAUTION – RADIOACTIVE MATERIAL – URANIUM", as previously required by the regulations.

(vi) Depleted uranium used as shielding constituting part of any shipping container which is conspicuously and legibly impressed with the legend "CAUTION – RADIOACTIVE SHIELDING – URANIUM" and which meets the specification for containers for radioactive material prescribed in Section 173.394 or 173.395 of 49 CFR Part 173, of the regulations published by the United States Department of Transportation;

(vii) Thorium contained in finished optical lenses: *Provided*, That each lens does not contain more than thirty percent by weight of thorium, and that the exemption contained in this subparagraph shall not be deemed to authorize either:

(A) The shaping, grinding or polishing of such lens or manufacturing processes other than the assembly of such lens into optical systems and devices without alteration of the lens; or

(B) The receipt, possession, use or transfer of thorium contained in contact lenses, or in spectacles, or in eyepieces in binoculars or other optical instruments;

(viii) Uranium contained in detector heads for use in fire detection units: *Provided*, That each detector head contains not more than 0.005 microcuries of uranium; or

(ix) Thorium contained in any finished aircraft engine part containing nickel–thoria alloy, provided that:

(A) The thorium is dispersed in the nickel–thoria alloy in the form of finely divided thoria (thorium dioxide); and

(B) The thorium content in the nickel–thoria alloy does not exceed four percent by weight.

(d) The exemptions in WAC 402–19–190(1)(c) do not authorize the manufacture of any of the products described.

(2) *Radioactive material other than source material.*

(a) Exempt concentrations.

(i) Except as provided in WAC 402–19–190(2)(a)(ii) any person is exempt from this chapter and chapters 402–21 and 402–22 WAC to the extent that such person receives, possesses, uses, transfers, owns or acquires products or materials containing radioactive material in concentrations not in excess of those listed in WAC 402–19–580, Schedule C.

(ii) No person may introduce radioactive material into a product or material, knowing or having reason to believe, that it will be transferred to persons exempt under WAC 402–19–190(2)(a)(i) or equivalent regulations of the United States Nuclear Regulatory Commission or any Agreement State, except in accordance with a specific license issued pursuant to WAC 402–22–110(1) or the general license provided in WAC 402–19–250.

(b) Exempt quantities.

(i) Except as provided in WAC 402-19-190(2)(b)(ii) and (iii) any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns or acquires radioactive material in individual quantities each of which does not exceed the applicable quantity set forth in WAC 402-19-550, Schedule B.

(ii) This paragraph, WAC 402-19-190(2)(b), does not authorize the production, packaging or repackaging of radioactive material for purposes of commercial distribution, or the incorporation of radioactive material into products intended for commercial distribution.

(iii) No person may, for purposes of commercial distribution, transfer radioactive material in the individual quantities set forth in WAC 402-19-550, Schedule B, knowing or having reason to believe that such quantities of radioactive material will be transferred to persons exempt under WAC 402-19-190(2)(b) or equivalent regulations of the United States Nuclear Regulatory Commission or any Agreement State, except in accordance with a specific license issued by the United States Nuclear Regulatory Commission, pursuant to Section 32.18 of 10 CFR Part 32 or by the department pursuant to WAC 402-22-110(2) which license states that the radioactive material may be transferred by the licensee to persons exempt under WAC 402-19-190(2)(b) or the equivalent regulations of the United States Nuclear Regulatory Commission or any Agreement State.

(c) Exempt items.

(i) Certain items containing radioactive material. Except for persons who apply radioactive material to, or persons who incorporate radioactive material into the following products, any person is exempt from these regulations to the extent that person receives, possesses, uses, transfers, owns or acquires the following products:*

*NOTE: Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing source material or byproduct material whose subsequent possession, use, transfer and disposal by all other persons who are exempted from regulatory requirements may be obtained only from the United States Nuclear Regulatory Commission, Washington, D.C. 20555.

(A) Timepieces or hands or dials containing not more than the following specified quantities of radioactive material and not exceeding the following specified levels of radiation:
25 millicuries of tritium per timepiece;
5 millicuries of tritium per hand;
15 millicuries of tritium per dial (bezels when used shall be considered as part of the dial);
100 microcuries of promethium – 147 per watch or 200 microcuries of promethium – 147 per any other timepiece;
20 microcuries of promethium – 147 per watch hand or 40 microcuries of promethium – 147 per other timepiece hand;
60 microcuries of promethium – 147 per watch dial or 120 microcuries of promethium – 147 per other timepiece dial (bezels when used shall be considered as part of the dial);
The levels of radiation from hands and dials containing promethium – 147 will not exceed, when measured through 50 milligrams per square centimeter of absorber:
For wrist watches, 0.1 millirad per hour at 1 centimeter from any surface;
For pocket watches, 0.1 millirad per hour at 1 centimeter from any surface;
For any other timepiece, 0.2 millirad per hour at 10 centimeters from any surface.
One microcurie of radium-226 per timepiece in timepieces manufactured prior to the effective date of these regulations.

(B) Lock illuminators containing not more than 15 millicuries of tritium or not more than 2 millicuries of promethium – 147 installed in automobile locks. The levels of radiation from each lock illuminator containing promethium – 147 will not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 50 milligrams per square centimeter of absorber.

(C) Precision balances containing not more than 1 millicurie of tritium per balance or not more than 0.5 millicurie of tritium per balance part.

(D) Automobile shift quadrants containing not more than 25 millicuries of tritium.

(E) Marine compasses containing not more than 750 millicuries of tritium gas and other marine navigational instruments containing not more than 250 millicuries of tritium gas.

(F) Thermostat dials and pointers containing not more than 25 millicuries of tritium per thermostat.

(G) Electron tubes: *Provided*, That each tube does not contain more than one of the following specified quantities of radioactive material:

(aa) 150 millicuries of tritium per microwave receiver protector tube or 10 millicuries of tritium per any other electron tube;
(bb) 1 microcurie of cobalt-60;
(cc) 5 microcuries of nickel-63;
(dd) 30 microcuries of krypton-85;
(ee) 5 microcuries of cesium-137;
(ff) 30 microcuries of promethium-147;
(gg) 1 microcurie of radium-226:
And provided further, That the levels of radiation from each electron tube containing radioactive material does not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber.*

*NOTE: For purposes of this subdivision, "electron tubes" include spark gap tubes, power tubes,

gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pick-up tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents.

(H) Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, a source of radioactive material not exceeding the applicable quantity set forth in WAC 402-19-550, Schedule B.

(I) Spark gap irradiators containing not more than 1 microcurie of cobalt-60 per spark gap irradiator for use in electrically ignited fuel oil burners having a firing rate of at least three gallons (11.4 liters) per hour.

(ii) Self-luminous products containing radioactive material(s).

(A) Tritium, krypton-85 or promethium-147. Except for persons who manufacture, process or produce self-luminous products containing tritium, krypton-85 or promethium-147, any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns or acquires tritium, krypton-85 or promethium-147 in self-luminous products manufactured, processed, produced, imported or transferred in accordance with a specific license issued by the United States Nuclear Regulatory Commission pursuant to Section 32.22 of 10 CFR Part 32, which license authorizes the transfer of the product to persons who are exempt from regulatory requirements. The exemption in WAC 402-19-190(2)(c)(ii) does not apply to tritium, krypton-85 or promethium-147 used in products for frivolous purposes or in toys or adornments.

(B) Radium-226. Any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers or owns articles containing less than 0.1 microcurie of radium-226 which were manufactured prior to the effective date of these regulations.

(iii) Gas and aerosol detectors containing radioactive material.

(A) Except for persons who manufacture, process or produce gas and aerosol detectors containing radioactive material, any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns or acquires radioactive material in gas and aerosol detectors designed to protect life or property from fires and airborne hazards: *Provided*, That detectors containing radioactive material shall have been manufactured, imported, or transferred in accordance with a specific license issued by the United States Nuclear Regulatory Commission* or an Agreement State, pursuant to Section 32.26 of 10 CFR Part 32, or licensing state pursuant to WAC 402-22-110(3), which authorizes the transfer of the detectors to persons who are exempt from regulatory requirements.

*NOTE: Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing source material or by-product material whose subsequent possession, use, transfer and disposal by all other persons are exempted from regulatory requirements may be obtained only from the United States Nuclear Regulatory Commission, Washington, D.C. 20555.

(B) Gas and aerosol detectors previously manufactured and distributed to general licensees in accordance with a specific license issued by an Agreement State shall be considered exempt under WAC 402-19-190(2)(c)(iii)(A): *Provided*, That the device is labeled in accordance with the specific license authorizing distribution of the general licensed device: *And provided further*, That they meet the requirements of WAC 402-22-110(3).

(C) Gas and aerosol detectors containing naturally occurring and accelerator-produced radioactive material (NARM) previously manufactured and distributed in accordance with a specific license issued by a Licensing State shall be considered exempt under WAC 402-19-190(2)(c)(iii)(A): *Provided*, That the device is labeled in accordance with the specific license authorizing distribution of the generally licensed device, and provided further that they meet the requirements of WAC 402-22-110(3).

(iv) Resins containing scandium-46 and designed for sand consolidation in oil wells. Any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns or acquires synthetic plastic resins containing scandium-46 which are designed for sand consolidation in oil wells. Such resins shall have been manufactured or imported in accordance with a specific license issued by the United States Nuclear Regulatory Commission or shall have been manufactured in accordance with the specifications contained in a specific license issued by the department or any Agreement State to the manufacturer of such resins pursuant to licensing requirements equivalent to those in Sections 32.16 and 32.17 of 10 CFR Part 32 of the regulations of the United States Nuclear Regulatory Commission. This exemption does not authorize the manufacture of any resins containing scandium-46.

[Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-19-190, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-190, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-190.]

WAC 402-19-220 Types of licenses. Licenses for radioactive materials are of two types: General and specific.

(1) General licenses provided in chapter 402-21 WAC are effective without the filing of applications with the department or the issuance of licensing documents to the particular persons, although the filing of a certificate with the department may be required by the particular general license. The general licensee is subject to all other applicable portions of these regulations and any limitations of the general license.

(2) Specific licenses require the submission of an application to the department and the issuance of a licensing document by the department. The licensee is subject to all applicable portions of these regulations as well as any limitations specified in the licensing document. (See chapter 402-22 WAC). [Statutory Authority: RCW 70-.98.080. 79-12-073 (Order 1459), § 402-19-220, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-020.]

WAC 402-19-240 Prelicensing inspection. The department may verify information contained in applications and secure additional information deemed necessary to make a reasonable determination as to whether to issue a license and whether any special conditions should be attached thereto by visiting the facility or location where radioactive materials would be possessed or used, and by discussing details of the proposed possession or use of the radioactive materials with the applicant or representatives designated by the applicant. Such visits may be made by the department or its duly authorized representatives. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-240, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-200.]

WAC 402-19-250 Reciprocal recognition of licenses. (1) Subject to these regulations, any person who holds a specific license from the United States Nuclear Regulatory Commission or any Agreement State, and issued by the agency having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, is hereby granted a general license to conduct the activities authorized in such licensing document within this state for a period not in excess of one hundred eighty days in any calendar year provided that:

(a) The licensing document does not limit the activity authorized by such document to specified installations or locations;

(b) The out-of-state licensee notifies the department in writing at least three days prior to engaging in such activity. Such notification shall indicate the location, period, and type of proposed possession and use within the state, and shall be accompanied by a copy of the pertinent licensing document. If, for a specific case, the three-day period would impose an undue hardship on the out-of-state licensee, the licensee may, upon application to the department, obtain permission to proceed sooner. The department may waive the requirement for filing additional written notifications during the remainder of the calendar year following the receipt of the initial notification from a person engaging in activities under the general license provided in this subsection;

(c) The out-of-state licensee complies with all applicable regulations of the department and with all the terms and conditions of the licensing document, except any such terms and conditions which may be inconsistent with applicable regulations of the department;

(d) The out-of-state licensee supplies such other information as the department may request; and

(e) The out-of-state licensee shall not transfer or dispose of radioactive material possessed or used under the general license provided in this subsection except by transfer to a person:

(i) Specifically licensed by the department or by the United States Nuclear Regulatory Commission or an Agreement State to receive such material; or

(ii) Exempt from the requirements for a license for such material under WAC 402-19-190(2)(a).

(2) Notwithstanding the provisions of subsection (1) of this section, any person who holds a specific license issued by the United States Nuclear Regulatory Commission or an Agreement State authorizing the holder to manufacture, transfer, install, or service a device described in WAC 402-21-050(4) within the areas subject to the jurisdiction of the licensing body is hereby granted a general license to install, transfer, demonstrate or service a device in this state provided that:

(a) Such person shall file a report with the department within thirty days after the end of each calendar quarter in which any device is transferred to or installed in this state. Each such report shall identify each general licensee to whom such device is transferred by name and address, the type of device transferred, and the quantity and type of radioactive material contained in the device;

(b) The device has been manufactured, labeled, installed, and serviced in accordance with applicable provisions of the specific license issued to such person by the United States Nuclear Regulatory Commission or an Agreement State;

(c) Such person shall assure that any labels required to be affixed to the device under regulations of the authority which licensed manufacture of the device bear a statement that "Removal of this label is prohibited"; and

(d) The holder of the specific license shall furnish to each general licensee to whom such device is transferred or on whose premises such device is installed a copy of the general license contained in WAC 402-21-050(4).

(3) The department may withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by another agency, or any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to prevent undue hazard to public health and safety or

property. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-19-250, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-250, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-210.]

WAC 402-19-300 Terms and conditions of licenses. (1) Each license issued pursuant to this part shall be subject to all the provisions of the act, as now or hereafter in effect, and to all rules, regulations, and orders of the department.

(2) No license issued or granted under chapters 402-21 and 402-22 WAC and no right to possess or utilize radioactive material granted by any license issued pursuant to chapters 402-21 and 402-22 WAC shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person unless the department shall, after securing full information find that the transfer is in accordance with the provisions of the act, and shall give its consent in writing.

(3) Each person licensed by the department pursuant to chapters 402-21 and 402-22 WAC shall confine his use and possession of the material licensed to the locations and purposes authorized in the license.

(4) Each licensee shall notify the department in writing when the licensee decides to permanently discontinue all activities involving materials authorized under the license. This notification requirement applies only to all specific licenses issued under chapter 402-22 WAC. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-19-300, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-300, filed 11/30/79, effective 1/1/80.]

WAC 402-19-350 Modification, revocation and termination of licenses. (1) The terms and conditions of all licenses shall be subject to amendment, revision, or modification, or the license may be suspended or revoked by reason of amendments to the act, or by reason of rules, regulations, and orders issued by the department.

(2) Any license may be revoked, suspended, or modified, in whole or in part, for any material false statement in the application or any statement of fact required under provisions of the act, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means which would warrant the department to refuse to grant a license on an original application, or for violation of, or failure to observe any of the terms and conditions of the act, or of the license, or of any rule, regulation, or order of the department.

(3) Except in cases of wilfulness or those in which the public health, interest, or safety requires otherwise, no license shall be modified, suspended, or revoked unless, prior to the institution of proceedings therefore, facts or conduct which may warrant such action shall have been called to the attention of the licensee in writing and the licensee shall have been accorded an opportunity to demonstrate or achieve compliance with all lawful requirements.

(4) The department may terminate a specific license upon request submitted by the licensee to the department in writing. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-350, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-180.]

WAC 402-19-370 Fees. No fees are required from applicants, licensees, or registrants except as provided in chapter 402-70 WAC for owners or operators of uranium or thorium mills and their associated mill tailings as authorized pursuant to section 3, chapter 110, Laws of 1979 ex. sess. [RCW 70.121.030]. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-370, filed 11/30/79, effective 1/1/80.]

WAC 402-19-400 Transfer of material. (1) No licensee shall transfer radioactive material except as authorized pursuant to this section.

(2) Except as otherwise provided in the license and subject to the provisions of this section, any licensee may transfer radioactive material:

(a) To the department*;

(b) To the United States Department of Energy;

(c) To any person exempt from the regulations in this part to the extent permitted under such exemption;

(d) To any person authorized to receive such material under terms of a general license or its equivalent, or a specific license or equivalent licensing document, issued by the department, the United States Nuclear Regulatory Commission, any Agreement State or any Licensing State, or to any person otherwise authorized to receive such material by the federal government or any agency thereof, the department, any Agreement State or any Licensing State; or

(e) As otherwise authorized by the department in writing.

(3) Before transferring radioactive material to a specific licensee of the department, the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State, or to a general licensee who is required to register with the department, the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State prior to receipt of the radioactive material, the licensee transferring the material shall verify that the transferee's license authorizes the receipt of the type, form, and quantity of radioactive material to be transferred.

(4) The following methods for the verification required by WAC 402-19-400(3) are acceptable:

(a) The transferor may obtain for possession, and read, a current copy of the transferee's specific license or registration certificate;

(b) The transferor may obtain for possession a written certification by the transferee that the transferee is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date;

*A licensee may transfer material to the department only after receiving prior approval from the department.

(c) For emergency shipments the transferor may accept oral certification by the transferee that the transferee is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date: *Provided*, That the oral certification is confirmed in writing within ten days;

(d) The transferor may obtain other sources of information compiled by a reporting service from official records of the department, the United States Nuclear Regulatory Commission, the licensing agency of an Agreement State or a Licensing State as to the identity of licensees and the scope and expiration dates of licenses and registration; or

(e) When none of the methods of verification described in subsection (4) of this section are readily available or when a transferor desires to verify that information received by one of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the department, the United States Nuclear Regulatory Commission, or the licensing agency of an Agreement State or a Licensing State that the transferee is licensed to receive the radioactive material.

(5) Preparation for shipment and transport of radioactive material shall be in accordance with the provisions of WAC 402-19-500. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-19-400, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-400, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-170.]

WAC 402-19-500 Transportation. (1) *Transportation of radioactive material.* No person shall deliver radioactive material to a carrier for transport or transport radioactive material except as authorized in a general or specific license issued by the department or as exempted in WAC 402-19-500(2).

(2) *Exemptions.*

(a) Common and contract carriers, freight forwarders, and warehousemen who are subject to the rules and regulations of the United States Department of Transportation (49 CFR Parts 171 and 173-178) or the United States Postal Service (39 CFR Parts 14 and 15) are exempt from WAC 402-19-500 to the extent that they transport or store radioactive material in the regular course of their carriage for another or storage incident thereto. Common and contract carriers who are not subject to the rules and regulations of the United States Department of Transportation or United States Postal Service are subject to WAC 402-19-500.

(b) Physicians, as defined in WAC 402-12-051, are exempt from the requirements of WAC 402-19-500 only to the extent that they transport radioactive material for emergency use in the practice of medicine.

(c) Specific licensees are exempt from WAC 402-19-500 to the extent that they deliver to a carrier for transport packages each of which contains no radioactive material having a specific activity in excess of 0.002 microcurie per gram.

(d) Any licensee who delivers radioactive material to a carrier for transport, where such transport is subject to the regulations of the United States Postal Service, is exempt from the provisions of WAC 402-19-500.

(3) *Intrastate transport.*

(a) A general license is hereby issued to any common or contract carrier to transport and store radioactive material in the regular course of their carriage for another or storage incident thereto, provided the transportation and storage is in accordance with the applicable requirements of the regulations, appropriate to the mode of transport, of the United States Department of Transportation.

(b) A general license is hereby issued to any private carrier to transport radioactive material, provided the transportation is in accordance with the applicable requirements of the regulations, appropriate to the mode of transport, of the United States Department of Transportation insofar as such regulations relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting.[1]

(c) Persons who transport radioactive material pursuant to the general licenses in WAC 402-19-500(3)(a) or (b) are exempt from the requirements of chapters 402-24 and 402-48 WAC of these regulations to the extent that they transport radioactive material.

(4) *Preparation of radioactive material for transport.* A general license is hereby issued to deliver radioactive material to a carrier[2] for transport provided that:

(a) The licensee complies with the applicable requirements of the regulations, appropriate to the mode of transport, of the United States Department of Transportation insofar as such regulations relate to the packaging of radioactive material, and to the monitoring, marking and labeling of those packages.

(b) The licensee has established procedures for opening and closing packages in which radioactive material is transported to provide safety and to assure that, prior to the delivery to a carrier for transport, each package is properly closed for transport.

(c) Prior to delivery of a package to a carrier for transport, the licensee shall assure that any special instructions needed to safely open the package are sent to or have been make available to the consignee.

(d) In addition to the requirements of the United States Department of Transportation, each package of Type A or Type B quantity radioactive material prepared for shipment must have the innermost container labeled as to the isotope, chemical form, number of curies or subunits thereof, and date of determination of activity and each innermost container shall be tested to assure that the container is properly sealed and that contamination which would cause undue hazard to public health and safety or property is not present prior to transportation. This requirement does not apply to properly packaged shipments of radioactive waste consigned to a commercial low level waste burial facility.

[1]Any notification of incidents referred to in those requirements shall be filed with, or made to, the department.

[2]For the purpose of this regulation, a licensee who transports his own licensed material as a private carrier is considered to have delivered such material to a carrier for transport. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-19-500, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-500, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-220.]

WAC 402-19-530 Requirements for users of the Washington commercial low-level waste disposal site. (1) *Purpose and scope.* Each generator/shipper and each broker of low-level radioactive waste shall have a site use permit prior to the disposal of such wastes at any commercial low-level radioactive waste burial site located in the state of Washington. The term "broker" as used in these regulations shall mean any person who acts as an agent or intermediary for a generator/shipper or another person collecting and/or agreeing to arrange for the transport of radioactive waste generated by others, provided it shall not include a carrier whose sole function is to transport low-level radioactive waste.

(2) *Site use permit.*

(a) Filing application for site use permit.

(i) Application for a site use permit shall be filed on departmental form RHF-30 or a clear legible record containing all the information required on that form including but not limited to: U.S. nuclear regulatory commission or agreement state license number, name of company, address, 24-hour telephone number, and contact person.

(ii) Each application shall be signed by the applicant or a person duly authorized to act for or on the applicant's behalf.

(b) A site use permit must be obtained before disposal of low-level radioactive waste at any waste burial site is permitted.

(c) Each permit shall be renewed annually.

(d) Revocation of permit.

(i) The failure of one or more packages in a shipment of waste to be in compliance with the requirements of Title 402 WAC, the U.S. nuclear regulatory commission, or the U.S. department of transportation, may cause the revocation of this use permit for the responsible waste generator/shipper or broker. Failure to comply with the requirements in the preceding sentence may bar the acceptance of any other or subsequent shipment by the same generator/shipper or broker at the site.

(ii) The site use permit may be revoked for a specific generator/shipper or broker if a refusal to accept one or more of the shipments has been made by any other licensed commercial low-level waste burial site within the United States.

(iii) The site use permit may be reinstated provided the generator/shipper or broker submits documentation approved by the department describing its quality assurance program to achieve compliance for future shipments.

(3) *Waste shipment certification.* A low-level radioactive waste shipment certification shall be required to accompany each shipment of radioactive waste to the licensed low-level waste burial site. The certification shall be submitted at the burial site to the department of social and health services or its designee and must be judged to be properly executed prior to acceptance of the waste by the site operator. The certification shall be on departmental form RHF-31 or a clear legible record containing all the information required in that form, or the certification form provided for in executive order EO79-09. The information shall include but is not limited to name of company, volume of waste in shipment, shipment number, permit number (when issued), and date. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-19-530, filed 12/8/80. Statutory Authority: RCW 70.98.080. 80-02-080 (Order 1481), § 402-19-530, filed 1/21/80.]

WAC 402-19-550 Schedule B, exempt quantities of radioactive materials. (See also WAC 402-19-190(2)(b).)

Radioactive Material	Microcuries
Antimony-122 (Sb-122)	100
Antimony-124 (Sb-124)	10
Antimony-125 (Sb-125)	10
Arsenic-73 (As-73)	100
Arsenic-74 (As-74)	10
Arsenic-76 (As-76)	10
Arsenic-77 (As-77)	100
Barium-131 (Ba-131)	10
Barium-133 (Ba-133)	10
Barium-140 (Ba-140)	10
Bismuth-210 (Bi-210)	1
Bromine-82 (Br-82)	10
Cadmium-109 (Cd-109)	10
Cadmium-115m (Cd-115m)	10
Cadmium-115 (Cd-115)	100
Calcium-45 (Ca-45)	10
Calcium-47 (Ca-47)	10
Carbon-14 (C-14)	100
Cerium-141 (Ce-141)	100
Cerium-143 (Ce-143)	100
Cerium-144 (Ce-144)	1
Cesium-129 (Cs-129)	100
Cesium-131 (Cs-131)	1,000
Cesium-134m (Cs-134m)	100
Cesium-134 (Cs-134)	1
Cesium-135 (Cs-135)	10
Cesium-136 (Cs-136)	10
Cesium-137 (Cs-137)	10
Chlorine-36 (Cl-36)	10
Chlorine-38 (Cl-38)	10
Chromium-51 (Cr-51)	1,000
Cobalt-57 (Co-57)	100
Cobalt-58m (Co-58m)	10
Cobalt-58 (Co-58)	10
Cobalt-60 (Co-60)	1
Copper-64 (Cu-64)	100
Dysprosium-165 (Dy-165)	10
Dysprosium-166 (Dy-166)	100

Radioactive Material	Microcuries
Erbium–169 (Er–169)	100
Erbium–171 (Er–171)	100
Europium–152 (Eu–152) 9.2h	100
Europium–152 (Eu–152) 13 yr	1
Europium–154 (Eu–154)	1
Europium–155 (Eu–155)	10
Fluorine–18 (F–18)	1,000
Gadolinium–153 (Gd–153)	10
Gadolinium–159 (Gd–159)	100
Gallium–67 (Ga–67)	100
Gallium–72 (Ga–72)	10
Germanium–71 (Ge–71)	100
Gold–198 (Au–198)	100
Gold–199 (Au–199)	100
Hafnium–181 (Hf–181)	10
Holmium–166 (Ho–166)	100
Hydrogen–3 (H–3)	1,000
Indium–111 (In–111)	100
Indium–113m (In–113m)	100
Indium–114m (In–114m)	10
Indium–115m (In–115m)	100
Indium–115 (In–115)	10
Iodine–123 (I–123)	100
Iodine–125 (I–125)	1
Iodine–126 (I–126)	1
Iodine–129 (I–129)	0.1
Iodine–131 (I–131)	1
Iodine–132 (I–132)	10
Iodine–133 (I–133)	1
Iodine–134 (I–134)	10
Iodine–135 (I–135)	10
Iridium–192 (Ir–192)	10
Iridium–194 (Ir–194)	100
Iron–52 (Fe–52)	10
Iron–55 (Fe–55)	100
Iron–59 (Fe–59)	10
Krypton–85 (Kr–85)	100
Krypton–87 (Kr–87)	10
Lanthanum–140 (La–140)	10
Lutetium–177 (Lu–177)	100
Manganese–52 (Mn–52)	10
Manganese–54 (Mn–54)	10
Manganese–56 (Mn–56)	10
Mercury–197m (Hg–197m)	100
Mercury–197 (Hg–197)	100
Mercury–203 (Hg–203)	10
Molybdenum–99 (Mo–99)	100
Neodymium–147 (Nd–147)	100
Neodymium–149 (Nd–149)	100
Nickel–59 (Ni–59)	100
Nickel–63 (Ni–63)	10
Nickel–65 (Ni–65)	100
Niobium–93m (Nb–93m)	10
Niobium–95 (Nb–95)	10
Niobium–97 (Nb–97)	10
Osmium–185 (Os–185)	10
Osmium–191m (Os–191m)	100
Osmium–191 (Os–191)	100
Osmium–193 (Os–193)	100
Palladium–103 (Pd–103)	100
Palladium–109 (Pd–109)	100
Phosphorus–32 (P–32)	10
Platinum–191 (Pt–191)	100
Platinum–193m (Pt–193m)	100
Platinum–193 (Pt–193)	100
Platinum–197m (Pt–197m)	100
Platinum–197 (Pt–197)	100
Polonium–210 (Po–210)	0.1
Potassium–42 (K–42)	10
Potassium–43 (K–43)	10
Praseodymium–142 (Pr–142)	100
Praseodymium–143 (Pr–143)	100
Promethium–147 (Pm–147)	10
Promethium–149 (Pm–149)	10
Rhenium–186 (Re–186)	100
Rhenium–188 (Re–188)	100
Rhodium–103m (Rh–103m)	100
Rhodium–105 (Rh–105)	100
Rubidium–81 (Rb–81)	10
Rubidium–86 (Rb–86)	10
Rubidium–87 (Rb–87)	10
Ruthenium–97 (Ru–97)	100
Ruthenium–103 (Ru–103)	10
Ruthenium–105 (Ru–105)	10
Ruthenium–106 (Ru–106)	1
Samarium–151 (Sm–151)	10
Samarium–153 (Sm–153)	100
Scandium–46 (Sc–46)	10
Scandium–47 (Sc–47)	100
Scandium–48 (Sc–48)	10
Selenium–75 (Se–75)	10
Silicon–31 (Si–31)	100
Silver–105 (Ag–105)	10
Silver–110m (Ag–110m)	1
Silver–111 (Ag–111)	100
Sodium–22 (Na–22)	10
Sodium–24 (Na–24)	10
Strontium–85 (Sr–85)	10
Strontium–89 (Sr–89)	1
Strontium–90 (Sr–90)	0.1
Strontium–91 (Sr–91)	10
Strontium–92 (Sr–92)	10
Sulphur–35 (S–35)	100
Tantalum–182 (Ta–182)	10
Technetium–96 (Tc–96)	10
Technetium–97m (Tc–97m)	100
Technetium–97 (Tc–97)	100
Technetium–99m (Tc–99m)	100
Technetium–99 (Tc–99)	10
Tellurium–125m (Te–125m)	10
Tellurium–127m (Te–127m)	10
Tellurium–127 (Te–127)	100
Tellurium–129m (Te–129m)	10
Tellurium–129 (Te–129)	100
Tellurium–131m (Te–131m)	10
Tellurium–132 (Te–132)	10

Radioactive Material	Microcuries
Terbium–160 (Tb–160)	10
Thallium–200 (Tl–200)	100
Thallium–201 (Tl–201)	100
Thallium–202 (Tl–202)	100
Thallium–204 (Tl–204)	10
Thulium–170 (Tm–170)	10
Thulium–171 (Tm–171)	10
Tin–113 (Sn–113)	10
Tin–125 (Sn–125)	10
Tungsten–181 (W–181)	10
Tungsten–185 (W–185)	10
Tungsten–187 (W–187)	100
Vanadium–48 (V–48)	10
Xenon–131m (Xe–131m)	1,000
Xenon–133 (Xe–133)	100
Xenon–135 (Xe–135)	100
Ytterbium–175 (Yb–175)	100
Yttrium–87 (Y–87)	10
Yttrium–90 (Y–90)	10
Yttrium–91 (Y–91)	10
Yttrium–92 (Y–92)	100
Yttrium–93 (Y–93)	100
Zinc–65 (Zn–65)	10
Zinc–69m (Zn–69m)	100
Zinc–69 (Zn–69)	1,000
Zirconium–93 (Zr–93)	10
Zirconium–95 (Zr–95)	10
Zirconium–97 (Zr–97)	10
Any radioactive material not listed above other than alpha emitting radioactive material	0.1

[Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–19–550, filed 11/30/79, effective 1/1/80. Formerly WAC 402–20–240.]

WAC 402–19–580 Schedule C, exempt concentrations. (See Wac 402–19–190(2)(a).)

Element (atomic number)	Isotope	Column I Gas concentration $\mu Ci/ml^1$	Column II Liquid and solid concentration $\mu Ci/ml^2$
Antimony (51)	Sb–122		$3x10^{-4}$
	Sb–124		$2x10^{-4}$
	Sb–125		$1x10^{-3}$
Argon (18)	Ar–37	$1x10^{-3}$	
	Ar–41	$4x10^{-7}$	
Arsenic (33)	As–73		$5x10^{-3}$
	As–74		$5x10^{-4}$
	As–76		$2x10^{-4}$
	As–77		$8x10^{-4}$
Barium (56)	Ba–131		$2x10^{-3}$
	Ba–140		$3x10^{-4}$
Beryllium (4)	Be–7		$2x10^{-2}$
Bismuth (83)	Bi–206		$4x10^{-4}$
Bromine (35)	Br–82	$4x10^{-7}$	$3x10^{-3}$
Cadmium (48)	Cd–109		$2x10^{-3}$
	Cd–115m		$3x10^{-4}$
	Cd–115		$3x10^{-4}$
Calcium (20)	Ca–45		$9x10^{-5}$
	Ca–47		$5x10^{-4}$
Carbon (6)	C–14	$1x10^{-6}$	$8x10^{-3}$
Cerium (58)	Ce–141		$9x10^{-4}$
	Ce–143		$4x10^{-4}$
	Ce–144		$1x10^{-4}$
Cesium (55)	Cs–131		$2x10^{-2}$
	Cs–134m		$6x10^{-2}$
	Cs–134		$9x10^{-5}$
Chlorine (17)	Cl–38	$9x10^{-7}$	$4x10^{-3}$
Chromium (24)	Cr–51		$2x10^{-2}$
Cobalt (27)	Co–57		$5x10^{-3}$
	Co–58		$1x10^{-3}$
	Co–60		$5x10^{-4}$
Copper (29)	Cu–64		$3x10^{-3}$
Dysprosium (66)	Dy–165		$4x10^{-3}$
	Dy–166		$4x10^{-4}$
Erbium (68)	Er–169		$9x10^{-4}$
	Er–171		$1x10^{-3}$
Europium (63)	Eu–152 (9.2 h)		$6x10^{-4}$
	Eu–155		$2x10^{-3}$
Fluorine (9)	F–18	$2x10^{-6}$	$8x10^{-3}$
Gadolinium (64)	Gd–153		$2x10^{-3}$
	Gd–159		$8x10^{-4}$
Gallium (31)	Ga–72		$4x10^{-4}$
Germanium (32)	Ge–71		$2x10^{-2}$
Gold (79)	Au–196		$2x10^{-3}$
	Au–198		$5x10^{-4}$
	Au–199		$2x10^{-3}$
Hafnium (72)	Hf–181		$7x10^{-4}$
Hydrogen (1)	H–3	$5x10^{-6}$	$3x10^{-2}$
Indium (49)	In–113m		$1x10^{-2}$
	In–114m		$2x10^{-4}$
Iodine (53)	I–126	$3x10^{-9}$	$2x10^{-5}$
	I–131	$3x10^{-9}$	$2x10^{-5}$
	I–132	$8x10^{-8}$	$6x10^{-4}$
	I–133	$1x10^{-8}$	$7x10^{-5}$
	I–134	$2x10^{-7}$	$1x10^{-3}$
Iridium (77)	Ir–190		$2x10^{-3}$
	Ir–192		$4x10^{-4}$
	Ir–194		$3x10^{-4}$
Iron (26)	Fe–55		$8x10^{-3}$
	Fe–59		$6x10^{-4}$
Krypton (36)	Kr–85m	$1x10^{-6}$	
	Kr–85	$3x10^{-6}$	
Lanthanum (57)	La–140		$2x10^{-4}$
Lead (82)	Pb–203		$4x10^{-3}$
Lutetium (71)	Lu–177		$1x10^{-3}$
Manganese (25)	Mn–52		$3x10^{-4}$
	Mn–54		$1x10^{-3}$
	Mn–56		$1x10^{-3}$
Mercury (80)	Hg–197m		$2x10^{-3}$
	Hg–197		$3x10^{-3}$
	Hg–203		$2x10^{-4}$
Molybdenum (42)	Mo–99		$2x10^{-3}$
Neodymium (60)	Nd–147		$6x10^{-4}$
	Nd–149		$3x10^{-3}$
Nickel (28)	Ni–65		$1x10^{-3}$
Niobium (Columbium) (41)	Nb–95		$1x10^{-3}$
	Nb–97		$9x10^{-3}$
Osmium (76)	Os–185		$7x10^{-4}$
	Os–191m		$3x10^{-2}$
	Os–191		$2x10^{-3}$
	Os–193		$6x10^{-4}$
Palladium (46)	Pd–103		$3x10^{-3}$
	Pd–109		$9x10^{-4}$

Element (atomic number)	Isotope	Column I Gas concentration $\mu Ci/ml$[1]	Column II Liquid and solid concentration $\mu Ci/ml$[2]
Phosphorus (15)	P-32		$2x10^{-4}$
Platinum (78)	Pt-191		$1x10^{-3}$
	Pt-193m		$1x10^{-2}$
	Pt-197m		$1x10^{-2}$
	Pt-197		$1x10^{-3}$
Potassium (19)	K-42		$3x10^{-3}$
Praseodymium (59)	Pr-142		$3x10^{-4}$
	Pr-143		$5x10^{-4}$
Promethium (61)	Pm-147		$2x10^{-3}$
	Pm-149		$4x10^{-4}$
Rhenium (75)	Re-183		$6x10^{-3}$
	Re-186		$9x10^{-4}$
	Re-188		$6x10^{-4}$
Rhodium (45)	Rh-103m		$1x10^{-1}$
	Rh-105		$1x10^{-3}$
Rubidium	Rb-86		$7x10^{-4}$
Ruthenium (44)	Ru-97		$4x10^{-3}$
	Ru-103		$8x10^{-4}$
	Ru-105		$1x10^{-3}$
	Ru-106		$1x10^{-4}$
Samarium (62)	Sm-153		$8x10^{-4}$
Scandium (21)	Sc-46		$4x10^{-4}$
	Sc-47		$9x10^{-4}$
	Sc-48		$3x10^{-4}$
Selenium (34)	Se-75		$3x10^{-3}$
Silicon (14)	Si-31		$9x10^{-3}$
Silver (47)	Ag-105		$1x10^{-3}$
	Ag-110m		$3x10^{-4}$
	Ag-111		$4x10^{-4}$
Sodium (11)	Na-24		$2x10^{-3}$
Strontium (38)	Sr-85		$1x10^{-3}$
	Sr-89		$1x10^{-4}$
	Sr-91		$7x10^{-4}$
	Sr-92		$7x10^{-4}$
Sulfur (16)	S-35	$9x10^{-8}$	$6x10^{-4}$
Tantalum (73)	Ta-182		$4x10^{-4}$
Technetium (43)	Tc-96m		$1x10^{-1}$
	Tc-96		$1x10^{-3}$
Tellurium (52)	Te-125m		$2x10^{-3}$
	Te-127m		$6x10^{-4}$
	Te-127		$3x10^{-3}$
	Te-129m		$3x10^{-4}$
	Te-131m		$6x10^{-4}$
	Te-132		$3x10^{-4}$
Terbium (65)	Tb-160		$4x10^{-4}$
Thallium (81)	Tl-200		$4x10^{-3}$
	Tl-201		$3x10^{-3}$
	Tl-202		$1x10^{-3}$
	Tl-204		$1x10^{-3}$
Thulium (69)	Tm-170		$5x10^{-4}$
	Tm-171		$5x10^{-3}$
Tin (50)	Sn-113		$9x10^{-4}$
	Sn-125		$2x10^{-4}$
Tungsten (Wolfram) (74)	W-181		$4x10^{-3}$
	W-187		$7x10^{-4}$
Vanadium (23)	V-48		$3x10^{-4}$
Xenon (54)	Xe-131m	$4x10^{-6}$	
	Xe-133	$3x10^{-6}$	
	Xe-135	$1x10^{-6}$	
Ytterbium (70)	Yb-175		$1x10^{-3}$
Yttrium (39)	Y-90		$2x10^{-4}$
	Y-91m		$3x10^{-2}$
	Y-91		$3x10^{-4}$
	Y-92		$6x10^{-4}$
	Y-93		$3x10^{-4}$
Zinc (30)	Zn-65		$1x10^{-3}$
	Zn-69m		$7x10^{-4}$
	Zn-69		$2x10^{-2}$
Zirconium (40)	Zr-95		$6x10^{-4}$
	Zr-97		$2x10^{-4}$
Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years		$1x10^{-10}$	$1x10^{-6}$

NOTES:

[1]Values are given in Column I only for those materials normally used as gases

[2]$\mu Ci/gm$ for solids

NOTE 1: Many radioisotopes disintegrate into isotopes which are also radioactive. In expressing the concentrations in Schedule C the activity stated is that of the parent isotope and takes into account the daughters.

NOTE 2: For purposes of WAC 402-19-190(2) where there is involved a combination of isotopes, the limit for the combination should be derived as follows: Determine for each isotope in the product the ratio between the concentration present in the product and the exempt concentration established in Schedule C for the specific isotope when not in combination. The sum of such ratios may not exceed "1" (i.e., unity).

EXAMPLE:

$$\frac{\text{Concentration of Isotope A in Product}}{\text{Exempt concentration of Isotope A}} + \frac{\text{Concentration of Isotope B in Product}}{\text{Exempt concentration of Isotope B}} \leq 1$$

NOTE 3: For the purpose of determining concentration in a product or device, the total quantity of radioactive material present is divided by only that weight or volume of the discrete part or component throughout which the radioactive material is relatively uniformly distributed. If the weight or volume of this part or component cannot be determined then the product or device should be evaluated on the basis of the total quantity of radioactive material present.

[Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-19-580, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-250.]

Chapter 402-21 WAC
GENERAL LICENSES

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

402-21-100 Intrastate transportation of radioactive material. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-21-100, filed 11/30/79, effective 1/1/80.] Repealed by 81-01-011 (Order 1570), filed 12/8/80. Statutory Authority: RCW 70.98.050.

WAC 402-21-010 Purpose and scope. This chapter establishes general licenses for the possession and use of radioactive material contained in certain items and a general license for ownership of radioactive material. Chapter 402-19 WAC also contains provisions applicable to the subject matter of this part. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-21-010, filed 11/30/79, effective 1/1/80. Formerly chapter 402-20 WAC.]

WAC 402-21-030 General licenses--Source material. (1) A general license is hereby issued authorizing use, possession, and transfer of not more than fifteen pounds of source material at any one time by persons in the following categories:

(a) Pharmacists using the source material solely for the preparation of medicinal compounds;

(b) Physicians using the source material for medicinal purposes;

(c) Persons receiving possession of source material from pharmacists and physicians in the form of medicinals or drugs;

(d) Commercial and industrial firms, and research, educational, and medical institutions, and state and local government agencies for research, development, educational, operational, or commercial purposes;

And provided, that no such person shall, pursuant to this general license, receive more than a total of one hundred fifty pounds of source material in any one calendar year.

(2) Persons who receive, possess, use, or transfer source material pursuant to the general license issued in subsection (1) of this section are exempt from the provisions of chapters 402-24 and 402-48 WAC to the extent that such receipt, possession, use, or transfer is within the terms of such general license: *Provided, however,* That this exemption shall not be deemed to apply to any such person who is also in possession of source material under a specific license issued pursuant to chapter 402-22 WAC.

(3) A general license is hereby issued authorizing the receipt of title to source material without regard to quantity. This general license does not authorize any person to receive, possess, use, or transfer source material.

(4) Depleted uranium in industrial products and devices.

(a) A general license is hereby issued to receive, acquire, possess, use, or transfer, in accordance with the provisions of paragraphs (4)(b), (c), (d), and (e) of this section, depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of the product or device.

(b) The general license in paragraph (4)(a) of this section applies only to industrial products or devices which have been manufactured either in accordance with a specific license issued to the manufacturer of the products or devices pursuant to WAC 402-22-110 (13) or in accordance with a specific license issued to the manufacturer by the United States Nuclear Regulatory Commission or an Agreement State which authorizes manufacture of the products or devices for distribution to persons generally licensed by the United States Nuclear Regulatory Commission or an Agreement State.

(c)(i) Persons who receive, acquire, possess, or use depleted uranium pursuant to the general license established by paragraph (4)(a) of this section shall file Department Form RHF-20 "Registration Certificate - Use of Depleted Uranium Under General License," with the department. The form shall be submitted within thirty days after the first receipt or acquisition of such depleted uranium. The registrant shall furnish on Department Form RHF-20 the following information and such other information as may be required by that form:

(A) Name and address of the registrant;

(B) A statement that the registrant has developed and will maintain procedures designed to establish physical control over the depleted uranium described in paragraph (4)(a) of this section and designed to prevent transfer of such depleted uranium in any form, including metal scrap, to persons not authorized to receive the depleted uranium; and

(C) Name and/or title, address, and telephone number of the individual duly authorized to act for and on behalf of the registrant in supervising the procedures identified in item (4)(c)(i)(B) of this section.

(ii) The registrant possessing or using depleted uranium under the general license established by paragraph (4)(a) of this section shall report in writing to the department any changes in information previously furnished on the "Registration Certificate - Use of Depleted Uranium Under General License." The report shall be submitted within thirty days after the effective date of such change.

(d) A person who receives, acquires, possesses, or uses depleted uranium pursuant to the general license established by paragraph (4)(a) of this section:

(i) Shall not introduce such depleted uranium, in any form, into a chemical, physical, or metallurgical treatment or process, except a treatment or process for repair or restoration of any plating or other covering of the depleted uranium.

(ii) Shall not abandon such depleted uranium.

(iii) Shall transfer or dispose of such depleted uranium only by transfer in accordance with the provision

of chapter 402–19 WAC. In the case where the transferee receives the depleted uranium pursuant to the general license established by paragraph (4)(a) of this section the transferor shall furnish the transferee a copy of this regulation and a copy of Department Form RHF–20.

In the case where the transferee receives the depleted uranium pursuant to a general license contained in the United States Nuclear Regulatory Commission's or Agreement State's regulation equivalent to paragraph (4)(a) of this section the transferor shall furnish the transferee a copy of this regulation and a copy of Department Form RHF–20 accompanied by a note explaining that use of the product or device is regulated by the United States Nuclear Regulatory Commission or Agreement State under requirements substantially the same as those in this regulation.

(iv) Shall maintain and make available to the department upon request the name and address of the person receiving the depleted uranium pursuant to such transfer.

(v) Shall not export such depleted uranium except in accordance with a license issued by the United States Nuclear Regulatory Commission pursuant to 10 CFR Part 110.

(e) Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by paragraph (4)(a) of this section is exempt from the requirements of chapters 402–24 and 402–48 WAC of these regulations with respect to the depleted uranium covered by that general license. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–21–030, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–21–030, filed 11/30/79, effective 1/1/80. Formerly WAC 402–20–030.]

WAC 402–21–050 General licenses*--Radioactive material other than source material.

*NOTE: Different general licenses are issued in this section, each of which has its own specific conditions and requirements.

(1) ***Certain devices and equipment.*** A general license is hereby issued to transfer, receive, acquire, own, possess, and use radioactive material incorporated in the following devices or equipment which have been manufactured, tested and labeled by the manufacturer in accordance with a specific license issued to the manufacturer by the United States Nuclear Regulatory Commission for use pursuant to Section 31.3 of 10 CFR Part 31. This general license is subject to the provisions of WAC 402–12–080 through 402–12–140, chapters 402–19, 402–24** and 402–48 WAC of these regulations.

(a) Static elimination device. Devices designed for use as static eliminators which contain, as a sealed source or sources, radioactive material consisting of a total of not more than 500 microcuries of polonium–210 per device.

(b) *Ion generating tube.* Devices designed for ionization of air which contain, as a sealed source or sources, radioactive material consisting of a total of not more than 500 microcuries of polonium–210 per device or a total of not more than 50 millicuries of hydrogen–3 (tritium) per device.

**Attention is directed particularly to the provisions of chapter 402–24 WAC of these regulations which relate to the labeling of containers.

(2) Reserved.

(3) Reserved.

(4) ***Certain measuring, gauging or controlling devices.***

(a) A general license is hereby issued to commercial and industrial firms and research, educational and medical institutions, individuals in the conduct of their business, and state or local government agencies to own, acquire, receive, possess, use or transfer, in accordance with the provisions of paragraphs (4)(b), (c), and (d) of this section, radioactive material excluding special nuclear material contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

(b) The general license in paragraph (4)(a) of this section applies only to radioactive material contained in devices which have been manufactured and labeled in accordance with the specifications contained in a specific license issued by the department pursuant to WAC 402–22–110 (4) or in accordance with the Nuclear Regulatory Commission, an Agreement State or a Licensing State, which authorizes distribution of devices to persons generally licensed by the United States Nuclear Regulatory Commission, an Agreement State or Licensing State**.

**NOTE: Regulations under the Federal Food, Drug, and Cosmetic Act authorizing the use of radioactive control devices in food production require certain additional labeling thereon which is found in Section 179.21 of 21 CFR Part 179.

(c) Any person who owns, acquires, receives, possesses, uses or transfers radioactive material in a device pursuant to the general license in paragraph (a) of this subsection:

(i) Shall assure that all labels affixed to the device at the time of receipt and bearing a statement that removal of the label is prohibited are maintained thereon and shall comply with all instructions and precautions provided by such labels;

(ii) Shall assure that the device is tested for leakage of radioactive material and proper operation of the on–off mechanism and indicator, if any, at no longer than six–month intervals or at such other intervals as are specified in the label, however:

(A) Devices containing only krypton need not be tested for leakage of radioactive material; and

(B) Devices containing only tritium or not more than 100 microcuries of other beta and/or gamma emitting material or 10 microcuries

of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose;

(iii) Shall assure that the tests required by item (4)(c)(ii) of this section and other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:

(A) In accordance with the instructions provided by the labels; or

(B) By a person holding a specific license from the department or from the United States Nuclear Regulatory Commission or from any Agreement State to perform such activities;

(iv) Shall maintain records showing compliance with the requirements of items (4)(c)(ii) and (iii) of this section. The records shall show the results of tests. The records also shall show the dates of performance and the names of persons performing, testing, installation, servicing, and removal from installation concerning the radioactive material, its shielding or containment. Records of tests for leakage of radioactive material required by item (4)(c)(ii) of this section shall be maintained for one year after the next required leak test is performed or the sealed source is transferred or disposed. Records of tests of the on/off mechanism and indicator required by item (4)(c)(ii) of this section shall be maintained for one year after the next required test of the on/off mechanism and indicator is performed or the sealed source is transferred or disposed. Records of other testing, installation, servicing, and removal from installation required by item (4)(c)(iii) of this section shall be maintained for a period of two years from the date of the recorded event or until the device is transferred or disposed;

(v) Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on/off mechanism or indicator, or upon the detection of 0.005 microcuries or more removable radioactive material, shall immediately suspend operation of the device until it has been repaired by the manufacturer or other person holding a specific license from the department, the United States Nuclear Regulatory Commission, or from an Agreement State to repair such devices, or disposed by transfer to a person authorized by a specific license to receive the radioactive material contained in the device and, within thirty days, furnish to the department a report containing a brief description of the event and the remedial action taken;

(vi) Shall not abandon the device containing radioactive material;

(vii) Except as provided in item (4)(c)(viii) of this section, shall transfer or dispose the device containing radioactive material only by transfer to a person holding a specific license of the department, the United States Nuclear Regulatory Commission, or an Agreement State, or a Licensing State whose specific license authorizes the person to receive the device and within thirty days after transfer of a device to a specific licensee shall furnish to the department a report containing identification of the device by manufacturer's name and model number and the name and address of the person receiving the device. No report is required if the device is transferred to the specific licensee in order to obtain a replacement device;

(viii) Shall transfer the device to another general licensee only:

(A) Where the device remains in use at a particular location. In such case, the transferor shall give the transferee a copy of this subsection and any safety documents identified in the label of the device and within thirty days of the transfer, report to the department the manufacturer's name and model number of device transferred, the name and address of the transferee, and the name and/or position of an individual who may constitute a point of contact between the department and the transferee; or

(B) Where the device is held in storage in the original shipping container at its intended location of use prior to initial use by a general licensee.

(ix) Shall comply with the provisions of WAC 402-24-180 and 402-24-190 for reporting radiation incidents, theft or loss of licensed material, but shall be exempt from the other requirements of chapters 402-24 and 402-48 WAC.

(d) The general license in paragraph (4)(a) of this section does not authorize the manufacture, import or export of devices containing radioactive material.

(e) The general license provided in subsection (4) of this section is subject to the provisions of WAC 402-12-080 through 402-12-100, 402-12-130, 402-12-140, 402-12-170, 402-19-300, 402-19-350, 402-19-400, and 402-19-500.

(5) ***Luminous safety devices for aircraft.***

(a) A general license is hereby issued to own, receive, acquire, possess and use tritium or promethium-147 contained in luminous safety devices for use in aircraft, provided:

(i) Each device contains not more than 10 curies of tritium or 300 millicuries of promethium-147; and

(ii) Each device has been manufactured, assembled or imported in accordance with a specific license issued by the United States Nuclear Regulatory Commission, or each device has been manufactured or assembled in accordance with the specifications contained in a specific license issued by the department or any Agreement State to the manufacturer or assembler of such device pursuant to licensing requirements equivalent to those in Section 32.53 of 10 CFR Part 32 of the regulations of the United States Nuclear Regulatory Commission.

(b) Persons who own, receive, acquire, possess or use luminous safety devices pursuant to the general license in subsection (5) of this section are exempt from the requirements of chapters 402-24 and 402-48 WAC except that they shall comply with the provisions of WAC 402-24-180 and 402-24-190.

(c) This general license does not authorize the manufacture, assembly, or repair of luminous safety devices containing tritium or promethium–147.

(d) This general license does not authorize the ownership, receipt, acquisition, possession or use of promethium–147 contained in instrument dials.

(e) This general license is subject to the provisions of WAC 402–12–080 through 402–12–140, 402–12–170, 402–19–300, 402–19–350, 402–19–400, and 402–19–500.

(6) ***Ownership of radioactive material.*** A general license is hereby issued to own radioactive material without regard to quantity. Notwithstanding any other provisions of this chapter, this general license does not authorize the manufacture, production, transfer, receipt, possession or use of radioactive material.

(7) ***Calibration and reference sources.***

(a) A general license is hereby issued to those persons listed below to own, receive, acquire, possess, use and transfer, in accordance with the provisions of paragraphs (7)(d) and (e) of this section, americium–241 in the form of calibration or reference sources:

(i) Any person who holds a specific license issued by the department which authorizes that person to receive, possess, use and transfer radioactive material; or

(ii) Any person who holds a specific license issued by the United States Nuclear Regulatory Commission which authorizes that person to receive, possess, use and transfer special nuclear material.

(b) A general license is hereby issued to own, receive, possess, use and transfer plutonium in the form of calibration or reference sources in accordance with the provisions of paragraphs (7)(d) and (e) of this section to any person who holds a specific license issued by the department which authorizes that person to receive, possess, use and transfer radioactive material.

(c) A general license is hereby issued to own, receive, possess, use and transfer radium–226 in the form of calibration or reference sources in accordance with the provisions of paragraphs (7)(d) and (e) of this section to any person who holds a specific license issued by the department which authorizes that person to receive, possess, use and transfer radioactive material.

(d) The general licenses in paragraphs (7)(a), (b) and (c) of this section apply only to calibration or reference sources which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer or importer of the sources by the United States Regulatory Commission pursuant to Section 32.57 of 10 CFR Part 32 or Section 70.39 of 10 CFR Part 70 or which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer by the department or any Agreement State pursuant to licensing requirements equivalent to those contained in Section 32.57 of 10 CFR Part 32 or Section 70.39 of 10 CFR Part 70 of the regulations of the United States Nuclear Regulatory Commission.

(e) The general licenses provided in paragraphs (7)(a), (b) and (c) are subject to the provisions of WAC 402–12–080 through 402–12–100, 402–12–130, 402–12–140, 402–12–170, 402–19–300, 402–19–350, 402–19–400, 402–19–500, chapters 402–24 and 402–48 WAC.

In addition, persons who own, receive, acquire, possess, use or transfer one or more calibration or reference sources pursuant to these general licenses:

(i) Shall not possess at any one time, at any one location of storage or use, more than 5 microcuries of americium–241 and 5 microcuries of plutonium in such sources and 5 microcuries of radium–226;

(ii) Shall not receive, possess, use or transfer such source unless the source, or the storage container, bears a label which includes one of the following statements or a substantially similar statement which contains the information called for in the following statement:

(A) The receipt, possession, use and transfer of this source, Model ----------, Serial No. ----------, are subject to a general license and the regulations of the United States Nuclear Regulatory Commission or of a state with which the Commission has entered into an agreement for the exercise of regulatory authority. Do not remove this label.

CAUTION – RADIOACTIVE MATERIAL – THIS SOURCE CONTAINS (AMERICIUM–241). (PLUTONIUM)*. DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE

Name of manufacturer or importer

*NOTE: Showing only the name of the appropriate material.

(B) The receipt, possession, use and transfer of this source, Model ----------, Serial No. ----------, are subject to a general license and the regulations of any Licensing State. Do not remove this label.

CAUTION – RADIOACTIVE MATERIAL – THIS SOURCE CONTAINS RADIUM–226. DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE.

Name of manufacturer or importer

(iii) Shall not transfer, abandon, or dispose of such source except by transfer to a person authorized by a license from the department, the United States Nuclear Regulatory Commission, or an Agreement State to receive the source;

(iv) Shall store such source, except when the source is being used, in a closed container adequately designed and constructed to contain americium–241, plutonium, or radium–226 which might otherwise escape during storage; and

(v) Shall not use such source for any purpose other than the calibration of radiation detectors or the standardization of other sources.

(f) These general licenses do not authorize the manufacture of calibration or reference sources containing americium–241, plutonium, or radium–226.

(8) ***General license for use of radioactive material for certain in vitro clinical or laboratory testing.****

(a) A general license is hereby issued to any physician, veterinarian, clinical laboratory or hospital to receive, acquire, possess, transfer or use, for any of the following stated tests, in accordance with the provisions of paragraphs (8)(b), (c), (d), (e), and (f) of this section the following radioactive materials in prepackaged units:

(i) Iodine–125, in units not exceeding 10 microcuries each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

(ii) Iodine–131, in units not exceeding 10 microcuries each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

(iii) Carbon–14, in units not exceeding 10 microcuries each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

(iv) Hydrogen–3 (tritium), in units not exceeding 50 microcuries each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

(v) Iron–59, in units not exceeding 20 microcuries each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

(vi) Cobalt–57, in units not exceeding 10 microcuries each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

(vii) Selenium–75, in units not to exceed 10 microcuries each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

(viii) Mock Iodine–125 reference or calibration sources, in units not exceeding 0.05 microcurie of iodine–129 and 0.005 microcurie of americium–241 each for use in *in vitro* clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

*NOTE: The New Drug provisions of the Federal Food, Drug and Cosmetic Act also govern the availability and use of any specific diagnostic drugs in interstate commerce.

(b) No person shall receive, acquire, possess, use or transfer radioactive material pursuant to the general license established by paragraph (8)(a) of this section until that person has filed Department Form RHF–15, "Certificate – *In Vitro* Testing with Radioactive Material Under General License", with the department and received from the department a validated copy of Department Form RHF–15 with certification number assigned, or until that person has been authorized pursuant to WAC 402–22–070(3) to use radioactive material under the general license in subsection (8) of this section. The physician, veterinarian, clinical laboratory or hospital shall furnish on Department Form RHF–15 the following information and such other information as may be required by that form:

(i) Name and address of the physician, veterinarian, clinical laboratory or hospital;

(ii) The location of use; and

(iii) A statement that the physician, veterinarian, clinical laboratory or hospital has appropriate radiation measuring instruments to carry out *in vitro* clinical or laboratory tests with radioactive material as authorized under the general license in paragraph (8)(a) of this section and that such tests will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive material.

(c) A person who receives, acquires, possesses or uses radioactive material pursuant to the general license established by paragraph (9)(a) of this section shall comply with the following:

(i) The general licensee shall not possess at any one time, pursuant to the general license in paragraph (8)(a) of this section at any one location of storage or use, a total amount of iodine–125, iodine–131, selenium–75, iron–59, and/or cobalt–57 in excess of 200 microcuries.

(ii) The general licensee shall store the radioactive material, until used, in the original shipping container or in a container providing equivalent radiation protection.

(iii) The general licensee shall use the radioactive material only for the uses authorized by paragraph (8)(a) of this section.

(iv) The general licensee shall not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the department, the United States Nuclear Regulatory Commission, any Agreement State or Licensing State, nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the supplier.

(v) The general licensee shall dispose of the Mock Iodine–125 reference or calibration sources described in item (8)(a)(viii) of this section as required by WAC 402–24–130 of these regulations.

(d) The general licensee shall not receive, acquire, possess, or use radioactive material pursuant to paragraph (8)(a) of this section:

(i) Except as prepackaged units which are labeled in accordance with the provision of an applicable specific license issued pursuant to WAC 402–22–110(8) or in accordance with the provisions of a specific license issued by the United States Nuclear Regulatory Commission, or any Agreement State or Licensing State which authorizes the manufacture and distribution of iodine–125, iodine–131, carbon–14, hydrogen–3 (tritium), iron–59, selenium–75, cobalt–57, or Mock Iodine–125 to persons generally licensed under subsection (8) of this section or its equivalent; and

(ii) Unless one of the following statements, as appropriate, or a substantially similar statement which contains the information called for in one of the following statements, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

This radioactive material shall be received, acquired, possessed and used only by physicians, veterinarians, clinical laboratories or hospitals and only for *in vitro* clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of the United States Nuclear Regulatory Commission or of a state with which the Commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

This radioactive material shall be received, acquired, possessed and used only by physicians, veterinarians, clinical laboratories or hospitals and only for *in vitro* clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of a Licensing State.

Name of manufacturer

(e) The physician, veterinarian, clinical laboratory or hospital possessing or using radioactive material under the general license of paragraph (9)(a) of this section shall report in writing to the department, any changes in the information previously furnished in the "Certificate – *In Vitro* Testing with Radioactive Material Under General License", Department Form RHF–15. The report shall be furnished within thirty days after the effective date of such change.

(f) Any person using radioactive material pursuant to the general license of paragraph (8)(a) of this section is exempt from the requirements of chapters 402–24 and 402–48 WAC of these regulations with respect to radioactive material covered by that general license, except that such persons using the Mock Iodine–125 described in item (9)(a)(viii) of this section shall comply with the provisions of WAC 402–24–130, 402–24–180 and 402–24–190 and of these regulations.

(9) ***Ice detection devices.***

(a) A general license is hereby issued to own, receive, acquire, possess, use and transfer strontium–90 contained in ice detection devices, provided each device contains not more than 50 microcuries of strontium–90 and each device has been manufactured or imported in accordance with a specific license issued by the United States Nuclear Regulatory Commission or each device has been manufactured in accordance with the specifications contained in a specific license issued by the department or any Agreement State to the manufacturer of such device pursuant to licensing requirements equivalent to those in Section 32.61 of 10 CFR Part 32 of the regulations of the United States Nuclear Regulatory Commission.

(b) Persons who own, receive, acquire, possess, use or transfer strontium–90 contained in ice detection devices pursuant to the general license in paragraph (9)(a) of this section:

(i) Shall, upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating to the device, discontinue use of the device until it has been inspected, tested for leakage and repaired by a person holding a specific license from the United States Nuclear Regulatory Commission or an Agreement State to manufacture or service such devices; or shall dispose of the device pursuant to the provisions of these regulations;

(ii) Shall assure that all labels affixed to the device at the time of receipt, and which bear a statement which prohibits removal of the labels, are maintained thereon; and

(iii) Are exempt from the requirements of chapters 402–24 and 402–48 WAC of these regulations except that such persons shall comply with the provisions of WAC 402–24–130, 402–24–180, and 402–24–190.

(c) This general license does not authorize the manufacture, assembly, disassembly or repair of strontium–90 in ice detection devices.

(d) This general license is subject to the provision of WAC 402–12–080 through WAC 402–12–100, 402–12–130, 402–12–140, 402–12–170, 402–19–300, 402–19–350, 402–19–400, and 402–19–500 of these regulations. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–21–050, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–21–050, filed 11/30/79, effective 1/1/80. Formerly WAC 402–20–040.]

Chapter 402–22 WAC
SPECIFIC LICENSES

WAC 402-22-010 Purpose and scope. (1) This chapter prescribes requirements for the issuance of specific licenses.

(2) The provisions and requirements of this chapter are in addition to, and not in substitution for, other requirements of these regulations. In particular the provisions of chapter 402-19 WAC apply to applications and licenses subject to this chapter. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-010, filed 11/30/79, effective 1/1/80. Formerly chapter 402-20 WAC.]

WAC 402-22-020 Filing application for specific licenses. (1) Applications for specific licenses shall be filed on Department Form RHF-1.

(2) The department may at any time after the filing of the original application, and before the expiration of the license, require further statements in order to enable the department to determine whether the application should be granted or denied or whether a license should be modified or revoked.

(3) Each application shall be signed by the applicant or licensee or a person duly authorized to act for and on the applicant's behalf.

(4) An application for a license may include a request for a license authorizing one or more activities.

(5) In the application, the applicant may incorporate by reference information contained in previous applications, statements, or reports filed with the department provided such references are clear and specific.

(6) Applications and documents submitted to the department may be made available for public inspection except that the department may withhold any document or part thereof from public inspection if disclosure of its content is not required in the public interest and would adversely affect the interest of a person concerned. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-020, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-050.]

WAC 402-22-040 General requirements for the issuance of specific licenses. A license application will be approved if the department determines that:

(1) The applicant is qualified by reason of training and experience to use the material in question for the purpose requested in accordance with these regulations in such a manner as to minimize danger to public health and safety or property;

(2) The applicant's proposed equipment, facilities, and procedures are adequate to minimize danger to public health and safety or property;

(3) The issuance of the license will not be inimical to the health and safety of the public; and

(4) The applicant satisfies any applicable special requirements in WAC 402-22-070, 402-22-090, and 402-22-110. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-040, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-060.]

WAC 402-22-045 Issuance of specific licenses. (1) Upon a determination that an application meets the requirements of the act and the regulations of the department the department will issue a specific license authorizing the proposed activity in such form and containing such conditions and limitations as it deems appropriate or necessary.

(2) The department may incorporate in any license at the time of issuance, or thereafter by appropriate rule, regulation, or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use and transfer of radioactive material subject to this part as it deems appropriate or necessary in order to:

(a) Minimize danger to public health and safety or property;

(b) Require such reports and the keeping of such records, and to provide for such inspections of activities under the license as may be appropriate or necessary; and

(c) Prevent loss or theft of material subject to this part. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-045, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-080.]

WAC 402-22-050 Expiration of licenses. Except as provided in WAC 402-22-055(2), each specific license shall expire at the end of the day, in the month and year stated therein. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-050, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-100.]

WAC 402-22-055 Renewal of license. (1) Applications for renewal of specific licenses shall be filed in accordance with WAC 402-22-020.

(2) In any case in which a licensee, not less than thirty days prior to expiration of the existing license, has filed an application in proper form for renewal or for a new license authorizing the same activities, such existing license shall not expire until the application has been finally determined by the department. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-055, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-110.]

WAC 402-22-060 Amendment of licenses at request of licensee. Applications for amendment of a license shall be filed in accordance with WAC 402-22-020 and shall specify the respects in which the licensee desires the license to be amended ad the grounds for such amendment. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-060, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-120.]

WAC 402-22-065 Agency action on applications to renew or amend. In considering an application by a licensee to renew or amend the license, the department

will apply the criteria set forth in WAC 402-22-040, 402-22-070, 402-22-090, or 402-22-110 as applicable. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-065, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-130.]

WAC 402-22-070 Special requirements for issuance of certain specific licenses for radioactive material. (1) *Human use of radioactive material in institutions.* In addition to the requirements set forth in WAC 402-22-040 a specific license for human use of radioactive material in institutions will be issued if:

(a) The applicant has appointed a radiation safety committee to coordinate the use of radioactive material throughout that institution and to maintain surveillance over the institution's radiation safety program. Membership of the committee should include a specialist (where applicable a physician) from each department where radioactive material is used, a representative of the institution's management, a representative of the nursing staff, and a person trained in radiation safety;

(b) The applicant possesses adequate facilities for the clinical care of patients;

(c) The physician(s) designated on the application as the individual user(s) has (or have) substantial experience in the handling and administration of radioactive material and, where applicable, the clinical management of radioactive patients; and

(d) If the application is for a license to use unspecified quantities or multiple types of radioactive material, the applicant's staff has substantial experience in the use of a variety of radioactive materials for a variety of human uses.

(2) *Licensing of individual physicians for human use of radioactive material.* In addition to the requirements set forth in WAC 402-22-040 a specific license for the human use of radioactive material will be issued to an individual physician if:

(a) The applicant has access to a hospital possessing adequate facilities to hospitalize and monitor the applicant's radioactive patients whenever it is advisable; and

(b) The applicant has extensive experience in the handling and administration of radioactive material and, where applicable, the clinical management of radioactive patients.

(c) The application is for use in the applicant's practice in an office outside a medical institution.

(d) The department will not approve an application by an individual physician or group of physicians for a specific license to receive, possess or use radioactive material on the premises of a medical institution unless:

(i) The use of radioactive material is limited to:

(A) the administration of radiopharmaceuticals for diagnostic or therapeutic purposes,

(B) the performance of diagnostic studies on patients to whom a radiopharmaceutical has been administered,

(C) the performance of in vitro diagnostic studies, or

(D) the calibration and quality control checks of radioactive assay instrumentation, radiation safety instrumentation and diagnostic instrumentation;

(ii) The physician brings the radioactive material with him and removes the radioactive material when he departs. (The institution cannot receive, possess or store radioactive material other than the amount of material remaining in the patient); and

(iii) The medical institution does not hold a radioactive material license issued pursuant to the provisions of subsection (1) of this section.

(3) *Specific licenses for certain groups of medical uses of radioactive material.*

(a) Subject to the provisions of paragraphs (3)(b), (c) and (d) of this section an application for a specific license pursuant to subsections (1), (2) or (4) of this section, or for any medical use or uses of radioactive material specified in one or more of Groups I to VI, inclusive, of WAC 402-22-200, Schedule A, will be approved for all of the uses within the group or groups which include the use or uses specified in the application if:

(i) The applicant satisfies the requirements of subsections (1), (2) or (4) of this section;

(ii) The applicant, or the physician designated in the application as the individual user, has adequate clinical experience in the types of uses included in the group or groups;

(iii) The applicant, or the physicians and all other personnel who will be involved in the preparation and use of the radioactive material, have adequate training and experience in the handling of radioactive material appropriate to their participation in the uses included in the group or groups;

(iv) The applicant's radiation detection and measuring instrumentation is adequate for conducting the procedures involved in the uses included in the group or groups; and

(v) The applicant's radiation safety operating procedures are adequate for handling and disposal of the radioactive material involved in the uses included in the group or groups.

(b) Any licensee or registrant who is authorized to use radioactive material pursuant to one or more groups in paragraph (3)(a) of this section and WAC 402-22-200, Schedule A, is subject to the following conditions:

(i) For Groups I, II, IV, and V, no licensee or registrant shall receive, possess or use radioactive material except as a radiopharmaceutical manufactured in the form to be administered to the patient, labeled, packaged and distributed in accordance with a specific license issued by the department pursuant to WAC 402-22-110 (10), a specific license issued by the United States Nuclear Regulatory Commission pursuant to Section 32.72 of 10 CFR Part 32, or a specific license issued by an Agreement State or a Licensing State pursuant to equivalent regulations.

(ii) For Group III, no licensee or registrant shall receive, possess or use generators or reagent kits containing radioactive material or shall use reagent kits that do not contain radioactive material to prepare radiopharmaceuticals containing radioactive material, except:

(A) Reagent kits not containing radioactive material that are approved by the department, the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State for use by persons licensed pursuant to subsection (3) of this section and WAC 402-22-200, Schedule A, or equivalent regulations; or

(B) Generators or reagent kits containing radioactive material that are manufactured, labeled, packaged and distributed in accordance with a specific license issued by the department pursuant to WAC 402-22-110(11), a specific license issued by the United States Nuclear Regulatory Commission pursuant to Section 32.73 of 10 CFR Part 32, or a specific license issued by an Agreement State or a Licensing State pursuant to equivalent regulations.

(iii) For Group VI, no licensee or registrant shall receive, possess or use radioactive material except as contained in a source or device that has been manufactured, labeled, packaged and distributed in accordance with a specific license issued by the department pursuant to WAC 402-22-110(12), a specific license issued by the United States Nuclear Regulatory Commission pursuant to Section 32.74 of 10 CFR Part 32, or a specific license issued to the manufacturer by an Agreement State or a Licensing State pursuant to equivalent regulations.

(iv) For Group III, any licensee or registrant who uses generators or reagent kits shall elute the generator or process radioactive material with the reagent kit in accordance with instructions which are approved by the department, the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State and are furnished by the manufacturer on the label attached to or in the leaflet or brochure which accompanies the generator or reagent kit.

(v) For Groups I, II and III any licensee using byproduct material for clinical procedures other than those specified in the product labeling (package insert) shall comply with the product labeling regarding:

(A) Chemical and physical form;

(B) Route of administration; and

(C) Dosage range.

(c) Any licensee who is licensed pursuant to paragraph (3)(a) of this section for one or more of the medical use groups in WAC 402-22-200, Schedule A, also is authorized, subject to the provisions of paragraph (3)(c) and (d) of this section to receive, possess and use for calibration and reference standards:

(i) Any radioactive material authorized under Group I, Group II, or Group III of WAC 402-22-200, Schedule A, with a half-life not longer than one hundred days, in amounts not to exceed 15 millicuries total;

(ii) Any radioactive material authorized under Group I, Group II, or Group III of WAC 402-22-200, Schedule A, with half-life greater than one hundred days in amounts not to exceed 200 microcuries total;

(iii) Technetium-99m in amounts not to exceed 30 millicuries; and

(iv) Any radioactive material, in amounts not to exceed 3 millicuries per source, contained in calibration or reference sources that have been manufactured, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to WAC 402-22-110(12), a specific license issued by the United States Nuclear Regulatory Commission pursuant to Section 32.74 of 10 CFR Part 32, or a specific license issued to the manufacturer by an Agreement State or a Licensing State pursuant to equivalent regulations.

(d) Leak tests.

(i) Any licensee or registrant who possesses sealed sources as calibration or reference sources pursuant to paragraph (3)(c) of this section shall cause each sealed source containing radioactive material, other than hydrogen-3, with a half-life greater than thirty days in any form other than gas to be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed sources should not be used until tested: *Provided, however,* That no leak tests are required when:

(A) The source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material;

(B) The sealed source is stored and is not being used; such sources shall, however, be tested for leakage prior to any use or transfer unless they have been leak tested within 6 months prior to the date of use or transfer;

(ii) The leak test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is mounted or stored on which contamination might be expected to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department.

(iii) If the leak test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee or registrant shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with chapters 402-22 and 402-24 WAC of these regulations. A report shall be filed within five days of the test with the department describing the equipment involved, the test results, and the corrective action taken.

(e) Any licensee or registrant who possesses and uses calibration and reference sources pursuant to item (3)(c)(iv) of this section shall:

(i) Follow the radiation safety and handling instructions approved by the department, the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State and furnished by the manufacturer on the label attached to the source, or permanent container thereof, or in the leaflet or brochure that accompanies the source, and maintain such instruction in a legible and conveniently available form; and

(ii) Conduct a quarterly physical inventory to account for all sources received and possessed. Records of the

inventories shall be maintained for inspection by the department and shall include the quantities and kinds of radioactive material, location of sources, and the date of the inventory.

(4) *Human use of sealed sources.* In addition to the requirements set forth in WAC 402-22-040, a specific license for human use of sealed sources will be issued only if the applicant or, if the application is made by an institution, the individual user:

(a) Has specialized training in the diagnostic or therapeutic use of the sealed source considered, or has experience equivalent to such training; and

(b) Is a physician.

(5) *Use of sealed sources in industrial radiography.* In addition to the requirements set forth in WAC 402-22-040, a specific license for use of sealed sources in industrial radiography will be issued if:

(a) The applicant will have an adequate program for training radiographers and radiographer's assistants and submits to the department a schedule or description of such program which specifies the:

(i) Initial training;

(ii) Periodic training;

(iii) On-the-job training;

(iv) Means to be used by the licensee to determine the radiographer's knowledge and understanding of and ability to comply with department regulations and licensing requirements, and the operating and emergency procedures of the applicant; and

(v) Means to be used by the licensee to determine the radiographer's assistant's knowledge and understanding of and ability to comply with the operating and emergency procedures of the applicant;

(b) The applicant submits to the department and complies with satisfactory written operating and emergency procedures (described in WAC 402-36-110 of these regulations);

(c) The applicant will have an adequate internal inspection system, or other management control, to assure that license provisions, regulations, and the applicant's operating and emergency procedures are followed by radiographers and radiographer's assistants;

(d) The applicant submits to the department a description of the applicant's overall organizational structure pertaining to the industrial radiography program, including specified delegations of authority and responsibility for operation of the program;

(e) The applicant who desires to conduct leak tests has established adequate procedures to be followed in leak testing sealed sources for possible leakage and contamination and submits to the department a description of such procedures including:

(i) Instrumentation to be used;

(ii) Method of performing tests, e.g., points on equipment to be smeared and method of taking smear; and

(iii) Pertinent experience of the person who will perform the tests;

(f) The licensee shall conduct a program for inspection and maintenance of radiographic exposure devices and storage containers to assure proper functioning of components important to safety.

(6) *Environmentally significant licensing actions.* In addition to the requirements set forth in WAC 402-22-040, a specific license for any activity within the licensing authority of the department which the department determines will significantly affect the radiological quality of the human environment, including those specified in WAC 197-10-175(7)(a) (i.e., licenses to operate low level waste burial facilities or licenses to operate or expand beyond the design capacity, mineral processing facilities or their tailings areas, whose products, or byproducts, have concentrations of naturally occurring radioactive material in excess of exempt concentrations as specified in WAC 402-19-580, Schedule C), will be issued if the following conditions are met:

(a) Environmental Impact Statement.

(i) The application for a license or license amendment (other than administrative amendments) is accompanied or preceded by a Final Environmental Impact Statement or Final Declaration of Nonsignificance completed in accordance with the State Environmental Policy Act (SEPA) procedures and guidelines specified in chapters 197-10 and 248-06 WAC. For any uranium or thorium mill in operation on or before the effective date of this regulation for which an Environmental Impact Statement has not been prepared previously, an application for license renewal must be accompanied or preceded by a Final Environmental Impact Statement or Final Declaration of Nonsignificance completed in accordance with SEPA guidelines.

NOTE: No construction shall be commenced until the license has been issued or unless an emergency exemption from SEPA requirements is granted in accordance with WAC 197-10-180. For the purposes of subsection (6) of this section, the term "commencement of construction" means any clearing of land, excavation or other substantial action related to a proposed activity for specific licensing that would adversely affect the natural environment of a site; this term does not include changes desirable for the temporary use of the land for public recreational use, limited borings to determine site characteristics as necessary for environmental assessment, or other preconstruction monitoring to establish background information related to suitability of a site or to the protection of environmental values. In the case where an exemption is granted, the applicant shall assume all financial risk for construction activity; waive any claim of entitlement to the issuance of a license based solely upon the grant of the exemption or the commencement of construction pursuant thereto; and furnish, if the circumstances warrant and the department so requires, a financial surety arrangement to insure the protection of the public health, safety and the environment in the event of abandonment, default, or inability of the license applicant to meet the requirements of the act or these regulations.

(ii) In addition to the information required in chapter 197-10 WAC, the following additional areas shall be addressed in the final Environmental Impact Statement:

(A) Alternative sites to those chosen by the applicant shall include all alternative sites, whether or not those sites are under the control or ownership of the applicant.

(B) Long term impacts shall include, but not be limited to, decommissioning, decontamination, reclamation impacts and material management associated with the proposed activities.

(C) Environmental reviews, dose assessments, ecology, construction effects on biota, impact on the environment from the use of chemicals, and socio-economic effects shall be addressed.

(D) Alternative disposal sites and techniques for disposal shall be evaluated to determine if a site or technique is clearly superior.

(b) For uranium or thorium milling operations, a bond made payable to the department of social and health services or other acceptable government agency, and in an amount specified by the department, shall be posted to ensure the protection of the public health and safety in the event of abandonment, default or other inability of the licensee to meet the requirements for reclamation and disposal of tailings and for decommissioning the site. The bond, or a copy thereof when the bond is made payable to another government agency, shall be received by the department prior to issuance of the license, or prior to license renewal for mills in operation on or before the effective date of this regulation. Other acceptable surety arrangements in addition to surety bonding include cash deposits, certificates of deposit, deposits of government securities, letters or lines of credit or combinations of the foregoing. The amount and mechanism of the surety arrangement may be reviewed by the department preceding each license renewal and adjustments may be required of the licensee prior to such renewal.

(c) The owner of the proposed uranium or thorium mill and tailings site(s) agrees to transfer or revert to the appropriate state or federal agency upon termination of the license, all lands, buildings and grounds, and any interest therein, necessary to fulfill the purposes of this subsection, except where the lands are held in trust for, or are owned by any Indian tribe. For any uranium or thorium mill in operation on or before the effective date of this regulation, such an agreement will be required prior to license renewal.

(d) For all uranium and thorium milling operations, the owner or operator shall arrange to pay to the department or its designee on a quarterly basis a charge on each pound of uranium or thorium compound which is milled out of the raw ore on or after January 1, 1980. For uranium or thorium mills in operation on or before the effective date of this regulation, the mill owner or operator shall determine the appropriate manner in which to make said payments prior to April 1, 1980.

(i) The specific charge shall be five cents per pound on each pound of uranium or thorium compound milled out of the raw ore.

(ii) The specific charge may be increased or decreased as is considered necessary to provide a special security fund for the further maintenance, surveillance or care which may be required after a licensee has ceased to operate.

(iii) The total charge shall not exceed one million dollars.

(e) The application for a license includes a description of an appropriate program for effluent monitoring, environmental monitoring and data reporting. Such description shall encompass locations, frequency, and types of sampling, analytical plans and procedures, minimum detection levels, sampling equipment and quality assurance programs.

(f) All licensees or registrants required to meet the additional requirements set forth in WAC 402-22-070(6) shall establish environmental monitoring programs adequate to determine the impact of their activity on the natural environment around the site of their environmentally significant activity. The established environmental and effluent monitoring program shall address all environmentally significant radionuclide releases and external radiation sources caused or threatened to be caused by the licensee's activities.

(i) Effluent and environmental monitoring results shall include the following minimum information as pertinent:

(A) Information as to flow rates, total volume of effluent, peak concentration, concentration of each radionuclide in the effluent averaged over a period of one year at the point where the effluent leaves a stack, tube, pipe, or similar conduit;

(B) A description of the properties of the effluents, including:

(I) Chemical composition;

(II) Physical characteristics, including suspended solids content in liquid effluents, and nature of gas aerosol for air effluents;

(III) The hydrogen ion concentrations (pH) of liquid effluents; and

(IV) The size range of particulates in effluent released into air;

(C) A description of the anticipated human occupancy in the unrestricted area where the highest concentration of radioactive material from the effluent is expected, and, in the case of a river stream a description of water uses downstream from the point of release of the effluent.

(D) Information as to the highest concentration of each radionuclide in an unrestricted area, including anticipated concentrations averaged over a period of one year:

(I) In air at any point of human occupancy; or

(II) In water at points of use downstream from the point of release of the effluent;

(E) The background concentration of radionuclides in the receiving river or stream prior to the release of liquid effluent;

(F) A description of the waste treatment facilities and procedures used to reduce the concentration of radionuclides in effluents prior to their release;

(G) A written description of sampling techniques and sample analysis methods;

(H) A written description of how all calculated results were obtained from sample analysis data. This explanation shall include example calculations and estimates of the precision and sensitivity of monitoring results;

(I) A written description of the licensee's quality control program including specification of control samples and standard samples used.

(ii) The licensee shall submit in writing to the department within sixty days after January 1 and July 1 of each year, reports specifying the quantities of each of the principle radionuclides released to unrestricted areas in liquid and in gaseous effluent during the previous six months of operations. This data shall be reported in a manner that will permit the department to confirm the potential annual radiation doses to the public. All data from the radiological and nonradiological environmental monitoring program will also be submitted for the same time period and frequency as specified above. The data shall be reported in a manner which will allow the department to confirm the potential annual radiation doses to the public. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-22-070, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-070, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-070.]

WAC 402-22-090 Special requirements for specific licenses of broad scope. This section prescribes requirements for the issuance of specific licenses of broad scope for radioactive material ("broad licenses") and certain regulations governing holders of such licenses.*

*NOTE: Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity or other product containing source material or byproduct material whose subsequent possession, use, transfer and disposal by all other persons who are exempted from regulatory requirements may be obtained only from the United States Nuclear Regulatory Commission, Washington, D.C. 20555.

(1) *The different types of broad licenses are set forth below:*

(a) A "Type A specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of the radioactive material specified in the license, but not exceeding quantities specified in the license, for any authorized purpose. The quantities specified are usually in the multicurie range.

(b) A "Type B specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of radioactive material specified in WAC 402-22-250 Schedule B, for any authorized purpose. The possession limit for a Type B broad license, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in WAC 402-22-250 Schedule B, Column I. If two or more radionuclides are possessed thereunder, the possession limit for each is determined as follows: For each radionuclide, determine the ratio of the quantity possessed to the applicable quantity specified in WAC 402-22-250 Schedule B, Column I, for that radionuclide. The sum of the ratios for all radionuclides possessed under the license shall not exceed unity.

(c) A "Type C specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of radioactive material specified in WAC 402-22-250 Schedule B, for any authorized purpose. The possession limit for a Type C broad license, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in WAC 402-22-250 Schedule B, Column II. If two or more radionuclides are possessed thereunder, the possession limit is determined for each as follows: For each radionuclide determine the ratio of the quantity possessed to the applicable quantity specified in WAC 402-22-250 Schedule B, Column II, for that radionuclide. The sum of the ratios for all radionuclides possessed under the license shall not exceed unity.

(2) *An application for a Type A specific license of broad scope will be approved if:*

(a) The applicant satisfies the general requirements specified in WAC 402-22-040.

(b) The applicant has engaged in a reasonable number of activities involving the use of radioactive material; and

(c) The applicant has established administrative controls and provisions relating to organization and management, procedures, recordkeeping, material control and accounting, and management review that are necessary to assure safe operations, including:

(i) The establishment of a radiation safety committee composed of such persons as a radiation safety officer, a representative of management, and persons trained and experienced in the safe use of radioactive material;

(ii) The appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters; and

(iii) The establishment of appropriate administrative procedures to assure:

(A) Control of procurement and use of radioactive material;

(B) Completion of safety evaluation of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures; and

(C) Review, approval, and recording by the radiation safety committee of safety evaluation of proposed uses prepared in accordance with item (2)(c)(iii)(B) of this section prior to use of the radioactive material.

(3) *An application for a Type B specific license of broad scope will be approved if:*

(a) The applicant satisfies the general requirements specified in WAC 402-22-040; and

(b) The applicant has established administrative controls and provisions relating to organization and management, procedures, recordkeeping, material control and accounting, and management review that are necessary to assure safe operations, including:

(i) The appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters; and

(ii) The establishment of appropriate administrative procedures to assure:

(A) Control of procurement and use of radioactive material;

(B) Completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures; and

(C) Review, approval, and recording by the radiation safety officer of safety evaluations of proposed uses prepared in accordance with item (3)(b)(ii)(B) of this section prior to use of the radioactive material.

(4) *An application for a Type C specific license of broad scope will be approved if:*

(a) The applicant satisfies the general requirements specified in WAC 402-22-040.

(b) The applicant submits a statement that radioactive material will be used only by, or under the direct supervision of individuals, who have received:

(i) A college degree at the bachelor level, or equivalent training and experience, in the physical or biological sciences or in engineering; and

(ii) At least forty hours of training and experience in the safe handling of radioactive material, and in the characteristics of ionizing radiation, units of radiation dose and quantities, radiation detection instrumentation, and biological hazards of exposure to radiation appropriate to the type and forms of radioactive material to be used; and

(c) The applicant has established administrative controls and provisions relating to procurement of radioactive material, procedures, recordkeeping, material control and accounting, and management review necessary to assure safe operations.

(5) *Specific licenses of broad scope are subject to the following conditions:*

(a) Unless specifically authorized by the department, persons licensed pursuant to this section shall not:

(i) Conduct tracer studies in the environment involving direct release of radioactive material;

(ii) Receive, acquire, own, possess, use or transfer devices containing 100,000 curies or more of radioactive material in sealed sources used for irradiation of materials;

(iii) Conduct activities for which a specific license issued by the department under WAC 402-22-070 or 402-22-110 is required; or

(iv) Add or cause the addition of radioactive material to any food, beverage, cosmetic, drug or other product designed for ingestion or inhalation by, or application to, a human being.

(b) Each Type A specific license of broad scope issued under this part shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety committee.

(c) Each Type B specific license of broad scope issued under this part shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety officer.

(d) Each Type C specific license of broad scope issued under this part shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals who satisfy the requirements of subsection (4) of this section. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-22-090, filed 11/30/79, effective 1/1/80. Formerly WAC 402-20-073.]

WAC 402-22-110 Special requirements for a specific license to manufacture, assemble, repair, or distribute commodities, products, or devices which contain radioactive material. (1) *Licensing the introduction of radioactive material into products in exempt concentrations.* In addition to the requirements set forth in WAC 402-22-040, a specific license authorizing the introduction of radioactive material into a product or material owned by or in the possession of the licensee or another to be transferred to persons exempt under WAC 402-19-190(2)(a) will be issued if:

(a) The applicant submits a description of the product or material into which the radioactive material will be introduced, intended use of the radioactive material and the product or material into which it is introduced, method of introduction, initial concentration of the radioactive material in the product or material, control methods to assure that no more than the specified concentration is introduced into the product or material, estimated time interval between introduction and transfer of the product or material, and estimated concentration of the radioactive material in the product or material at the time of transfer; and

(b) The applicant provides reasonable assurance that the concentrations of radioactive material at the time of transfer will not exceed the concentrations in WAC 402-19-580, Schedule C, that reconstruction of the radioactive material in concentrations exceeding those in WAC 402-19-580, Schedule C, is not likely, that use of lower concentrations is not feasible, and that the product or material is not likely to be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to a human being.

(c) Each person licensed under subsection (1) of this section shall file an annual report with the department which shall identify the type and quantity of each

product or material into which radioactive material has been introduced during the reporting period; name and address of the person who owned or possessed the product and material, into which radioactive material has been introduced, at the time of introduction; the type and quantity of radionuclide introduced into each such product or material; and the initial concentrations of the radionuclide in the product or material at time of transfer of the radioactive material by the licensee. If no transfers of radioactive material have been made pursuant to subsection (1) of this section during the reporting period, the report shall so indicate. The report shall cover the year ending June 30, and shall be filed within thirty days thereafter.

(2) *Licensing the distribution of radioactive material in exempt quantities.**

*NOTE: Authority to transfer possession or control by the manufacturer, processor or producer of any equipment, device, commodity or other product containing source material or by-product material whose subsequent possession, use, transfer and disposal by all other persons who are exempted from regulatory requirements may be obtained only from the United States Nuclear Regulatory Commission, Washington, D.C. 20555.

(a) An application for a specific license to distribute naturally occurring and accelerator-produced radioactive material (NARM) to persons exempted from these regulations pursuant to WAC 402-19-190(2)(b) will be approved if:

(i) The radioactive material is not contained in any food, beverage, cosmetic, drug or other commodity designed for ingestion or inhalation by, or application to, a human being;

(ii) The radioactive material is in the form of processed chemical elements, compounds, or mixtures, tissue samples, bioassay samples, counting standards, plated or encapsulated sources, or similar substances, identified as radioactive and to be used for its radioactive properties, but is not incorporated into any manufactured or assembled commodity, product, or device intended for commercial distribution; and

(iii) The applicant submits copies of prototype labels and brochures and the department approves such labels and brochures.

(b) The license issued under paragraph (2)(a) of this section is subject to the following conditions:

(i) No more than ten exempt quantities shall be sold or transferred in any single transaction. However, an exempt quantity may be composed of fractional parts of one or more of the exempt quantity provided the sum of the fractions shall not exceed unity.

(ii) Each exempt quantity shall be separately and individually packaged. No more than ten such packaged exempt quantities shall be contained in any outer package for transfer to persons exempt pursuant to WAC 402-19-190(2)(b). The outer package shall be such that the dose rate at the external surface of the package does not exceed 0.5 millirem per hour.

(iii) The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label which:

(A) Identifies the radionuclide and the quantity of radioactivity; and

(B) Bears the words "Radioactive Material."

(iv) In addition to the labeling information required by item (2)(b)(iii) of this section, the label affixed to the immediate container, or an accompanying brochure, shall:

(A) State that the contents are exempt from Licensing State requirements;

(B) Bear the words "Radioactive Material—Not for Human Use—Introduction into Foods, Beverages, Cosmetics, Drugs, or Medicinals, or into Products Manufactured for Commercial Distribution is Prohibited—Exempt Quantities Should Not Be Combined"; and

(C) Set forth appropriate additional radiation safety precautions and instructions relating to the handling, use, storage and disposal of the radioactive material.

(c) Each person licensed under paragraph (2)(a) of this section shall maintain records identifying, by name and address, each person to whom radioactive material is transferred for use under WAC 402-19-190(2)(b) or the equivalent regulations of a Licensing State, and stating the kinds and quantities of radioactive material transferred. An annual summary report stating the total quantity of each radionuclide transferred under the specific license shall be filed with the department. Each report shall cover the year ending June 30, and shall be filed within thirty days thereafter. If no transfers of radioactive material have been made pursuant to subsection (2) of this section during the reporting period, the report shall so indicate.

(3) *Licensing the incorporation of naturally occurring and accelerator-produced radioactive material into gas and aerosol detectors.* An application for a specific license authorizing the incorporation of NARM into gas and aerosol detectors to be distributed to persons exempt under WAC 402-19-190(2)(c)(iii) will be approved if the application satisfies requirements equivalent to those contained in Section 32.26 of 10 CFR Part 32.

(4) *Licensing the manufacture and distribution of devices to person generally licensed under WAC 402-21-050(4).*

(a) An application for a specific license to manufacture or distribute devices containing radioactive material, excluding special nuclear material, to persons generally licensed under WAC 402-21-050(4) or equivalent regulations of the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State will be approved if:

(i) The applicant satisfies the general requirements of WAC 402-22-040;

(ii) The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control, labels, proposed uses, installation, servicing, leak testing, operating and safety instructions,

and potential hazards of the device to provide reasonable assurance that:

(A) The device can be safely operated by persons not having training in radiological protection;

(B) Under ordinary conditions of handling, storage and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in any period of one calendar quarter a dose in excess of ten percent of the limits specified in the table in WAC 402-24-020(1); and

(C) Under accident conditions (such as fire and explosion) associated with handling, storage and use of the device, it is unlikely that any person would receive an external radiation dose or dose commitment in excess of the following organ doses:

Whole body; head and trunk; active blood-forming organs; gonads; or lens of eye	15 rems
Hands and forearms; feet and ankles; localized areas of skin averaged over areas no larger than one square centimeter	200 rems
Other organs	50 rems

(iii) Each device bears a durable, legible, clearly visible label or labels approved by the department, which contain in a clearly identified and separate statement:

(A) Instructions and precautions necessary to assure safe installation, operation and servicing of the device (documents such as operating and service manuals may be identified in the label and used to provide this information);

(B) The requirement, or lack of requirement, for leak testing, or for testing any on-off mechanism and indicator, including the maximum time interval for such testing, and the identification of radioactive material by isotope, quantity of radioactivity, and date of determination of the quantity; and

(C) The information called for in one of the following statements, as appropriate, in the same or substantially similar form:

(aa) The receipt, possession, use and transfer of this device, Model _____, Serial No. _____ Note*, are subject to a general license or the equivalent, and the regulations of the United States Nuclear Regulatory Commission or a state with which the United States Nuclear Regulatory Commission has entered into an agreement for the exercise of regulatory authority. This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION - RADIOACTIVE MATERIAL

_____

(Name of manufacturer or distributor)*

(bb) The receipt, possession, use and transfer of this device, Model _____, Serial No. _____ Note*, are subject to a general license or the equivalent, and the regulations of a Licensing State. This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION - RADIOACTIVE MATERIAL

_____

(Name of manufacturer or distributor)*

*NOTE: The model, serial number, and name of the manufacturer or distributor may be omitted from this label provided the information is elsewhere specified in labeling affixed to the device.

(b) In the event the applicant desires that the device be required to be tested at intervals longer than six months, either for proper operation of the on-off mechanism and indicator, if any, or for leakage of radioactive material or for both, he shall include in his application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the device or similar devices and by design features which have a significant bearing on the probability or consequences of leakage of radioactive material from the device or failure of the on-off mechanism and indicator. In determining the acceptable interval for the test for leakage of radioactive material, the department will consider information which includes, but is not limited to:

(i) Primary containment (source capsule);

(ii) Protection of primary containment;

(iii) Method of sealing containment;

(iv) Containment construction materials;

(v) Form of contained radioactive material;

(vi) Maximum temperature withstood during prototype tests;

(vii) Maximum pressure withstood during prototype tests;

(viii) Maximum quantity of contained radioactive material;

(ix) Radiotoxicity of contained radioactive material; and

(x) Operating experience with identical devices or similarly designed and constructed devices.

(c) In the event the applicant desires that the general licensee under WAC 402-21-050(4), or under equivalent regulations of the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on-off mechanism and indicator, or remove the device from installation, he shall include in his application written

instructions to be followed by the general licensee, estimated calendar quarter doses associated with such activity or activities, and bases for such estimates. The submitted information shall demonstrate that performance of such activity or activities by an individual untrained in radiological protection, in addition to other handling, storage, and use of devices under the general license, is unlikely to cause that individual to receive a calendar quarter dose in excess of ten percent of the limits specified in the table in WAC 402-24-020(1).

(d) Each person licensed under paragraph (4)(a) of this section to distribute devices to generally licensed persons shall:

(i) Furnish a copy of the general license contained in WAC 402-21-050(4) to each person to whom the person directly or through an intermediate person transfers radioactive material in a device for use pursuant to the general license contained in WAC 402-21-050(4);

(ii) Furnish a copy of the general license contained in the United States Nuclear Regulatory Commission's, Agreement State's, or Licensing State's regulation equivalent to WAC 402-21-050(4), or alternatively, furnish a copy of the general license contained in WAC 402-21-050(4) to each person to whom he directly or through an intermediate person transfers radioactive material in a device for use pursuant to the general license of the United States Nuclear Regulatory Commission, the Agreement State or the Licensing State. If a copy of the general license in WAC 402-21-050(4) is furnished to such a person, it shall be accompanied by a note explaining that the use of the device is regulated by the United States Nuclear Regulatory Commission, Agreement State or Licensing State under requirements substantially the same as those in WAC 402-21-050(4);

(iii) Report to the department all transfers of such devices to persons for use under the general license in WAC 402-21-050(4). Such report shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the department and the general licensee, the type and model number of device transferred, and the quantity and type of radioactive material contained in the device. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. If no transfers have been made to persons generally licensed under WAC 402-21-050(4) during the reporting period, the report shall so indicate. The report shall cover each calendar quarter and shall be filed within thirty days thereafter.

(iv) Reports to other departments.

(A) Report to the United States Nuclear Regulatory Commission all transfers of such devices to persons for use under the United States Nuclear Regulatory Commission general license in Section 31.5 of 10 CFR Part 31.

(B) Report to the responsible department all transfers of devices manufactured and distributed pursuant to subsection (4) of this section for use under a general license in that state's regulations equivalent to WAC 402-21-050(4).

(C) Such reports shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the department and the general licensee, the type and model of the device transferred, and the quantity and type of radioactive material contained in the device. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. The report shall be submitted within thirty days after the end of each calendar quarter in which such a device is transferred to the generally licensed person.

(D) If no transfers have been made to United States Nuclear Regulatory Commission licensees during the reporting period, this information shall be reported to the United States Nuclear Regulatory Commission.

(E) If no transfers have been made to general licensees within a particular state during the reporting period, this information shall be reported to the responsible department upon request of the department.

(v) Keep records showing the name, address and the point of contact for each general licensee to whom the person directly or through an intermediate person transfers radioactive material in devices for use pursuant to the general license provided in WAC 402-21-050(4), or equivalent regulations of the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State. The records shall show the date of each transfer, the radionuclide and the quantity of radioactivity in each device transferred, the identity of any intermediate person, and compliance with the report requirements of paragraph (4)(d) of this section.

(5) *Special requirements for the manufacture, assembly or repair of luminous safety devices for use in aircraft.* An application for a specific license to manufacture, assemble or repair luminous safety devices containing tritium or promethium-147 for use in aircraft for distribution to persons generally licensed under WAC 402-21-050(5) will be approved subject to the following conditions:

(a) The applicant satisfies the general requirements specified in WAC 402-22-040; and

(b) The applicant satisfies the requirements of Sections 32.53, 32.54, 32.55, 32.56, 32.101 of 10 CFR Part 32 or their equivalent.

(6) *Special requirements for license to manufacture calibration sources containing americium–241, plutonium or radium–226 for distribution to persons generally licensed under WAC 402–21–050(7).* An application for a specific license to manufacture calibration and reference sources containing americium–241, plutonium or radium–226 to persons generally licensed under WAC 402–21–050(7) will be approved subject to the following conditions:

(a) The applicant satisfies the general requirement of WAC 402–22–040; and

(b) The applicant satisfies the requirements of Sections 32.57, 32.58, 32.59, 32.102 of 10 CFR Part 32 and Section 70.39 of 10 CFR Part 70 or their equivalent.

(7) *Manufacture and distribution of radioactive material for certain in vitro* **clinical or laboratory testing under general license.** An application for a specific license to manufacture or distribute radioactive material for use under the general license of WAC 402–21–050 (8) will be approved if:

(a) The applicant satisfies the general requirements specified in WAC 402–22–040;

(b) The radioactive material is to be prepared for distribution in prepackaged units of:

(i) Iodine–125 in units not exceeding 10 microcuries each;

(ii) Iodine–131 in units not exceeding 10 microcuries each;

(iii) Carbon–14 in units not exceeding 10 microcuries each;

(iv) Hydrogen–3 (tritium) in units not exceeding 50 microcuries each;

(v) Iron–59 in units not exceeding 20 microcuries each;

(vi) Cobalt–57 in units not exceeding 10 microcuries each;

(vii) Selenium–75 in units not exceeding 10 microcuries each;

(viii) Mock Iodine–125 in units not exceeding 0.05 microcurie of iodine–129 and 0.005 microcurie of americium–241 each.

(c) Each prepackaged unit bears a durable, clearly visible label:

(i) Identifying the radioactive contents as to chemical form and radionuclide, and indicating that the amount of radioactivity does not exceed 10 microcuries of iodine–125, iodine–131, carbon–14, cobalt–57, or selenium–75; 50 microcuries of hydrogen–3 (tritium); 20 microcuries of iron–59; or Mock Iodine–125 in units not exceeding 0.05 microcurie of iodine–129 and 0.005 microcurie of americium–241 each; and

(ii) Displaying the radiation caution symbol described in WAC 402–24–090(1)(a) and the words, "CAUTION, RADIOACTIVE MATERIAL", and "Not for Internal or External Use in Humans or Animals".

(d) One of the following statements, as appropriate, or a substantially similar statement which contains the information called for in one of the following statements, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

(i) This radioactive material may be received, acquired, possessed and used only by physicians, veterinarians, clinical laboratories or hospitals and only for *in vitro* clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of the United States Nuclear Regulatory Commission or of a state with which the Commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

(ii) This radioactive material may be received, acquired, possessed and used only by physicians, veterinarians, clinical laboratories or hospitals and only for *in vitro* clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of a Licensing State.

Name of manufacturer

(e) The label affixed to the unit, or the leaflet or brochure which accompanies the package, contains adequate information as to the precautions to be observed in handling and storing such radioactive material. In the case of the Mock Iodine–125 reference or calibration source, the information accompanying the source must also contain directions to the licensee regarding the waste disposal requirements set out in WAC 402–24–130 of these regulations.

(8) *Licensing the manufacture and distribution of ice detection devices.* An application for a specific license to manufacture and distribute ice detection devices to persons generally licensed under WAC 402–21–050(9) will be approved subject to the following conditions:

(a) The applicant satisfies the general requirements of WAC 402–22–040; and

(b) The criteria of Sections 32.61, 32.62, 32.103 of 10 CFR Part 32 are met.

(9) *Manufacture and distribution of radiopharmaceuticals containing radioactive material for medical use under group licenses.* An application for a specific license to manufacture and distribute radiopharmaceuticals containing radioactive material for use by persons licensed pursuant to WAC 402–22–070(3) for the uses listed in Group I, Group II, Group IV, or Group V of WAC 402–22–200, Schedule A, will be approved if:

(a) The applicant satisfies the general requirements specified in WAC 402–22–040 of this part;

(b) The applicant submits evidence that:

(i) The radiopharmaceutical containing radioactive material will be manufactured, labeled and packaged in accordance with the Federal Food, Drug and Cosmetic Act or the Public Health Service Act, such as a new drug application (NDA) approved by the United States Food and Drug Administration (FDA), a biologic product license issued by FDA or a "Notice of Claimed

Investigational Exemption for a New Drug" (IND) that has been accepted by the FDA; or

(ii) The manufacture, compounding and distribution of the radiopharmaceutical containing radioactive material is not subject to the Federal Food, Drug and Cosmetic Act and the Public Health Service Act;

(c) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material which is appropriate for safe handling and storage of radiopharmaceuticals by group licensees; and

(d) The label affixed to each package of the radiopharmaceutical contains information on the radionuclide, quantity and date of assay, and the label affixed to each package, or the leaflet or brochure which accompanies each package, contains a statement that the radiopharmaceutical is licensed by the department for distribution to persons licensed pursuant to WAC 402–22–070(3) and 402–22–200 Schedule A, Group I, Group II, Group IV, and Group V, as appropriate, or under equivalent regulations of the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State. The labels, leaflets or brochures required by subsection (9) of this section are in addition to the labeling required by the Food and Drug Administration (FDA) and they may be separate from or, with the approval of FDA, may be combined with the labeling required by FDA.

(10) *Manufacture and distribution of generators or reagent kits for preparation of radiopharmaceuticals containing radioactive material.* An application for a specific license to manufacture and distribute generators or reagent kits containing radioactive material for preparation of radiopharmaceuticals by persons licensed pursuant to WAC 402–22–070(3) for the uses listed in Group III of WAC 402–22–200, Schedule A will be approved if:

(a) The applicant satisfies the general requirements specified in WAC 402–22–040;

(b) The applicant submits evidence that:

(i) The generator or reagent kit is to be manufactured, labeled and packaged in accordance with the Federal Food, Drug and Cosmetic Act or the Public Health Service Act, such as a new drug application (NDA) approved by the Food and Drug Administration (FDA), a biologic product license issued by FDA, or a "Notice of Claimed Investigational Exemption for a New Drug" (IND) that has been accepted by the FDA; or

(ii) The manufacture and distribution of the generator or reagent kit are not subject to the Federal Food, Drug and Cosmetic Act and the Public Health Service Act;

(c) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material contained in the generator or reagent kit;

(d) The label affixed to the generator or reagent kit contains information on the radionuclide, quantity, and date of assay; and

(e) The label affixed to the generator or reagent kit, or the leaflet or brochure which accompanies the generator or reagent kit; contains:

(i) Adequate information, from a radiation safety standpoint, on the procedures to be followed and the equipment and shielding to be used in eluting the generator or processing radioactive material with the reagent kit; and

(ii) A statement that this generator or reagent kit (as appropriate) is approved for use by persons licensed by the department pursuant to WAC 402–22–070(3) and Group III of WAC 402–22–200, Schedule A, or under equivalent regulations of the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State. The labels, leaflets or brochures required by subsection (10) of this section are in addition to the labeling required by FDA and they may be separate from or, with the approval of FDA, may be combined with the labeling required by FDA.

NOTE: Although the department does not regulate the manufacture and distribution of reagent kits that do not contain radioactive material, it does regulate the use of such reagent kits for the preparation of radiopharmaceuticals containing radioactive material as part of its licensing and regulation of the users of radioactive material. Any manufacturer of reagent kits that do not contain radioactive material who desires to have his reagent kits approved by the department for use by persons licensed pursuant to WAC 402–22–070(3) and Group III of WAC 402–22–200 Schedule A may submit the pertinent information specified in subsection (10) of this section.

(11) *Manufacture and distribution of sources or devices containing radioactive material for medical use.* An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed pursuant to WAC 402–22–070(3) for use as a calibration or reference source or for the uses listed in Group VI of WAC 402–22–200 Schedule A of this part will be approved if:

(a) The applicant satisfies the general requirements in WAC 402–22–040 of this part;

(b) The applicant submits sufficient information regarding each type of source or device pertinent to an evaluation of its radiation safety, including:

(i) The radioactive material contained, its chemical and physical form and amount;

(ii) Details of design and construction of the source or device;

(iii) Procedures for, and results of, prototype tests to demonstrate that the source or device will maintain its integrity under stresses likely to be encountered in normal use and accidents;

(iv) For devices containing radioactive material, the radiation profile of a prototype device;

(v) Details of quality control procedures to assure that production sources and devices meet the standards of the design and prototype tests;

(vi) Procedures and standards for calibrating sources and devices;

(vii) Legend and methods for labeling sources and devices as to their radioactive content; and

(viii) Instructions for handling and storing the source or device from the radiation safety standpoint, these instructions are to be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device: *Provided*, That instructions which are too lengthy for such label may be summarized on the label and printed in detail on a brochure which is referenced on the label.

(c) The label affixed to the source or device, or to the permanent storage container for the source or device, contains information on the radionuclide, quantity and date of assay, and a statement that the named source or device is licensed by the department for distribution to persons licensed pursuant to WAC 402–22–070(3) and Group VI of WAC 402–22–200 Schedule A or under equivalent regulations of the United States Nuclear Regulatory Commission, an Agreement State or a Licensing State: *Provided*, That such labeling for sources which do not require long term storage (e.g., gold–198 seeds) may be on a leaflet or brochure which accompanies the source.

(d) In the event the applicant desires that the source or device be required to be tested for leakage of radioactive material at intervals longer than six months, the applicant shall include in the application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source.

(e) In determining the acceptable interval for test of leakage of radioactive material, the department will consider information that includes, but is not limited to:

(i) Primary containment (source capsule);

(ii) Protection of primary containment;

(iii) Method of sealing containment;

(iv) Containment construction materials;

(v) Form of contained radioactive material;

(vi) Maximum temperature withstood during prototype tests;

(vii) Maximum pressure withstood during prototype tests;

(viii) Maximum quantity of contained radioactive material;

(ix) Radiotoxicity of contained radioactive material; and

(x) Operating experience with identical sources or devices or similarly designed and constructed sources or devices.

(12) *Requirements for license to manufacture and distribute industrial products containing depleted uranium for mass–volume applications.*

(a) An application for a specific license to manufacture industrial products and devices containing depleted uranium for use pursuant to WAC 402–21–030(4) or equivalent regulations of the United States Nuclear Regulatory Commission or an Agreement State will be approved if:

(i) The applicant satisfies the general requirements specified in WAC 402–22–040;

(ii) The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control procedures, labeling or marking, proposed uses and potential hazards of the industrial product or device to provide reasonable assurance that possession, use or transfer of the depleted uranium in the product or device is not likely to cause any individual to receive in any period of one calendar quarter a radiation dose in excess of ten percent of the limits specified in WAC 402–24–020(1); and

(iii) The applicant submits sufficient information regarding the industrial product or device and the presence of depleted uranium for a mass–volume application in the product or device to provide reasonable assurance that unique benefits will accrue to the public because of the usefulness of the product or device.

(b) In the case of an industrial product or device whose unique benefits are questionable, the department will approve an application for a specific license under subsection (12) of this section only if the product or device is found to combine a high degree of utility and low probability of uncontrolled disposal and dispersal of significant quantities of depleted uranium into the environment.

(c) The department may deny any application for a specific license under subsection (12) of this section if the end use(s) of the industrial product or device cannot be reasonably foreseen.

(d) Each person licensed pursuant to paragraph (12)(a) of this section shall:

(i) Maintain the level of quality control required by the license in the manufacture of the industrial product or device, and in the installation of the depleted uranium into the product or device;

(ii) Label or mark each unit to:

(A) Identify the manufacturer of the product or device and the number of the license under which the product or device was manufactured, the fact that the product or device contains depleted uranium, and the quantity of depleted uranium in each product or device; and

(B) State that the receipt, possession, use and transfer of the product or device are subject to a general license or the equivalent and the regulations of the United States Nuclear Regulatory Commission or of an Agreement State;

(iii) Assure that the depleted uranium before being installed in each product or device has been impressed with the following legend clearly legible through any plating or other covering: "Depleted Uranium";

(iv) Furnish to each person to whom depleted uranium in a product or device is transferred for use pursuant to the general license contained in WAC 402–21–030(4) or its equivalent:

(A) A copy of the general license contained in WAC 402–21–030(4) and a copy of Department Form RHF– 20; or

(B) A copy of the general license contained in the United States Nuclear Regulatory Commission's or Agreement State's regulation equivalent to WAC 402–21–030(4) and a copy of the United States Nuclear Regulatory Commission's or Agreement State's certificate, or alternatively, furnish a copy of the general license contained in WAC 402–21–030(4) and a copy of Department Form RHF– 20 with a note explaining that use of the product or device is regulated by the United States Nuclear Regulatory Commission or an Agreement State under requirements substantially the same as those in WAC 402–21–030(4).

(v) Report to the department all transfers of industrial products or devices to persons for use under the general license in WAC 402–21–030(4). Such report shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the department and the general licensee, the type and model number of device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within thirty days after the end of each calendar quarter in which such a product or device is transferred to the generally licensed person. If no transfers have been made to persons generally licensed under chapter 402–21 WAC during the reporting period, the report shall so indicate;

(vi) Provide certain other reports as follows:

(A) Report to the United States Nuclear Regulatory Commission all transfers of industrial products or devices to persons for use under the United States Nuclear Regulatory Commission general license in Section 40.25 of 10 CFR Part 40;

(B) Report to the responsible department all transfers of devices manufactured and distributed pursuant to subsection (12) of this section for use under a general license in that state's regulations equivalent to WAC 402–21–030(4);

(C) Such report shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the department and the general licensee, the type and model number of the device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within thirty days after the end of each calendar quarter in which such product or device is transferred to the generally licensed person;

(D) If no transfers have been made to United States Nuclear Regulatory Commission licensees during the reporting period, this information shall be reported to the United States Nuclear Regulatory Commission;

(E) If no transfers have been made to general licensees within a particular Agreement State during the reporting period, this information shall be reported to the responsible department; and

(vii) Keep records showing the name, address and point of contact for each general licensee to whom the person transfers depleted uranium in industrial products or devices for use pursuant to the general license provided in WAC 402–21–030(4) or equivalent regulations of the United States Nuclear Regulatory Commission or of an Agreement State. The records shall be maintained for a period of two years and shall show the date of each transfer, the quantity of depleted uranium in each product or device transferred, and compliance with the report requirements of this section.

[Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–22–110, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–22–110, filed 11/30/79, effective 1/1/80. Formerly WAC 402–20–076.]

WAC 402–22–200 Schedule A groups of medical uses of radioactive material (Ref. WAC 402–22–070(3) and 402–22–110(9)). (1) *Group I.* Use of prepared radiopharmaceuticals for certain diagnostic studies involving measurements of uptake, dilution and excretion. This group does not include imaging or localization studies.

(a) Any radioactive material in a radiopharmaceutical and for a diagnostic use involving measurements of uptake, dilution or excretion for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA) or for which a "New Drug Application" (NDA) is in effect.

(b) The provisions of paragraph (1)(a) of this section notwithstanding, no radioactive material in gaseous form or for use as an aerosol is permitted by this subsection except as specifically authorized in a license.

(2) *Group II.* Use of prepared radiopharmaceuticals for diagnostic imaging and localization studies.

(a) Any radioactive material in a radiopharmaceutical and for a diagnostic use involving imaging or localizing for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA) or for which a "New Drug Application" (NDA) is in effect;

(b) The provisions of paragraph (2)(a) of this section notwithstanding, no radioactive material in gaseous form or for use as an aerosol is permitted by this subsection except as specifically authorized in a license.

(3) *Group III.* Use of generators and reagent kits for the preparation and use of radiopharmaceuticals containing radioactive material for diagnostic imaging and localization studies.

(a) Any generator or reagent kit for preparation and diagnostic use of a radiopharmaceutical containing radioactive material for which generator or reagent kit a "Notice of Claimed Investigational Exemption of a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA) or for which a "New Drug Application" (NDA) is in effect.

(b) The provisions of paragraph (3)(a) of this section notwithstanding, no generator or reagent kit is authorized for preparation of any gaseous form or aerosol of a radioactive material, except as specifically authorized in a license.

(4) *Group IV.* Use of prepared radiopharmaceuticals for certain therapeutic uses that do not normally require hospitalization for purposes of radiation safety.

(a) Iodine–131 as iodide for treatment of hyperthyroidism and cardiac dysfunction;

(b) Phosphorus–32 as soluble phosphate for treatment of polycythemia vera, leukemia and bone metastases;

(c) Phosphorus–32 as colloidal chromic phosphate for intracavitary treatment of malignant effusions;

(d) Any radioactive material in a radiopharmaceutical and for a therapeutic use not normally requiring hospitalization for purposes of radiation safety for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA) or for which a "New Drug Application" (NDA) is in effect.

(5) *Group V.* Use of prepared radiopharmaceuticals for certain therapeutic uses that normally require hospitalization for purposes of radiation safety.

(a) Gold–198 as colloid for intracavitary treatment of malignant effusions;

(b) Iodine–131 as iodide for treatment of thyroid carcinoma;

(c) Any radioactive material in a radiopharmaceutical and for a therapeutic use normally requiring hospitalization for radiation safety reasons for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA) or for which a "New Drug Application" (NDA) is in effect.

(6) *Group VI.* Use of sources and devices containing radioactive material for certain medical uses.

(a) Americium–241 as a sealed source in a device for bone mineral analysis;

(b) Cesium–137 encased in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer;

(c) Cobalt–60 encased in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer;

(d) Gold–198 as seeds for interstitial treatment of cancer;

(e) Iodine–125 as a sealed source in a device for bone mineral analysis;

(f) Iridium–192 as seeds encased in nylon ribbon for interstitial treatment of cancer;

(g) Strontium–90 sealed in an applicator for treatment of superficial eye conditions; and

(h) Iodine–125 as seeds for interstitial treatment of cancer. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–22–200, filed 12/8/80. Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–22–200, filed 11/30/79, effective 1/1/80. Formerly WAC 402–20–260.]

WAC 402–22–250 Schedule B, limits for broad licenses. (See also WAC 402–22–090)

Radioactive Material	Col. I curies	Col. II curies
Antimony–122	1	0.01
Antimony–124	1	0.01
Antimony–125	1	0.01
Arsenic–73	10	0.1
Arsenic–74	1	0.01
Arsenic–76	1	0.01
Arsenic–77	10	0.1
Barium–131	10	0.1
Barium–140	1	0.01
Beryllium–7	10	0.1
Bismuth–210	0.1	0.001
Bromine–82	10	0.1
Cadmium–109	1	0.01
Cadmium–115m	1	0.01
Cadmium–115	10	0.1
Calcium–45	1	0.01
Calcium–47	10	0.1
Carbon–14	100	1.
Cerium–141	10	0.1
Cerium–143	10	0.1
Cerium–144	0.1	0.001
Cesium–131	100	1.
Cesium–134m	100	1.
Cesium–134	0.1	0.001
Cesium–135	1	0.01
Cesium–136	10	0.1
Cesium–137	0.1	0.001
Chlorine–36	1	0.01
Chlorine–38	100	1.
Chromium–51	100	1.
Cobalt–57	10	0.1
Cobalt–58m	100	1.
Cobalt–58	1	0.01
Cobalt–60	0.1	0.001
Copper–64	10	0.1
Dysprosium–165	100	1.
Dysprosium–166	10	0.1
Erbium–169	10	0.1
Erbium–171	10	0.1
Europium–152 (9.2h)	10	0.1
Europium–152 (13 y)	0.1	0.001
Europium–154	0.1	0.001
Europium–155	1	0.01
Fluorine–18	100	1.
Gadolinium–153	1	0.01
Gadolinium–159	10	0.1
Gallium–72	10	0.1
Germanium–71	100	1.
Gold–198	10	0.1

Radioactive Material	Col. I curies	Col. II curies	Radioactive Material	Col. I curies	Col. II curies
Gold–199	10	0.1	Rhenium–186	10	0.1
Hafnium–181	1	0.01	Rhenium–188	10	0.1
Holmium–166	10	0.1	Rhodium–103m	1,000	10.
Hydrogen–3	100	1.	Rhodium–105	10	0.1
Indium–113m	100	1.	Rubidium–86	1	0.01
Indium–114m	1	0.01	Rubidium–87	1	0.01
Indium–115m	100	1.	Ruthenium–97	100	1.
Indium–115	1	0.01	Ruthenium–103	1	0.01
Iodine–125	0.1	0.001	Ruthenium–105	10	0.1
Iodine–126	0.1	0.001	Ruthenium–106	0.1	0.001
Iodine–129	0.1	0.001	Samarium–151	1	0.01
Iodine–131	0.1	0.001	Samarium–153	10	0.1
Iodine–132	10	0.1	Scandium–46	1	0.01
Iodine–133	1	0.01	Scandium–47	10	0.1
Iodine–134	10	0.1	Scandium–48	1	0.01
Iodine–135	1	0.01	Selenium–75	1	0.01
Iridium–192	1	0.01	Silicon–31	10	0.1
Iridium–194	10	0.1	Silver–105	1	0.01
Iron–55	10	0.1	Silver–110m	0.1	0.001
Iron–59	1	0.01	Silver–111	10	0.1
Krypton–85	100	1.	Sodium–22	0.1	0.001
Krypton–87	10	0.1	Sodium–24	1	0.01
Lanthanum–140	1	0.01	Strontium–85m	1,000	10.
Lutetium–177	10	0.1	Strontium–85	1	0.01
Manganese–52	1	0.01	Strontium–89	1	0.01
Manganese–54	1	0.01	Strontium–90	0.01	0.0001
Manganese–56	10	0.1	Strontium–91	10	0.1
Mercury–197m	10	0.1	Strontium–92	10	0.1
Mercury–197	10	0.1	Sulphur–35	10	0.1
Mercury–203	1	0.01	Tantalum–182	1	0.01
Molybdenum–99	10	0.1	Technetium–96	10	0.1
Neodymium–147	10	0.1	Technetium–97m	10	0.1
Neodymium–149	10	0.1	Technetium–97	10	0.1
Nickel–59	10	0.1	Technetium–99m	100	1.
Nickel–63	1	0.01	Technetium–99	1	0.01
Nickel–65	10	0.1	Tellurium–125m	1	0.01
Niobium–93m	1	0.01	Tellurium–127m	1	0.01
Niobium–95	1	0.01	Tellurium–127	10	0.1
Niobium–97	100	1.	Tellurium–129m	1	0.01
Osmium–185	1	0.01	Tellurium–129	100	1.
Osmium–191m	100	1.	Tellurium–131m	10	0.1
Osmium–191	10	0.1	Tellurium–132	1	0.01
Osmium–193	10	0.1	Terbium–160	1	0.01
Palladium–103	10	0.1	Thallium–200	10	0.1
Palladium–109	10	0.1	Thallium–201	10	0.1
Phosphorus–32	1	0.01	Thallium–202	10	0.1
Platinum–191	10	0.1	Thallium–204	1	0.01
Platinum–193m	100	1.	Thulium–170	1	0.01
Platinum–193	10	0.1	Thulium–171	1	0.01
Platinum–197m	100	1.	Tin–113	1	0.01
Platinum–197	10	0.1	Tin–125	1	0.01
Polonium–210	0.01	0.0001	Tungsten–181	1	0.01
Potassium–42	1	0.01	Tungsten–185	1	0.01
Praseodymium–142	10	0.1	Tungsten–187	10	0.1
Praseodymium–143	10	0.1	Vanadium–48	1	0.01
Promethium–147	1	0.01	Xenon–131m	1,000	10.
Promethium–149	10	0.1	Xenon–133	100	1.
Radium–226	0.01	0.0001	Xenon–135	100	1.

Radioactive Material	Col. I curies	Col. II curies
Ytterbium–175	10	0.1
Yttrium–90	1	0.01
Yttrium–91	1	0.01
Yttrium–92	10	0.1
Yttrium–93	1	0.01
Zinc–65	1	0.01
Zinc–69m	10	0.1
Zinc–69	100	1.
Zirconium–93	1	0.01
Zirconium–95	1	0.01
Zirconium–97	1	0.01
Any radioactive material other than source material, special nuclear material, or alpha emitting radioactive material not listed above.	0.1	0.001

[Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–22–250, filed 11/30/79, effective 1/1/80. Formerly WAC 402–20–270.]

Chapter 402–24 WAC
STANDARDS FOR PROTECTION AGAINST RADIATION

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

402–24–100 Caution signs, signals and controls. [Order 708, § 402–24–100, filed 8/24/72; Order 1, § 402–24–100, filed 7/2/71; Order 1, § 402–24–100, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1095, filed 2/6/76.

WAC 402–24–010 Purpose and scope. This chapter establishes standards for protection against radiation hazards. Except as otherwise specifically provided, this chapter applies to all licensees or registrants. Nothing in this chapter shall be interpreted as limiting the intentional exposure of patients to radiation for the purpose of medical diagnosis or therapy. The definitions contained in WAC 402–12–050 also apply to this chapter. Chapter 402–10 WAC, Statement of Philosophy, is directly applicable to this chapter. [Order 1095, § 402–24–010, filed 2/6/76; Order 1, § 402–24–010, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402–24–020 Radiation dose to individuals in restricted areas.* (1) Except as provided in WAC 402–24–020(2) no licensee or registrant shall possess, use, receive, or transfer sources of radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from all sources of radiation in the licensee's or registrant's possession a dose in excess of the limits specified in the following table:

	Rem per Calendar Quarter
Whole body; head and trunk; active blood–forming organs; lens of eyes; or gonads	1.25
Hands and forearms; feet and ankles	18.75
Skin of whole body	7.5

NOTE:

*For determining the doses specified in WAC 402–24–020 a dose from x– or gamma rays up to 10 MeV may be assumed to be equivalent to the exposure measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dose rate.

(2) A licensee or registrant may permit an individual in a restricted area to receive a dose to the whole body greater than that permitted under WAC 402–24–020(1), provided that:

(a) During any calendar quarter the dose to the whole body from sources of radiation in the licensee's or registrant's possession shall not exceed 3 rems; and

(b) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5(N–18) rems when "N" equals the individual's age in years at the individual's last birthday; and

(c) The licensee or registrant has determined the individual's accumulated occupational dose to the whole body on Department Form RHF–4 or on a clear and legible record containing all the information required in

that form and has otherwise complied with the requirements of WAC 402-24-024. As used in WAC 402-24-020(2) "dose to the whole body" shall be deemed to include any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of the eye; and

(d) The licensee or registrant has determined that the predicted dose to the whole body is as low as is reasonably achievable and consistent with the statements in WAC 402-10-010. The licensee or registrant shall perform an evaluation of the expected whole body dose before permitting any individual to receive a whole body dose in excess of the limits specified in WAC 402-24-020(1).

A written evaluation of this exposure shall be retained for review by the department. [Statutory Authority: 70-.98.050. 81-01-011 (Order 1570), § 402-24-020, filed 12/8/80; Order 1095, § 402-24-020, filed 2/6/76; Order 1, § 402-24-020, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-024 Determination of prior accumulated dose. Determination of prior dose. Each licensee or registrant shall require any individual, prior to first entry of the individual into the licensee's or registrant's restricted area during each employment or work assignment under such circumstances that the individual will receive or is likely to receive in any period of one calendar quarter an occupational dose in excess of 25 percent of the applicable standards specified in WAC 402-24-020(1) and 402-24-035 to disclose and verify in a written, signed statement, either:

(1) That the individual had no prior occupational dose during the current calendar quarter; or

(2) The nature and amount of any occupational dose which the individual may have received during that specifically identified current calendar quarter from sources of radiation possessed or controlled by other persons. Each licensee shall maintain records of such statements until the department authorizes their disposition. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-024, filed 12/8/80; Order 1095, § 402-24-024, filed 2/6/76.]

WAC 402-24-027 Requirements for exceeding occupational radiation doses. (1) Before permitting, pursuant to WAC 402-24-020(2), any individual in a restricted area to receive an occupational radiation dose in excess of the standards specified in WAC 402-24-020(1) each licensee or registrant shall:

(a) Obtain a certificate on State of Washington Occupational External Radiation Exposure History (Form RHF-4) or on a clear and legible record containing all the information required in that form, signed by the individual, showing each period of time after the individual attained the age of 18 in which the individual received an occupational dose of radiation; and

(b) Calculate on Form RHF-4 in accordance with the instructions appearing therein, or on a clear and legible record containing all the information required in that form, the previously accumulated occupational dose received by the individual and the additional dose allowed for that individual under WAC 402-24-020(2).

In the preparation of Form RHF-4, or a clear and legible record containing all the information required in that form, the licensee or registrant shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. For each period for which the licensee or registrant obtains such reports, the dose shown in the report shall be used in preparing the form. In any case where a licensee or registrant is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

Part of Body	Column 1 Assumed Dose in Rems for Calendar Quarters Prior to January 1, 1961	Column 2 Assumed Dose in Rems for Calendar Quarters Beginning on or After January 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye	3.75	1.25

(2) The licensee or registrant shall retain and preserve records used in preparing Form RHF-4 until the department authorizes their disposition. If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961, yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in WAC 402-24-020(2)(b) the excess may be disregarded. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-027, filed 12/8/80.]

WAC 402-24-030 Exposure of individuals to concentrations of radioactive materials in restricted areas. (1) Requirements for exposures to individuals.

(a) No licensee shall possess, use, or transfer radioactive material in such a manner as to permit any individual in a restricted area to inhale a quantity of radioactive material in any period of one calendar quarter greater than the quantity which would result from inhalation for 40 hours per week for 13 weeks at uniform concentrations of radioactive material in air specified in WAC 402-24-220, Appendix A, Table I, Column 1[1], [2], [3]. If the radioactive material is of such form that intake by absorption through the skin is likely, individual exposures to radioactive material shall be controlled so that the uptake of radioactive material by any organ from either inhalation or absorption or both routes of intake [4], [5] in any calendar quarter does not exceed that which would result from inhaling such radioactive material for 40 hours per week for 13 weeks at uniform concentrations specified in WAC 402-24-220, Appendix A, Table I, Column 1.

(b) No licensee shall possess, use, or transfer mixtures of U-234, U-235, and U-238 in soluble form in such a manner as to permit any individual in a restricted area to inhale a quantity of such material in excess of the intake limits specified in Appendix A, Table I, Column 1

of this part. If such soluble uranium is of a form such that absorption through the skin is likely, individual exposures to such material shall be controlled so that the uptake of such material by any organ from either inhalation or absorption or both routes of intake[4] does not exceed that which would result from inhaling such material at the limits specified in WAC 402-24-220, Appendix A, Table I, Column 1 and footnote 4 thereto.

(c) For purposes of determining compliance with the requirements of WAC 402-24-030 the licensee shall use suitable measurements of concentrations of radioactive materials in air for detecting and evaluating airborne radioactivity in restricted areas and in addition, as appropriate, shall use measurements of radioactivity in the body, measurements of radioactivity excreted from the body, or any combination of such measurements as may be necessary for timely detection and assessment of individual intakes of radioactivity by exposed individuals. It is assumed that an individual inhales radioactive material at the airborne concentration in which he is present unless he uses respiratory protective equipment pursuant to WAC 402-24-030. When assessment of a particular individual's intake of radioactive material is necessary, intakes less than those which would result from inhalation for 2 hours in any one day or for 10 hours in any one week at uniform concentrations specified in Appendix A, Table I, Column 1 need not be included in such assessment, provided that for any assessment in excess of these amounts the entire amount is included.

(2) (a) The licensee shall, as a precautionary procedure, use process or other engineering controls, to the extent practicable, to limit concentrations of radioactive materials in air to levels below those which delimit an airborne radioactivity area as defined in WAC 402-12-050(5)(b).

(b) When it is impracticable to apply process or other engineering controls to limit concentrations of radioactive material in air below those defined in WAC 402-12-050(5)(b), other precautionary procedures, such as increased surveillance, limitation of working times, or provision of respiratory protective equipment, shall be used to maintain intake of radioactive material by any individual within any period of seven consecutive days as far below that intake of radioactive material which would result from inhalation of such material for 40 hours at the uniform concentrations specified in Appendix A, Table I, Column 1 as is reasonably achievable. Whenever the intake of radioactive material by any individual exceeds this 40-hour control measure, the licensee shall make such evaluations and take such actions as are necessary to assure against recurrence. The licensee shall maintain records of such occurrences, evaluations, and actions taken in a clear and readily identifiable form suitable for summary review and evaluation.

(3) When respiratory protective equipment is used to limit the inhalation of airborne radioactive material pursuant to WAC 402-24-030(2)(b), the licensee may make allowance for such use in estimating exposures of individuals to such materials provided that such equipment is used as stipulated in Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection."[6]

(4) Notwithstanding the provisions of WAC 412-24-030(2) and (3), the department may impose further restrictions:

(a) On the extent to which a licensee may make allowance for use of respirators in lieu of provision of process, containment, ventilation, or other engineering controls, if application of such controls is found to be practicable; and

(b) As might be necessary to assure that the respiratory protective program of the licensee is adequate in limiting exposures of personnel to airborne radioactive materials.

(5) The licensee shall notify, in writing, the department at least 30 days before the date that respiratory protective equipment is first used under the provisions of WAC 402-24-030.

(6) A licensee who was authorized to make allowance for use of respiratory protective equipment prior to the effective date of this regulation shall bring his respiratory protective program into conformance with the requirements of WAC 402-24-030(3) within one year of that date; and is exempt from the requirements of WAC 402-24-030(5).

NOTES:

[1]Since the concentration specified for tritium oxide vapor assumes equal intakes by skin absorption and inhalation, the total intake permitted is twice that which would result from inhalation alone at the concentration specified in H-3(s) in Appendix A, Table I, Column 1 for 40 hours per week for 13 weeks.

[2]For radioactive materials designated "Sub" in the "Isotope" Column of the table, the concentration value specified is based upon exposure to the material as an external radiation source. Individual exposures to these materials may be accounted for as part of the limitation on individual dose in WAC 402-24-020. These materials shall be subject to the precautionary procedures required by WAC 402-24-030(2)(a).

[3]Multiply the concentration values specified in Appendix A, Table I, Column 1 by 6.3×10^8 ml to obtain the quarterly quantity limit. Multiply the concentration value specified in Appendix A, Table I, Column 1 of this part by 2.5×10^9 ml to obtain the annual quantity limit for Rn-222.

[4]Significant intake by ingestion or injection is presumed to occur only as a result of circumstances such as accident, inadvertence, poor procedure, or similar special conditions. Such intakes must be evaluated and accounted for by techniques and procedures as may be appropriate to the circumstances for the occurrence. Exposures so evaluated shall be included in determining whether the limitation on individual exposures in WAC 402-24-030(1)(a) has been exceeded.

[5]Regulatory guidance on assessment of individual intakes of radioactive material is given in Regulatory

Guide 8.9, "Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program," single copies of which are available from the Office of Standards Development, United States Nuclear Regulatory Commission, Washington, D.C. 20555, upon written request.

[6]Single copies of Regulatory Guide 8.15 are available for the Office of Standards Development, United States Nuclear Regulatory Commission, Washington, D.C. 20555, upon written request. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-030, filed 12/8/80; Order 1095, § 402-24-030, filed 2/6/76; Order 1, § 402-24-030, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-035 Exposure of minors.* (1) No licensee or registrant shall possess, use, or transfer sources of radiation in such a manner as to cause any individual within a restricted area, who is under 18 years of age, to receive in any period of one calendar quarter from all sources of radiation in such licensee's or registrant's possession a dose in excess of 10 percent of the limits specified in the table in WAC 402-24-020(1).

(2) No licensee 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 WAC 402-24-220, Appendix A, Table II, of this chapter. For purposes of this paragraph, concentrations may be averaged over periods not greater than a week.

(3) The provisions of WAC 402-24-030(2)(b) and (3) shall apply to exposures subject to WAC 402-24-035(2) except that the references in WAC 402-24-030(2)(b) and (3) to Appendix A, Table I, Column 1 shall be deemed to be referenced to Appendix A, Table II, Column 1.

NOTE:

*For determining the doses specified in this section, a dose from x- or gamma rays up to 10 MeV may be assumed to be equivalent to the exposure measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dose rate.

[Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-035, filed 12/8/80; Order 1095, § 402-24-035, filed 2/6/76.]

WAC 402-24-040 Permissible levels of radiation from external sources in unrestricted areas.*

NOTE:

*It is the intent of this section to limit radiation levels so that it is unlikely that individuals in unrestricted areas would receive a dose to the whole body in excess of 0.5 rem in any one year. If in specific instances, it is determined by the department that this intent is not met, the department may, pursuant to WAC 402-12-170, impose such additional requirements on the licensee or registrant as may be necessary to meet the intent.

(1) Except as authorized by the department pursuant to WAC 402-24-040(2), no licensee or registrant shall possess, use, or transfer sources of radiation in such a manner as to create in any unrestricted area from such sources of radiation in that person's possession:

(a) Radiation levels which, if an individual were continuously present in the area, could result in the individual's receiving a dose in excess of 2 millirems in any 1 hour; or

(b) Radiation levels which, if an individual were continuously present in the area, could result in the individual's receiving a dose in excess of 100 millirems in any 7 consecutive days.

(2) Any person may apply to the department for proposed limits upon levels of radiation in unrestricted areas in excess of those specified in WAC 402-24-040(1) resulting from the applicant's possession or use of sources of radiation. Such applications should include information as to anticipated average radiation levels and anticipated occupancy times for each unrestricted area involved. The department may approve the proposed limits if the applicant demonstrates to the satisfaction of the department that the proposed limits are not likely to cause any individual to receive a dose to the whole body in any period of one calendar year in excess of 0.5 rem and that the proposed limits are consistent with WAC 402-10-010.

(3) In addition to other requirements of this part, licensees engaged in uranium fuel cycle operations subject to the provisions of 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operation," shall comply with that part. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-040, filed 12/8/80; Order 1095, § 402-24-040, filed 2/6/76; Order 1, § 402-24-040, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-050 Concentration in effluents to unrestricted areas. (1) A licensee shall not possess, use, or transfer licensed material so as to release to an unrestricted area radioactive material in concentrations which exceed the limits specified in WAC 402-24-220, Appendix A, Table II, except as authorized pursuant to WAC 402-24-050(2). For purposes of this section concentrations may be averaged over a period not greater than one year.

(2) An application for a license or amendment may include proposed limits higher than those specified in WAC 402-24-050(1). The department will approve the proposed limits if the applicant demonstrates:

(a) That the applicant has made a reasonable effort to minimize the radioactivity contained in effluents to unrestricted areas; and

(b) That it is not likely that radioactive material discharged in the effluent would result in the exposure of an individual to concentrations of radioactive material in air or water exceeding the limits specified in WAC 402-24-220, Appendix A, Table II.

(3) An application for higher limits pursuant to WAC 402-24-050(2) shall include information demonstrating that the applicant has made a reasonable effort to minimize the radioactivity discharged in effluents to unrestricted areas, and shall include, as pertinent:

(a) Information as to flow rates, total volume of effluent, peak concentration of each radionuclide in the effluent, and concentration of each radionuclide in the

effluent averaged over a period of one year at the point where the effluent leaves a stack, tube, pipe, or similar conduit;

(b) A description of the properties of the effluents, including:

(i) Chemical composition,

(ii) Physical characteristics, including suspended solids content in liquid effluents, and nature of gas or aerosol for air effluents,

(iii) The hydrogen ion concentrations (pH) of liquid effluents, and

(iv) The size range of particulates in effluents released into air;

(c) A description of the anticipated human occupancy in the unrestricted area where the highest concentration of radioactive material from the effluent is expected, and, in the case of a river or stream, a description of water uses downstream from the point of release of the effluent;

(d) Information as to the highest concentration of each radionuclide in an unrestricted area, including anticipated concentrations averaged over a period of one year:

(i) In air at any point of human occupancy, or

(ii) In water at points of use downstream from the point of release of the effluent;

(e) The background concentration of radionuclides in the receiving river or stream prior to the release of liquid effluent;

(f) A description of the environmental monitoring equipment, including sensitivity of the system, and procedures and calculations to determine concentrations of radionuclides in the unrestricted area and possible reconcentrations of radionuclides; and

(g) A description of the waste treatment facilities and procedures used to reduce the concentration of radionuclides in effluents prior to their release.

(4) For the purposes of this section, the concentration limits in WAC 402-24-220, Appendix A, Table II of this part shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit. If the conduit discharges within the restricted area, the concentration at the boundary may be determined by applying appropriate factors for dilution, dispersion, or decay between the point of discharge and the boundary.

(5) In addition to limiting concentrations in effluent streams, the Department may limit quantities of radioactive material released in air or water during a specified period of time if it appears that the daily intake of radioactive material from air, water, or food by a suitable sample of an exposed population group, averaged over a period not exceeding one year, would otherwise exceed the daily intake resulting from continuous exposure to air or water containing one-third (1/3) the concentration of radioactive material specified in WAC 402-24-220, Appendix A, Table II.

(6) The provisions of this section do not apply to disposal of radioactive material into sanitary sewerage systems, which is governed by WAC 402-24-140. [Order 1095, § 402-24-050, filed 2/6/76; Order 1, § 402-24-050, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-060 Leak tests. (1) Each sealed radioactive source possessed under the provisions of a specific license, other than hydrogen-3 (tritium), with a half-life greater than thirty days and in any form other than gas, shall be tested and results obtained for leakage and/or contamination prior to initial use and at six-month intervals or as specified by the license. If there is reason to suspect that a sealed source might have been damaged, it shall be tested for leakage and results obtained before further use.

(2) Leak tests shall be capable of detecting the presence of 0.005 microcurie of removable contamination. The results of leak tests made pursuant to WAC 402-24-060(1) shall be recorded in units of microcuries and shall be maintained for inspection by the department. Any test conducted pursuant to subsection (1) which reveals the presence of 0.005 microcurie or more of removable contamination shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with WAC 402-20-170. If a sealed source shows evidence of leaking, a report shall be filed with the department within five days of the test, describing the equipment involved, the test results, and the corrective action taken. Where sealed sources are permanently mounted in devices or equipment, tests for contamination and leakage may be made by wiping appropriate accessible surfaces and measuring these wipes for transferred contamination.

(3) Leak tests are required for sealed radioactive sources that are greater than 100 microcuries for beta and gamma emitters and greater than 10 microcuries for alpha emitters. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-060, filed 12/8/80; Order 1095, § 402-24-060, filed 2/6/76; Order 1, § 402-24-060, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-070 Personnel monitoring. (1) Each licensee or registrant shall supply appropriate personnel monitoring equipment to, and shall require the use of such equipment by:

(a) Each individual who enters a restricted area under such circumstances that the individual receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in WAC 402-24-020(1).

(b) Each individual under 18 years of age who enters a restricted area under such circumstances that the individual receives, or is likely to receive, a dose in any calendar quarter in excess of 5 percent of the applicable value specified in WAC 402-24-020(1).

(c) Each individual who enters a high radiation area.

(2) Personnel monitoring devices assigned to an individual:

(a) Shall not intentionally be exposed to give a false or erroneous reading;

(b) Shall be assigned to one individual per exposure interval (i.e., weekly, monthly) and used to determine exposure for that individual only;

(c) Shall not be worn by any individual other than that individual originally assigned to the device;

(d) Personnel monitoring devices that are exposed while not being worn by the assigned individual shall be processed and recorded as soon as possible. A replacement monitoring device shall be assigned to the individual immediately. A record of the circumstances of the exposure shall be retained. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-070, filed 12/8/80; Order 1095, § 402-24-070, filed 2/6/76; Order 708, § 402-24-070, filed 8/24/72; Order 1, § 402-24-070, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-080 Orders requiring furnishing bioassay services. Where necessary or desirable in order to aid in determining the extent of an individual's exposure to concentrations of radioactive material, the Department may incorporate license provisions or issue an order requiring a licensee or registrant to make available to the individual appropriate bioassay services and to furnish a copy of the reports of such services to the Department. [Order 1095, § 402-24-080, filed 2/6/76; Order 1, § 402-24-080, filed 1/8/69; Rules (part), filed 10/26/66.]

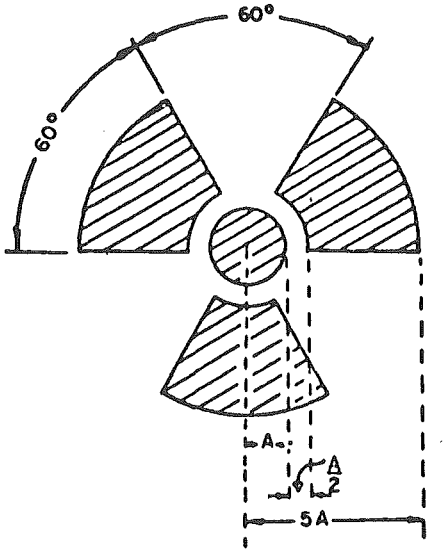
WAC 402-24-085 Surveys. Each licensee or registrant shall make or cause to be made such surveys as may be necessary for the licensee or registrant to establish compliance with these regulations. Records of such surveys shall be preserved as specified in WAC 402-24-170. Information on performing surveys may be found in the United States Nuclear Regulatory Commission's Regulatory Guide 8.23. [Statutory Authority: RCW 70-.98.050. 81-01-011 (Order 1570), § 402-24-085, filed 12/8/80; Order 1095, § 402-24-085, filed 2/6/76.]

WAC 402-24-090 Caution signs, labels, and signals. (1) *General.*

(a) Except as otherwise authorized by the department, symbols prescribed by this section shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this section is the conventional three-blade design: Radiation Symbol

(i) Cross-hatch area is to be magenta or purple.

(ii) Background is to be yellow.



(b) The conventional radiation symbol as described in WAC 402-24-090(1)(a) shall be used only for:

(i) Instructing individuals to be cognizant of a potential radiation hazard as prescribed in WAC 402-24-090(1)(c) through 402-24-090(1)(j).

(ii) Indicating that information presented pertains to the topic of radiation.

(c) In addition to the contents of signs and labels prescribed in this section, a licensee or registrant may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation.

(d) Each radiation area and entrance thereto shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: CAUTION* - RADIATION AREA. However, in an exceptionally large room where other activities of a nonradiological nature are conducted the entrance need not be posted provided a conspicuous barricade with an appropriate number of signs is established to delineate the radiation area.

NOTE:

*The word "DANGER" may be substituted for "CAUTION" on signs required by subsections WAC 402-24-090(1)(d) through 402-24-090(1)(h).

(e) High radiation areas.

(i) Each high radiation area and all entrances thereto shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: CAUTION* - HIGH RADIATION AREA.

(ii) Each entrance or access point to a high radiation area shall be:

(A) equipped with a control device which shall 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

(B) equipped with a control device which shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering the high radiation

area and the licensee or a supervisor of the activity are made aware of the entry; or

(C) maintained locked except during periods when access to the area is required, with positive control over each individual entry.

(iii) The controls required by WAC 402-24-090(1)(e)(ii) shall be established in such a way that no individual will be prevented from leaving a high radiation area.

(iv) In the case of a high radiation area established for a period of 30 days or less, direct surveillance to prevent unauthorized entry may be substituted for the controls required by WAC 402-24-090(1)(e)(ii).

(v) Any licensee or registrant may apply to the department for approval of methods not included in WAC 402-24-090(1)(e)(ii) and (iv) for controlling access to high radiation areas. The department will approve the proposed alternatives if the licensee or registrant demonstrates that the alternative methods of control will prevent unauthorized entry into a high radiation area, and that the requirement of WAC 402-24-090(1)(e)(ii) is met.

(vi) Very high radiation areas:

(A) Each area in which there may exist radiation levels in excess of 500 rems in one hour at one meter from a sealed radioactive source[7] that is used to irradiate materials shall:

(I) Have each entrance or access point equipped with entry control devices which shall function automatically to prevent any individual from inadvertently entering the area when such radiation levels exist; permit deliberate entry into the area only after a control device is actuated that shall cause the radiation level within the area, from the sealed source, to be reduced below that at which it would be impossible for an individual to receive a dose in excess of 100 mrem in one hour; and prevent operation of the source if the source would produce radiation levels in the area that could result in a dose to an individual in excess of 100 mrem in one hour. The entry control devices required by this paragraph (2)(e)(vi)(A) shall be established in such a way that no individual will be prevented from leaving the area.

(II) Be equipped with additional control devices such that upon failure of the entry control devices to function as required by paragraph (2)(e)(vi)(A)(I) of this section the radiation level within the area, from the sealed source, shall be reduced below that at which it would be possible for an individual to receive a dose in excess of 100 mrem in one hour; and visible and audible alarm signals shall be generated to make an individual attempting to enter the area aware of the hazard and the licensee or at least one other individual who is familiar with the activity and prepared to render or summon assistance, aware of such failure of the entry control devices;

(III) Be equipped with control devices such that upon failure or removal of physical radiation barriers other than the source's shielded storage container the radiation level from the source shall be reduced below that at which it would be possible for an individual to receive a dose in excess of 100 mrem in one hour; and visible and audible alarm signals shall be generated to make potentially affected individuals aware of the hazard and the licensee or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of the failure or removal of the physical barrier. When the shield for the stored source is a liquid, means shall be provided to monitor the integrity of the shield and to signal, automatically, loss of adequate shielding. Physical radiation barriers that comprise permanent structural components, such as walls, that have no credible probability of failure or removal in ordinary circumstances need not meet the requirements of this paragraph (2)(e)(vi)(A)(III);

(IV) Be equipped with devices that will automatically generate visible and audible alarm signals to alert personnel in the area before the source can be put into operation and in sufficient time for any individual in the area to operate a clearly identified control device which shall be installed in the area and which can prevent the source from being put into operation;

(V) Be controlled by use of such administrative procedure and such devices as are necessary to assure that the area is cleared of personnel prior to each use of the source preceding which use it might have been possible for an individual to have entered the area;

(VI) Be checked by a physical radiation measurement to assure that prior to the first individual's entry into the area after any use of the source, the radiation level from the source in the area is below that at which it would be possible for an individual to receive a dose in excess of 100 mrem in one hour;

(VII) Have entry control devices required in paragraph (2)(e)(vi)(A)(I) of this section which have been tested for proper functioning prior to initial operation with such source of radiation on any day that operations are not uninterruptedly continued from the previous day or before resuming operations after any unintended interruption, and for which records are kept of the dates, times, and results of such tests of function. No operations other than those necessary to place the source in safe condition or to erect repairs on controls shall be conducted with such source unless control devices are functioning properly. The licensee shall submit an acceptable schedule for more complete periodic tests of the entry control and warning systems to be established and adhered to as a condition of the license;

(VIII) Have those entry and exit portals that are used in transporting materials to and from the irradiation area, and that are not intended for use by individuals, controlled by such devices and administrative procedures as are necessary to physically protect and warn against inadvertent entry by any individual through such portals. Exit portals for processed materials shall be equipped to detect and signal the presence of loose radiation sources that are carried toward such an exit and to automatically prevent such loose sources from being carried out of the area.

(B) Licensees with, or applicants for, licenses or radiation sources that are within the purview of paragraph (2)(e)(vi)(A) of this section, and that must be used in a variety of positions or in peculiar locations, such as open

fields or forests, that make it impracticable to comply with certain requirements of paragraph (2)(e)(vi)(A) of this section, such as those for the automatic control of radiation levels, may apply to the department for approval, prior to use of safety measures that are alternative to those specified in paragraph (2)(e)(vi)(C) of this section, and that will provide at least an equivalent degree of personnel protection in the use of such sources. At least one of the alternative measures must include an entry-preventing interlock control based on a physical measurement of radiation that assures the absence of high radiation levels before an individual can gain access to an area where such sources are used.

(f) Airborne radioactivity areas. Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: CAUTION* - AIRBORNE RADIOACTIVITY AREA.

(g) Additional requirements.

(i) Each area or room in which any radioactive material, other than natural uranium or thorium, is used or stored in an amount exceeding 10 times the quantity of radioactive material specified in Appendix B of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: CAUTION* - RADIOACTIVE MATERIAL.

(ii) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding one hundred times the quantity specified in Appendix B of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: CAUTION* - RADIOACTIVE MATERIAL.

(h) Containers.

(i) Except as provided in WAC 402-24-090, each container of radioactive material shall bear a durable, clearly visible label identifying the radioactive contents.

(ii) A label required pursuant to WAC 402-24-090(1)(h)(i) shall bear the radiation caution symbol and the words: CAUTION* - RADIOACTIVE MATERIAL. It shall also provide sufficient information to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures.

As appropriate, the information will include radiation levels, kinds of material, estimate of activity, date for which activity is estimated.

(i) 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.

(j) All radiation machines shall be labeled in a manner which cautions individuals that radiation is produced when the machine is being operated.

(2) *Notwithstanding the provisions of WAC 402-24-090(1)(h), (i) labeling is not required:*

(a) For laboratory containers, such as beakers, flasks, and test tubes, used transiently in laboratory procedures when the person using such containers is present. For such containers a label identifying the radioactive contents is not required.

(b) For containers that do not contain radioactive material in quantities greater than the applicable quantities listed in WAC 402-24-230, Appendix B.

(c) For containers containing only natural uranium or thorium in quantities no greater than ten times the applicable quantities listed in WAC 402-24-230, Appendix B.

(d) For containers that do not contain radioactive material in concentrations greater than the applicable concentrations listed in WAC 402-24-220, Column 2, Table I, Appendix A.

(e) For containers when they are attended by an individual who takes the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established by the regulations in this part;

(f) For containers when they are in transport and packaged and labeled in accordance with regulations published by the Department of Transportation;

(g) For containers which are accessible only to individuals authorized to handle or use them* or to work in the vicinity thereof, provided that the contents are identified to such individuals by a readily available written record;

NOTE:

*For example, containers in locations such as water-filled canals, storage vaults, or hot cells.

(h) For manufacturing and process equipment such as piping and tanks.

(i) Each licensee, prior to disposal of an empty container which previously held radioactive material shall properly survey for contamination and remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

[7]This paragraph (1)(e) (vi)(A) does not apply to radioactive sources that are used in teletherapy, in radiography, or in completely self-shielded irradiators in which the source is both stored and operated within the same shielding radiation barrier and, in the designed configuration of the irradiator, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual. This paragraph (1)(e)(vi)(A) also does not apply to sources from which the radiation is incidental to some other use nor to nuclear reactor generated radiation other than radiation from byproduct, source, or special nuclear materials that are used in sealed sources in nonself-shielded irradiators. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-090, filed 12/8/80; Order 1095, § 402-24-090, filed 2/6/76; Order 1, § 402-24-090, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-095 Exceptions from posting and labeling requirements. Notwithstanding the provisions of WAC 402-24-090:

(1) Notwithstanding the requirements of WAC 402-36-140, 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 twelve inches from the surface of the source container or housing does not exceed five millirem per hour.

(2) Rooms or other areas in hospitals are not required to be posted with caution signs, and control of entrance or access thereto pursuant to WAC 402-24-090(1)(c) is not required, because of the presence of patients containing radioactive material provided that there are personnel in attendance who will take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the regulations in this chapter.

(3) Caution signs are not required to be posted in areas or rooms containing radioactive material for periods of less than eight hours provided that:

(a) the material is 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 material in excess of the limits established in this part, and

(b) such area or room is subject to the licensee's or registrant's control.

(4) A room or other area is not required to be posted with a caution sign, and control is not required for each entrance or access point to a room or other area which is a high radiation area solely because of the presence of radioactive material prepared for transport and packaged and labeled in accordance with regulations of the Department of Transportation.

(5) Rooms with x-ray equipment may not be required to be posted with caution signs provided that access is controlled.

(6) The interior of a teletherapy room is not required to be posted with caution signs provided such posting is conspicuously placed at the entrance(s) to the rooms. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-095, filed 12/8/80; Order 1095, § 402-24-095, filed 2/6/76.]

WAC 402-24-110 Instruction of personnel. Instructions required for individuals working in or frequenting any portion of a restricted area are specified in WAC 402-48-040. [Order 1095, § 402-24-110, filed 2/6/76; Order 708, § 402-24-110, filed 8/24/72; Order 1, § 402-24-110, filed 7/2/71; Order 1, § 402-24-110, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-120 Security and fire protection of stored radioactive material. (1) Licensed materials stored in an unrestricted area shall be secured from unauthorized removal from the place of storage.

(2) Licensed materials in an unrestricted area and not in storage shall be tended under the constant surveillance and immediate control of the licensee. [Order 1095, § 402-24-120, filed 2/6/76; Order 1, § 402-24-120, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-125 Procedures for picking up, receiving, and opening packages. (1)(a) Each licensee or registrant who expects to receive a package containing quantities of radioactive material in excess of the Type A quantities specified in WAC 402-24-125(2) shall:

(i) if the package is to be delivered to the licensee's or registrant's facility by the carrier, make arrangements to receive the package when it is offered for delivery by the carrier; or

(ii) if the package is to be picked up by the licensee or registrant at the carrier's terminal, make arrangements to receive notification from the carrier of the arrival of the package, at the time of arrival.

(b) Each licensee or registrant who picks up a package of radioactive material from a carrier's terminal shall pick up the package expeditiously upon receipt of notification from the carrier of its arrival.

(2)(a) Each licensee or registrant, upon receipt of a package of radioactive material, shall monitor the external surfaces of the package for radioactive contamination caused by leakage of the radioactive contents, except:

(i) Packages containing no more than the exempt quantity specified in the table in this subdivision;

(ii) Packages containing no more than 10 millicuries of radioactive material consisting solely of tritium, carbon-14, sulfur-35, or iodine-125;

(iii) Packages containing only radioactive material as gases or in special form;

(iv) Packages containing only radioactive material in other than liquid form (including Mo-99/Tc-99m generators) and not exceeding the Type A quantity limit specified in the Table in this subdivision; and

(v) Packages containing only radionuclides with half-lives of less than 30 days and a total quantity of no more than 100 millicuries.

The monitoring shall be performed as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or eighteen hours if received after normal working hours.

(b) If removable radioactive contamination in excess of 0.01 microcurie (22,200 transformations per minute) per 100 square centimeters of package surface is found on the external surfaces of the package, the licensee shall immediately notify by telephone, telegraph, mailgram or facsimile, the final delivering carrier, shipper and the department.

TABLE OF EXEMPT AND TYPE A QUANTITIES

Transport Group*	Exempt Quantity Limit (in millicuries)	Type A Quantity Limit (in curies)
I	0.01	0.001
II	0.1	0.050
III	1	3
IV	1	20
V	1	20
VI	1	1,000
VII	25,000	1,000
Special form*	1	20

NOTE:

*The definitions of "transport group" and "special form" are specified in WAC 402-12-210 and 402-12-200(2) respectively.

(3)(a) Each licensee or registrant, upon receipt of a package containing quantities of radioactive material in excess of the Type A quantities specified in WAC 402-24-125(2), other than those transported by exclusive use vehicle, shall monitor the radiation levels external to the package. The package shall be monitored as soon practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or 18 hours if received after normal working hours.

(b) If radiation levels are found on the external surface of the package in excess of 200 millirem per hour, or at three feet from the external surface of the package in excess of 10 millirem per hour, the licensee or registrant shall immediately notify, by telephone, telegraph, mailgram or facsimile, the shipper, the final delivering carrier and the department.

(4) Each licensee or registrant shall establish and maintain procedures for safely opening packages in which radioactive material is received, and shall assure that such procedures are followed and that due consideration is given to special instructions for the type of package being opened. In addition, this shall include a wipe sample of the outside of any inner package which contains a liquid or dispersible radionuclide (radioactive wastes shall be exempted). [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-125, filed 12/8/80; Order 1095, § 402-24-125, filed 2/6/76.]

WAC 402-24-130 Waste disposal, general requirement. No licensee shall dispose of any radioactive material except:

(1) By transfer to an authorized recipient as provided in WAC 402-19-400, or

(2) As authorized pursuant to WAC 402-24-050, 402-24-135, 402-24-140, or 402-24-150. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-130, filed 12/8/80; Order 1095, § 402-24-130, filed 2/6/76; Order 1, § 402-24-130, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-135 Method of obtaining approval of proposed disposal procedures. Any person may apply to the Department for approval of proposed procedures to dispose of radioactive material in a manner not otherwise authorized in this chapter. Each application shall contain a description of the radioactive material, including the quantities and kinds of radioactive material and levels of radioactivity involved, and the proposed manner and conditions of disposal. The application, where appropriate, should also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, geological, meteorological, and hydrological characteristics; usage of ground and surface waters in the general area; the nature and location of other potentially affected facilities; and procedures to be observed to minimize the risk of unexpected or hazardous exposures.

The Department will not approve any application for a license to receive radioactive material from other persons for disposal on land not owned by a State or the Federal Government. [Order 1095, § 402-24-135, filed 2/6/76.]

WAC 402-24-140 Disposal by release into sanitary sewerage systems. No licensee shall discharge radioactive material into a sanitary sewerage system unless:

(1) It is readily soluble or dispersible in water;

(2) The quantity of any radioactive material released into the system by the licensee in any one day does not exceed the larger of:

(a) The quantity which, if diluted by the average daily quantity of sewage released into the sewer by the licensee, will result in an average concentration not greater than the limits specified in WAC 402-24-220, Appendix A, Table I, Column 2, or

(b) Ten times the quantity of such material specified in WAC 402-24-230, Appendix B of this part;

(3) The quantity of any radioactive material released in any one month, if diluted by the average monthly quantity of water released by the licensee, will not result in an average concentration exceeding the limits specified in WAC 402-24-220 Appendix A, Table I, Column 2; and

(4) The gross quantity of radioactive material released into the sewerage system by the licensee does not exceed one curie (1Ci) per year.

Excreta from individuals undergoing medical diagnosis or therapy with radioactive material shall be exempt from any limitations contained in this section: *Provided*, That the licensee provides for appropriate radiological monitoring whenever any waste line in the licensee's installation which may carry such excreta is opened. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-140, filed 12/8/80; Order 1095, § 402-24-140, filed 2/6/76; Order 1, § 402-24-140, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-150 Disposal by burial in soil. No licensee shall dispose of radioactive material by burial in soil except as specifically approved by the department pursuant to WAC 402-24-135. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-150, filed 12/8/80; Order 1095, § 402-24-150, filed 2/6/76; Order 1, § 402-24-150, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-160 Disposal by incineration. No licensee shall incinerate radioactive material for the purpose of disposal or preparation for disposal except as specifically approved by the Department pursuant to WAC 402-24-050 and WAC 402-24-135. [Order 1095, § 402-24-160, filed 2/6/76; Order 1, § 402-24-160, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-170 Records of surveys, radiation monitoring, and disposal. (1) Each licensee or registrant shall maintain records showing the radiation exposures of all individuals for whom personnel monitoring is required under WAC 402-24-070. Such records shall be kept on State of Washington Current Occupational External Radiation Exposure (Form RHF-5), in accordance with the instructions contained in that form, or on clear and legible records containing all the information required by Form RHF-5. The doses entered on the forms or records shall be for periods of time not exceeding one calendar quarter.

(2) Each licensee or registrant shall maintain records in the same units used in this part, showing the results of surveys required by WAC 402-24-085 monitoring required by WAC 402-24-125(2) and 402-24-125(3), and disposals made under WAC 402-24-135 through 402-24-150.

(3) (a) Records of individual exposure to radiation and to radioactive material which must be maintained pursuant to the provisions of WAC 402-24-170(1) and records of bioassays, including results of whole body counting examinations made pursuant to WAC 402-24-080, shall be preserved indefinitely or until the department authorizes their disposal.

(b) Records of the results of surveys and monitoring which must be maintained pursuant to WAC 402-24-170(2) shall be preserved for two years after completion of the survey except that the following records shall be maintained until the department authorizes their disposition:

(i) Records of the results of surveys to determine compliance with WAC 402-24-030;

(ii) In the absence of personnel monitoring data, records of the results of surveys to determine external radiation dose;

(iii) Records of the results of surveys used to evaluate the release of radioactive effluents to the environment.

(4) Records of disposal of licensed material made pursuant to WAC 402-24-135, 402-24-140 or 402-24-150 shall be maintained until the department authorizes their disposition.

(5) Records which must be maintained pursuant to this part may be the original or a reproduced copy or microform if such reproduced copy or microform is duly authenticated by authorized personnel and the microform is capable of producing a clear and legible copy after storage for the period specified by department regulations.

(6) If there is a conflict between the department's regulations in this part, license condition, or other written department approval or authorization pertaining to the retention period for the same type of record, the retention period specified in the regulations in this part for such records shall apply unless the department, pursuant to WAC 402-24-125 of these regulations, has granted a specific exemption from the record retention requirements specified in the regulations in this part.

(7) The discontinuance of, or curtailment of, activities does not relieve the licensee or registrant of responsibility for retaining all records required by this section. A licensee or registrant may, however, request the department to accept such records. The acceptance of the records by the department relieves the licensee or registrant of subsequent responsibility only in respect to their preservation as required in this section. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-170, filed 12/8/80; Order 1095, § 402-24-170, filed 2/6/76; Order 708, § 402-24-170, filed 8/24/72; Order 1, § 402-24-170, filed 7/2/71; Order 1, § 402-24-170, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-180 Reports of theft or loss of radiation sources. Each licensee and/or registrant shall report immediately by telephone, (Seattle, Area Code 206-682-5327) telegraph, mailgram, or facsimile and confirm promptly by letter to the State Department of Social and Health Services, Radiation Control Unit, Mail Stop LD-11, Olympia, Washington 98504, the actual or attempted theft or loss as soon as such theft or loss becomes known to the licensee and/or registrant of:

(1) Any radiation machine; or

(2) Any quantity of radioactive material in excess of a quantity exempted under WAC 402-24-230, Appendix B, or any item exempted in chapter 402-19 WAC. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-180, filed 12/8/80; Order 1095, § 402-24-180, filed 2/6/76; Order 708, § 402-24-180, filed 8/24/72; Order 1, § 402-24-180, filed 7/2/71; Order 1, § 402-24-180, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-190 Notification of incidents. (1) *Immediate notification.* Each licensee and/or registrant shall immediately notify the State Department of Social and Health Services, Radiation Control Unit, Mail Stop LD-11, Olympia, Washington 98504, by telephone (Seattle, Area Code 206-682-5327), telegraph, mailgram, or facsimile and confirming letter of any incident involving any radiation source possessed by him and which may have caused or threatens to cause:

(a) A dose to the whole body of any individual of 25 rems or more of radiation; a dose to the skin of the whole body of any individual of 150 rems or more of radiation; or a dose to the feet, ankles, hands, or forearms of any individual of 375 rems or more of radiation; or

(b) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limits specified for such materials in WAC 402-24-220, Appendix A, Table II; or

(c) A loss of one working week or more of the operation of any facilities affected; or

(d) Damage to property in excess of $200,000.

(2) *Twenty-four hour notification.* Each licensee and/or registrant shall within twenty-four hours notify the State Department of Social and Health Services, Radiation Control Unit, Mail Stop LD-11, Olympia, Washington 98504, by telephone (Seattle, Area Code 206-682-5327), telegraph, mailgram or facsimile, and confirming letter of any incident involving any radiation source possessed which may have caused or threatens to cause:

(a) A dose to the whole body of any individual of 5 rems or more of radiation; a dose to the skin of the whole body of any individual of 30 rems or more of radiation; or a dose to the feet, ankles, hands, or forearms of 75 rems or more of radiation; or

(b) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 500 times the limits specified for such materials in WAC 402-24-220, Appendix A, Table II; or

(c) A loss of one day or more of the operation of any facilities affected; or

(d) Damage to property in excess of $2,000.

(3) Exposure of personnel monitoring device in excess of 5 rem which was not worn by the assigned individual. Each licensee and/or registrant shall notify the State Department of Social and Health Services, Radiation Control Program, Mail Stop LD-11, Olympia, Washington 98504 by telephone (Seattle 206/682-5327), telegraph, mailgram, or facsimile within twenty-four hours and confirming by letter.

(4) For each occurrence, requiring notification pursuant to WAC 402-24-190, a prompt investigation of the situation shall be initiated by the licensee/registrant. A report of the findings of the investigation shall be sent to the department within thirty days.

Any report filed with the department pursuant to WAC 402-24-190 shall be prepared in the manner described in WAC 402-24-200(2). Telephone notifications that do not involve immediate or twenty-four hour notification shall not be made to the emergency number (Seattle 206/682-5327). Routine calls should be made to the Olympia office (206/753-3469). [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-190, filed 12/8/80; Order 1095, § 402-24-190, filed 2/6/76; Order 708, § 402-24-190, filed 8/24/72; Order 1, § 402-24-190, filed 7/2/71; Order 1, § 402-24-190, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-200 Reports of overexposures and excessive levels and concentrations. (1) In addition to any notification required by WAC 402-24-190, each licensee or registrant shall make a report in writing within 30 days to the department of each exposure of an individual to radiation level or concentrations of radioactive material in excess of any applicable limit as set forth in this part or as otherwise approved by the department.

(2) Each report required by WAC 402-24-200(1) shall describe:

(a) The extent of exposure of individuals to radiation or to radioactive material, including estimates of each individual's dose as required by WAC 402-24-200(3);

(b) levels of radiation and concentrations of radioactive material involved;

(c) the cause of exposure, levels or concentrations; and

(d) corrective steps taken or planned to assure against a recurrence.

(3) Any report filed with the department pursuant to this section shall include for each individual exposed the name, social security number, and date of birth, and an estimate of the individual's dose. The report shall be prepared so that this information is stated in a separate part of the report.

(4) Individuals shall be notified of reports in accordance with the requirements of WAC 402-48-040.

(5) In addition to any notification required by WAC 402-24-190, each licensee shall make a report in writing within 30 days to the department of levels of radiation or releases of radioactive material in excess of limits specified by 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," or in excess of license conditions related to compliance with 40 CFR Part 190. Each report required under this paragraph shall describe the extent of exposure of individuals to radiation or to radioactive material; levels of radiation and concentrations of radioactive material involved; the cause of the exposure, levels of concentrations; and corrective steps taken or planned to assure against a recurrence. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-200, filed 12/8/80; Order 1095, § 402-24-200, filed 2/6/76; Order 708, § 402-24-200, filed 8/24/72; Order 1, § 402-24-200, filed 7/2/71; Order 1, § 402-24-200, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-210 Vacating premises. Each specific licensee shall, no less than 30 days before vacating or relinquishing possession or control of premises which may have been contaminated with radioactive material as a result of licensed activities, notify the Department in writing of intent to vacate. When deemed necessary by the Department, the licensee shall decontaminate the premises in such a manner as the Department may specify. [Order 1095, § 402-24-210, filed 2/6/76; Order 1, § 402-24-210, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-215 Notifications and reports to individuals. (1) Requirements for notification and reports to individuals of exposure to radiation or radioactive material are specified in WAC 402-48-040 of these regulations.

(2) When a licensee or registrant is required pursuant to WAC 402-24-200 to report to the Department any exposure of an individual to radiation from any source, the licensee or registrant shall also notify the individual. Such notice shall be transmitted at a time not later than the transmittal to the Department, and shall comply with the provisions of WAC 402-48-040(1). [Order 1095, § 402-24-215, filed 2/6/76.]

WAC 402-24-220 Appendix A--Concentrations in air and water above natural background.

Element (atomic number)	Isotope[1]	Table I Restricted Area Column 1 Air (μCi/ml)	Table I Restricted Area Column 2 Water (μCi/ml)	Table II Unrestricted Area Column 1 Air (μCi/ml)	Table II Unrestricted Area Column 2 Water (μCi/ml)
Actinium (89)	Ac-227	S 2×10^{-12}	6×10^{-5}	8×10^{-14}	2×10^{-6}
		I 3×10^{-11}	9×10^{-3}	9×10^{-13}	3×10^{-4}
	Ac-228	S 8×10^{-8}	3×10^{-3}	3×10^{-9}	9×10^{-5}
		I 2×10^{-8}	3×10^{-3}	6×10^{-10}	9×10^{-5}
Americium (95)	Am-241	S 6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I 1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}

Element (atomic number)	Isotope[1]		Table I Restricted Area Column 1 Air (μCi/ml)	Table I Restricted Area Column 2 Water (μCi/ml)	Table II Unrestricted Area Column 1 Air (μCi/ml)	Table II Unrestricted Area Column 2 Water (μCi/ml)
	Am-242m	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	3×10^{-10}	3×10^{-3}	9×10^{-12}	9×10^{-5}
	Am-242	S	4×10^{-8}	4×10^{-3}	1×10^{-9}	1×10^{-4}
		I	5×10^{-8}	4×10^{-3}	2×10^{-9}	1×10^{-4}
	Am-243	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Am-244	S	4×10^{-6}	1×10^{-1}	1×10^{-7}	5×10^{-3}
		I	2×10^{-5}	1×10^{-1}	8×10^{-7}	5×10^{-3}
Antimony (51)	Sb-122	S	2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-5}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
	Sb-124	S	2×10^{-7}	7×10^{-4}	5×10^{-9}	2×10^{-5}
		I	2×10^{-8}	7×10^{-4}	7×10^{-10}	2×10^{-5}
	Sb-125	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	3×10^{-8}	3×10^{-3}	9×10^{-10}	1×10^{-4}
Argon (18)	Ar-37	Sub[2]	6×10^{-3}	———	1×10^{-4}	———
	Ar-41	Sub	2×10^{-6}	———	4×10^{-8}	———
Arsenic (33)	As-73	S	2×10^{-6}	1×10^{-2}	7×10^{-8}	5×10^{-4}
		I	4×10^{-7}	1×10^{-2}	1×10^{-8}	5×10^{-4}
	As-74	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	5×10^{-5}
		I	1×10^{-7}	2×10^{-3}	4×10^{-9}	5×10^{-5}
	As-76	S	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
		I	1×10^{-7}	6×10^{-4}	3×10^{-9}	2×10^{-5}
	As-77	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
Astatine (85)	At-211	S	7×10^{-9}	5×10^{-5}	2×10^{-10}	2×10^{-6}
		I	3×10^{-8}	2×10^{-3}	1×10^{-9}	7×10^{-5}
Barium (56)	Ba-131	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
	Ba-140	S	1×10^{-7}	8×10^{-4}	4×10^{-9}	3×10^{-5}
		I	4×10^{-8}	7×10^{-4}	1×10^{-9}	2×10^{-5}
Berkelium (97)	Bk-249	S	9×10^{-10}	2×10^{-2}	3×10^{-11}	6×10^{-4}
		I	1×10^{-7}	2×10^{-2}	4×10^{-9}	6×10^{-4}
	Bk-250	S	1×10^{-7}	6×10^{-3}	5×10^{-9}	2×10^{-4}
		I	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
Beryllium (4)	Be-7	S	6×10^{-6}	5×10^{-2}	2×10^{-7}	2×10^{-3}
		I	1×10^{-6}	5×10^{-2}	4×10^{-8}	2×10^{-3}
Bismuth (83)	Bi-206	S	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
		I	1×10^{-7}	1×10^{-3}	5×10^{-9}	4×10^{-5}
	Bi-207	S	2×10^{-7}	2×10^{-3}	6×10^{-9}	6×10^{-5}
		I	1×10^{-8}	2×10^{-3}	5×10^{-10}	6×10^{-5}
	Bi-210	S	6×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
		I	6×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
	Bi-212	S	1×10^{-7}	1×10^{-2}	3×10^{-9}	4×10^{-4}
		I	2×10^{-7}	1×10^{-2}	7×10^{-9}	4×10^{-4}
Bromine (35)	Br-82	S	1×10^{-6}	8×10^{-3}	4×10^{-8}	3×10^{-4}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
Cadmium (48)	Cd-109	S	5×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
		I	7×10^{-8}	5×10^{-3}	3×10^{-9}	2×10^{-4}
	Cd-115m	S	4×10^{-8}	7×10^{-4}	1×10^{-9}	3×10^{-5}
		I	4×10^{-8}	7×10^{-4}	1×10^{-9}	3×10^{-5}
	Cd-115	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
Calcium (20)	Ca-45	S	3×10^{-8}	3×10^{-4}	1×10^{-9}	9×10^{-6}
		I	1×10^{-7}	5×10^{-3}	4×10^{-9}	2×10^{-4}
	Ca-47	S	2×10^{-7}	1×10^{-3}	6×10^{-9}	5×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	3×10^{-5}
Californium (98)	Cf-249	S	2×10^{-12}	1×10^{-4}	5×10^{-14}	4×10^{-6}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	2×10^{-5}
	Cf-250	S	5×10^{-12}	4×10^{-4}	2×10^{-13}	1×10^{-5}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	3×10^{-5}
	Cf-251	S	2×10^{-12}	1×10^{-4}	6×10^{-14}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-5}
	Cf-252	S	6×10^{-12}	2×10^{-4}	2×10^{-13}	7×10^{-6}
		I	3×10^{-11}	2×10^{-4}	1×10^{-12}	7×10^{-6}
	Cf-253	S	8×10^{-10}	4×10^{-3}	3×10^{-11}	1×10^{-4}
		I	8×10^{-10}	4×10^{-3}	3×10^{-11}	1×10^{-4}
	Cf-254	S	5×10^{-12}	4×10^{-6}	2×10^{-13}	1×10^{-7}
		I	5×10^{-12}	4×10^{-6}	2×10^{-13}	1×10^{-7}
Carbon (6)	C-14	S	4×10^{-6}	2×10^{-2}	1×10^{-7}	8×10^{-4}
	(CO_2)	Sub[2]	5×10^{-5}	———	1×10^{-6}	———
Cerium (58)	Ce-141	S	4×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	2×10^{-7}	3×10^{-3}	5×10^{-9}	9×10^{-5}
	Ce-143	S	3×10^{-7}	1×10^{-3}	9×10^{-9}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
	Ce-144	S	1×10^{-8}	3×10^{-4}	3×10^{-10}	1×10^{-5}
		I	6×10^{-9}	3×10^{-4}	2×10^{-10}	1×10^{-5}
Cesium (55)	Cs-131	S	1×10^{-5}	7×10^{-2}	4×10^{-7}	2×10^{-3}
		I	3×10^{-6}	3×10^{-2}	1×10^{-7}	9×10^{-4}
	Cs-134m	S	4×10^{-5}	2×10^{-1}	1×10^{-6}	6×10^{-3}
		I	6×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
	Cs-134	S	4×10^{-8}	3×10^{-4}	1×10^{-9}	9×10^{-6}
		I	1×10^{-8}	1×10^{-3}	4×10^{-10}	4×10^{-5}
	Cs-135	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	9×10^{-8}	7×10^{-3}	3×10^{-9}	2×10^{-4}
	Cs-136	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	9×10^{-5}
		I	2×10^{-7}	2×10^{-3}	6×10^{-9}	6×10^{-5}
	Cs-137	S	6×10^{-8}	4×10^{-4}	2×10^{-9}	2×10^{-5}
		I	1×10^{-8}	1×10^{-3}	5×10^{-10}	4×10^{-5}
Chlorine (17)	Cl-36	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
		I	2×10^{-8}	2×10^{-3}	8×10^{-10}	6×10^{-5}
	Cl-38	S	3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	7×10^{-8}	4×10^{-4}
Chromium (24)	Cr-51	S	1×10^{-5}	5×10^{-2}	4×10^{-7}	2×10^{-3}
		I	2×10^{-6}	4×10^{-2}	8×10^{-8}	2×10^{-3}
Cobalt (27)	Co-57	S	3×10^{-6}	2×10^{-2}	1×10^{-7}	5×10^{-4}
		I	2×10^{-7}	1×10^{-2}	6×10^{-9}	4×10^{-4}
	Co-58m	S	2×10^{-5}	8×10^{-2}	6×10^{-7}	3×10^{-3}
		I	9×10^{-6}	6×10^{-2}	3×10^{-7}	2×10^{-3}
	Co-58	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-8}	3×10^{-3}	2×10^{-9}	9×10^{-5}
	Co-60	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	5×10^{-5}
		I	9×10^{-9}	1×10^{-3}	3×10^{-10}	3×10^{-5}
Copper (29)	Cu-64	S	2×10^{-6}	1×10^{-2}	7×10^{-8}	3×10^{-4}
		I	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
Curium (96)	Cm-242	S	1×10^{-10}	7×10^{-4}	4×10^{-12}	2×10^{-5}
		I	2×10^{-10}	7×10^{-4}	6×10^{-12}	2×10^{-5}
	Cm-243	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	5×10^{-6}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	2×10^{-5}
	Cm-244	S	9×10^{-12}	2×10^{-4}	3×10^{-13}	7×10^{-6}
		I	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-5}
	Cm-245	S	5×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Cm-246	S	5×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Cm-247	S	5×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	6×10^{-4}	4×10^{-12}	2×10^{-5}
	Cm-248	S	6×10^{-13}	1×10^{-5}	2×10^{-14}	4×10^{-7}
		I	1×10^{-11}	4×10^{-5}	4×10^{-13}	1×10^{-6}
	Cm-249	S	1×10^{-5}	6×10^{-2}	4×10^{-7}	2×10^{-3}
		I	1×10^{-5}	6×10^{-2}	4×10^{-7}	2×10^{-3}
Dysprosium (66)	Dy-165	S	3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	7×10^{-8}	4×10^{-4}
	Dy-166	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
Einsteinium (99)	Es-253	S	8×10^{-10}	7×10^{-4}	3×10^{-11}	2×10^{-5}
		I	6×10^{-10}	7×10^{-4}	2×10^{-11}	2×10^{-5}
	Es-254m	S	5×10^{-9}	5×10^{-4}	2×10^{-10}	2×10^{-5}
		I	6×10^{-9}	5×10^{-4}	2×10^{-10}	2×10^{-5}
	Es-254	S	2×10^{-11}	4×10^{-4}	6×10^{-13}	1×10^{-5}
		I	1×10^{-10}	4×10^{-4}	4×10^{-12}	1×10^{-5}
	Es-255	S	5×10^{-10}	8×10^{-4}	2×10^{-11}	3×10^{-5}
		I	4×10^{-10}	8×10^{-4}	1×10^{-11}	3×10^{-5}
Erbium (68)	Er-169	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	4×10^{-7}	3×10^{-3}	1×10^{-8}	9×10^{-5}
	Er-171	S	7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Europium (63)	Eu-152 (T_r=9.2hrs)	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
	Eu-152 (T_r=13yrs)	S	1×10^{-8}	2×10^{-3}	4×10^{-10}	8×10^{-5}
		I	2×10^{-8}	2×10^{-3}	6×10^{-10}	8×10^{-5}
	Eu-154	S	4×10^{-9}	6×10^{-4}	1×10^{-10}	2×10^{-5}

Element (atomic number)	Isotope[1]		Table I Restricted Area Column 1 Air (μCi/ml)	Table I Restricted Area Column 2 Water (μCi/ml)	Table II Unrestricted Area Column 1 Air (μCi/ml)	Table II Unrestricted Area Column 2 Water (μCi/ml)
		I	7×10^{-9}	6×10^{-4}	2×10^{-10}	2×10^{-5}
	Eu–155	S	9×10^{-8}	6×10^{-3}	3×10^{-9}	2×10^{-4}
		I	7×10^{-8}	6×10^{-3}	3×10^{-9}	2×10^{-4}
Fermium (100)	Fm–254	S	6×10^{-8}	4×10^{-3}	2×10^{-9}	1×10^{-4}
		I	7×10^{-8}	4×10^{-3}	2×10^{-9}	1×10^{-4}
	Fm–255	S	2×10^{-8}	1×10^{-3}	6×10^{-10}	3×10^{-5}
		I	1×10^{-8}	1×10^{-3}	4×10^{-10}	3×10^{-5}
	Fm–256	S	3×10^{-9}	3×10^{-5}	1×10^{-10}	9×10^{-7}
		I	2×10^{-9}	3×10^{-5}	6×10^{-11}	9×10^{-7}
Fluorine (9)	F–18	S	5×10^{-6}	2×10^{-2}	2×10^{-7}	8×10^{-4}
		I	3×10^{-6}	1×10^{-2}	9×10^{-8}	5×10^{-4}
Gadolinium (64)	Gd–153	S	2×10^{-7}	6×10^{-3}	8×10^{-9}	2×10^{-4}
		I	9×10^{-8}	6×10^{-3}	3×10^{-9}	2×10^{-4}
	Gd–159	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
Gallium (31)	Ga–72	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
Germanium (32)	Ge–71	S	1×10^{-5}	5×10^{-2}	4×10^{-7}	2×10^{-3}
		I	6×10^{-6}	5×10^{-2}	2×10^{-7}	2×10^{-3}
Gold (79)	Au–196	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	6×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
	Au–198	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	5×10^{-5}
		I	2×10^{-7}	1×10^{-3}	8×10^{-9}	5×10^{-5}
	Au–199	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	8×10^{-7}	4×10^{-3}	3×10^{-8}	2×10^{-4}
Hafnium (72)	Hf–181	S	4×10^{-8}	2×10^{-3}	1×10^{-9}	7×10^{-5}
		I	7×10^{-8}	2×10^{-3}	3×10^{-9}	7×10^{-5}
Holmium (67)	Ho–166	S	2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I	2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-5}
Hydrogen (1)	H–3	S	5×10^{-6}	1×10^{-1}	2×10^{-7}	3×10^{-3}
		I	5×10^{-6}	1×10^{-1}	2×10^{-7}	3×10^{-3}
		Sub[2]	2×10^{-3}	———	4×10^{-5}	———
Indium (49)	In–113m	S	8×10^{-6}	4×10^{-2}	3×10^{-7}	1×10^{-3}
		I	7×10^{-6}	4×10^{-2}	2×10^{-7}	1×10^{-3}
	In–114m	S	1×10^{-7}	5×10^{-4}	4×10^{-9}	2×10^{-5}
		I	2×10^{-8}	5×10^{-4}	7×10^{-10}	2×10^{-5}
	In–115m	S	2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	6×10^{-8}	4×10^{-4}
	In–115	S	2×10^{-7}	3×10^{-3}	9×10^{-9}	9×10^{-5}
		I	3×10^{-8}	3×10^{-3}	1×10^{-9}	9×10^{-5}
Iodine (53)	I–125	S	5×10^{-9}	4×10^{-5}	8×10^{-11}	2×10^{-7}
		I	2×10^{-7}	6×10^{-3}	6×10^{-9}	2×10^{-4}
	I–126	S	8×10^{-9}	5×10^{-5}	9×10^{-11}	3×10^{-7}
		I	3×10^{-7}	3×10^{-3}	1×10^{-8}	9×10^{-5}
	I–129	S	2×10^{-9}	1×10^{-5}	2×10^{-11}	6×10^{-8}
		I	7×10^{-8}	6×10^{-3}	2×10^{-9}	2×10^{-4}
	I–131	S	9×10^{-9}	6×10^{-5}	1×10^{-10}	3×10^{-7}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
	I–132	S	2×10^{-7}	2×10^{-3}	3×10^{-9}	8×10^{-6}
		I	9×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
	I–133	S	3×10^{-8}	2×10^{-4}	4×10^{-10}	1×10^{-6}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
	I–134	S	5×10^{-7}	4×10^{-3}	6×10^{-9}	2×10^{-5}
		I	3×10^{-6}	2×10^{-2}	1×10^{-7}	6×10^{-4}
	I–135	S	1×10^{-7}	7×10^{-4}	1×10^{-9}	4×10^{-6}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
Iridium (77)	Ir–190	S	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
	Ir–192	S	1×10^{-7}	1×10^{-3}	4×10^{-9}	4×10^{-5}
		I	3×10^{-8}	1×10^{-3}	9×10^{-10}	4×10^{-5}
	Ir–194	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-5}
		I	2×10^{-7}	9×10^{-4}	5×10^{-9}	3×10^{-5}
Iron (26)	Fe–55	S	9×10^{-7}	2×10^{-2}	3×10^{-8}	8×10^{-4}
		I	1×10^{-6}	7×10^{-2}	3×10^{-8}	2×10^{-3}
	Fe–59	S	1×10^{-7}	2×10^{-3}	5×10^{-9}	6×10^{-5}
		I	5×10^{-8}	2×10^{-3}	2×10^{-9}	5×10^{-5}
Krypton (36)	Kr–85m					
		Sub[2]	6×10^{-6}	———	1×10^{-7}	———
	Kr–85	Sub	1×10^{-5}	———	3×10^{-7}	———
	Kr–87	Sub	1×10^{-6}	———	2×10^{-8}	———
	Kr–88	Sub	1×10^{-6}	———	2×10^{-8}	———
Lanthanum (57)	La–140	S	2×10^{-7}	7×10^{-4}	5×10^{-9}	2×10^{-5}
		I	1×10^{-7}	7×10^{-4}	4×10^{-9}	2×10^{-5}
Lead (82)	Pb–203	S	3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	6×10^{-8}	4×10^{-4}
	Pb–210	S	1×10^{-10}	4×10^{-6}	4×10^{-12}	1×10^{-7}
		I	2×10^{-10}	5×10^{-3}	8×10^{-12}	2×10^{-4}
	Pb–212	S	2×10^{-8}	6×10^{-4}	6×10^{-10}	2×10^{-5}
		I	2×10^{-8}	5×10^{-4}	7×10^{-10}	2×10^{-5}
Lutetium (71)	Lu–177	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Manganese (25)	Mn–52	S	2×10^{-7}	1×10^{-3}	7×10^{-9}	3×10^{-5}
		I	1×10^{-7}	9×10^{-4}	5×10^{-9}	3×10^{-5}
	Mn–54	S	4×10^{-7}	4×10^{-3}	1×10^{-8}	1×10^{-4}
		I	4×10^{-8}	3×10^{-3}	1×10^{-9}	1×10^{-4}
	Mn–56	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Mercury (80)	Hg–197m	S	7×10^{-7}	6×10^{-3}	3×10^{-8}	2×10^{-4}
		I	8×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
	Hg–197	S	1×10^{-6}	9×10^{-3}	4×10^{-8}	3×10^{-4}
		I	3×10^{-6}	1×10^{-2}	9×10^{-8}	5×10^{-4}
	Hg–203	S	7×10^{-8}	5×10^{-4}	2×10^{-9}	2×10^{-5}
		I	1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
Molybdenum (42)	Mo–99	S	7×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
Neodymium (60)	Nd–144	S	8×10^{-11}	2×10^{-3}	3×10^{-12}	7×10^{-5}
		I	3×10^{-10}	2×10^{-3}	1×10^{-11}	8×10^{-5}
	Nd–147	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	2×10^{-7}	2×10^{-3}	8×10^{-9}	6×10^{-5}
	Nd–149	S	2×10^{-6}	8×10^{-3}	6×10^{-8}	3×10^{-4}
		I	1×10^{-6}	8×10^{-3}	5×10^{-8}	3×10^{-4}
Neptunium (93)	Np–237	S	4×10^{-12}	9×10^{-5}	1×10^{-13}	3×10^{-6}
		I	1×10^{-10}	9×10^{-4}	4×10^{-12}	3×10^{-5}
	Np–239	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	7×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
Nickel (28)	Ni–59	S	5×10^{-7}	6×10^{-3}	2×10^{-8}	2×10^{-4}
		I	8×10^{-7}	6×10^{-2}	3×10^{-8}	2×10^{-3}
	Ni–63	S	6×10^{-8}	8×10^{-4}	2×10^{-9}	3×10^{-5}
		I	3×10^{-7}	2×10^{-2}	1×10^{-8}	7×10^{-4}
	Ni–65	S	9×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Niobium (41)	Nb–93m	S	1×10^{-7}	1×10^{-2}	4×10^{-9}	4×10^{-4}
		I	2×10^{-7}	1×10^{-2}	5×10^{-9}	4×10^{-4}
	Nb–95	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	1×10^{-7}	3×10^{-3}	3×10^{-9}	1×10^{-4}
	Nb–97	S	6×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
		I	5×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
Osmium (76)	Os–185	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I	5×10^{-8}	2×10^{-3}	2×10^{-9}	7×10^{-5}
	Os–191m	S	2×10^{-5}	7×10^{-2}	6×10^{-7}	3×10^{-3}
		I	9×10^{-6}	7×10^{-2}	3×10^{-7}	2×10^{-3}
	Os–191	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
	Os–193	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	3×10^{-7}	2×10^{-3}	9×10^{-9}	5×10^{-5}
Palladium (46)	Pd–103	S	1×10^{-6}	1×10^{-2}	5×10^{-8}	3×10^{-4}
		I	7×10^{-7}	8×10^{-3}	3×10^{-8}	3×10^{-4}
	Pd–109	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
Phosphorus (15)	P–32	S	7×10^{-8}	5×10^{-4}	2×10^{-9}	2×10^{-5}
		I	8×10^{-8}	7×10^{-4}	3×10^{-9}	2×10^{-5}
Platinum (78)	Pt–191	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
	Pt–193m	S	7×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
		I	5×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
	Pt–193	S	1×10^{-6}	3×10^{-2}	4×10^{-8}	9×10^{-4}
		I	3×10^{-7}	5×10^{-2}	1×10^{-8}	2×10^{-3}
	Pt–197m	S	6×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
		I	5×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
	Pt–197	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}

Element (atomic number)	Isotope[1]	Table I Restricted Area Column 1 Air (μCi/ml)	Table I Restricted Area Column 2 Water (μCi/ml)	Table II Unrestricted Area Column 1 Air (μCi/ml)	Table II Unrestricted Area Column 2 Water (μCi/ml)
Plutonium (94)	Pu-238	S 2×10^{-12}	1×10^{-4}	7×10^{-14}	5×10^{-6}
		I 3×10^{-11}	8×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-239	S 2×10^{-12}	1×10^{-4}	6×10^{-14}	5×10^{-6}
		I 4×10^{-11}	8×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-240	S 2×10^{-12}	1×10^{-4}	6×10^{-14}	5×10^{-6}
		I 4×10^{-11}	8×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-241	S 9×10^{-11}	7×10^{-3}	3×10^{-12}	2×10^{-4}
		I 4×10^{-8}	4×10^{-2}	1×10^{-9}	1×10^{-3}
	Pu-242	S 2×10^{-12}	1×10^{-4}	6×10^{-14}	5×10^{-6}
		I 4×10^{-11}	9×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-243	S 2×10^{-6}	1×10^{-2}	6×10^{-8}	3×10^{-4}
		I 2×10^{-6}	1×10^{-2}	8×10^{-8}	3×10^{-4}
	Pu-244	S 2×10^{-12}	1×10^{-4}	6×10^{-14}	4×10^{-6}
		I 3×10^{-11}	3×10^{-4}	1×10^{-12}	1×10^{-5}
Polonium (84)	Po-210	S 5×10^{-10}	2×10^{-5}	2×10^{-11}	7×10^{-7}
		I 2×10^{-10}	8×10^{-4}	7×10^{-12}	3×10^{-5}
Potassium (19)	K-42	S 2×10^{-6}	9×10^{-3}	7×10^{-8}	3×10^{-4}
		I 1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
Praseodymium (59)	Pr-142	S 2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I 2×10^{-7}	9×10^{-4}	5×10^{-9}	3×10^{-5}
	Pr-143	S 3×10^{-7}	1×10^{-3}	1×10^{-8}	5×10^{-5}
		I 2×10^{-7}	1×10^{-3}	6×10^{-9}	5×10^{-5}
Promethium (61)	Pm-147	S 6×10^{-8}	6×10^{-3}	2×10^{-9}	2×10^{-4}
		I 1×10^{-7}	6×10^{-3}	3×10^{-9}	2×10^{-4}
	Pm-149	S 3×10^{-7}	1×10^{-3}	1×10^{-8}	4×10^{-5}
		I 2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
Protactinium (91)	Pa-230	S 2×10^{-9}	7×10^{-3}	6×10^{-11}	2×10^{-4}
		I 8×10^{-10}	7×10^{-3}	3×10^{-11}	2×10^{-4}
	Pa-231	S 1×10^{-12}	3×10^{-5}	4×10^{-14}	9×10^{-7}
		I 1×10^{-10}	8×10^{-4}	4×10^{-12}	2×10^{-5}
	Pa-233	S 6×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
		I 2×10^{-7}	3×10^{-3}	6×10^{-9}	1×10^{-4}
Radium (88)	Ra-223	S 2×10^{-9}	2×10^{-5}	6×10^{-11}	7×10^{-7}
		I 2×10^{-10}	1×10^{-4}	8×10^{-12}	4×10^{-6}
	Ra-224	S 5×10^{-9}	7×10^{-5}	2×10^{-10}	2×10^{-6}
		I 7×10^{-10}	2×10^{-4}	2×10^{-11}	5×10^{-6}
	Ra-226	S 3×10^{-11}	4×10^{-7}	3×10^{-12}	3×10^{-8}
		I 5×10^{-11}	9×10^{-4}	2×10^{-12}	3×10^{-5}
	Ra-228	S 7×10^{-11}	8×10^{-7}	2×10^{-12}	3×10^{-8}
		I 4×10^{-11}	7×10^{-4}	1×10^{-12}	3×10^{-5}
Radon (86)	Rn-220	S 3×10^{-7}	———	1×10^{-8}	———
		I ———	———	———	———
	Rn-222[3]	S 3×10^{-8}	———	3×10^{-9}	———
Rhenium (75)	Re-183	S 3×10^{-6}	2×10^{-2}	9×10^{-8}	6×10^{-4}
		I 2×10^{-7}	8×10^{-3}	5×10^{-9}	3×10^{-4}
	Re-186	S 6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I 2×10^{-7}	1×10^{-3}	8×10^{-9}	5×10^{-5}
	Re-187	S 9×10^{-6}	7×10^{-2}	3×10^{-7}	3×10^{-3}
		I 5×10^{-7}	4×10^{-2}	2×10^{-8}	2×10^{-3}
	Re-188	S 4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I 2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-5}
Rhodium (45)	Rh-103m	S 8×10^{-5}	4×10^{-1}	3×10^{-6}	1×10^{-2}
		I 6×10^{-5}	3×10^{-1}	2×10^{-6}	1×10^{-2}
	Rh-105	S 8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I 5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Rubidium (37)	Rb-86	S 3×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
		I 7×10^{-8}	7×10^{-4}	2×10^{-9}	2×10^{-5}
	Rb-87	S 5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I 7×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
Ruthenium (44)	Ru-97	S 2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I 2×10^{-6}	1×10^{-2}	6×10^{-8}	3×10^{-4}
	Ru-103	S 5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}
		I 8×10^{-8}	2×10^{-3}	3×10^{-9}	8×10^{-5}
	Ru-105	S 7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I 5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
	Ru-106	S 8×10^{-8}	4×10^{-4}	3×10^{-9}	1×10^{-5}
		I 6×10^{-9}	3×10^{-4}	2×10^{-10}	1×10^{-5}
Samarium (62)	Sm-147	S 7×10^{-11}	2×10^{-3}	2×10^{-12}	6×10^{-5}
		I 3×10^{-10}	2×10^{-3}	9×10^{-12}	7×10^{-5}
	Sm-151	S 6×10^{-8}	1×10^{-2}	2×10^{-9}	4×10^{-4}
		I 1×10^{-7}	1×10^{-2}	5×10^{-9}	4×10^{-4}
	Sm-153	S 5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}
		I 4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
Scandium (21)	Sc-46	S 2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
		I 2×10^{-8}	1×10^{-3}	8×10^{-10}	4×10^{-5}
	Sc-47	S 6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I 5×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
	Sc-48	S 2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-5}
		I 1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
Selenium (34)	Se-75	S 1×10^{-6}	9×10^{-3}	4×10^{-8}	3×10^{-4}
		I 1×10^{-7}	8×10^{-3}	4×10^{-9}	3×10^{-4}
Silicon (14)	Si-31	S 6×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
		I 1×10^{-6}	6×10^{-3}	3×10^{-8}	2×10^{-4}
Silver (47)	Ag-105	S 6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I 8×10^{-8}	3×10^{-3}	3×10^{-9}	1×10^{-4}
	Ag-110m	S 2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I 1×10^{-8}	9×10^{-4}	3×10^{-10}	3×10^{-5}
	Ag-111	S 3×10^{-7}	1×10^{-3}	1×10^{-8}	4×10^{-5}
		I 2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
Sodium (11)	Na-22	S 2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
		I 9×10^{-9}	9×10^{-4}	3×10^{-10}	3×10^{-5}
	Na-24	S 1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
		I 1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
Strontium (38)	Sr-85m	S 4×10^{-5}	2×10^{-1}	1×10^{-6}	7×10^{-3}
		I 3×10^{-5}	2×10^{-1}	1×10^{-6}	7×10^{-3}
	Sr-85	S 2×10^{-7}	3×10^{-3}	8×10^{-9}	1×10^{-4}
		I 1×10^{-7}	5×10^{-3}	4×10^{-9}	2×10^{-4}
	Sr-89	S 3×10^{-8}	3×10^{-4}	3×10^{-10}	3×10^{-6}
		I 4×10^{-8}	8×10^{-4}	1×10^{-9}	3×10^{-5}
	Sr-90	S 1×10^{-9}	1×10^{-5}	3×10^{-11}	3×10^{-7}
		I 5×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
	Sr-91	S 4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I 3×10^{-7}	1×10^{-3}	9×10^{-9}	5×10^{-5}
	Sr-92	S 4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I 3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
Sulfur (16)	S-35	S 3×10^{-7}	2×10^{-3}	9×10^{-9}	6×10^{-5}
		I 3×10^{-7}	8×10^{-3}	9×10^{-9}	3×10^{-4}
Tantalum (73)	Ta-182	S 4×10^{-8}	1×10^{-3}	1×10^{-9}	4×10^{-5}
		I 2×10^{-8}	1×10^{-3}	7×10^{-10}	4×10^{-5}
Technetium (43)	Tc-96m	S 8×10^{-5}	4×10^{-1}	3×10^{-6}	1×10^{-2}
		I 3×10^{-5}	3×10^{-1}	1×10^{-6}	1×10^{-2}
	Tc-96	S 6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I 2×10^{-7}	1×10^{-3}	8×10^{-9}	5×10^{-5}
	Tc-97m	S 2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I 2×10^{-7}	5×10^{-3}	5×10^{-9}	2×10^{-4}
	Tc-97	S 1×10^{-5}	5×10^{-2}	4×10^{-7}	2×10^{-3}
		I 3×10^{-7}	2×10^{-2}	1×10^{-8}	8×10^{-4}
	Tc-99m	S 4×10^{-5}	2×10^{-1}	1×10^{-6}	6×10^{-3}
		I 1×10^{-5}	8×10^{-2}	5×10^{-7}	3×10^{-3}
	Tc-99	S 2×10^{-6}	1×10^{-2}	7×10^{-8}	3×10^{-4}
		I 6×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
Tellurium (52)	Te-125m	S 4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
		I 1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
	Te-127m	S 1×10^{-7}	2×10^{-3}	5×10^{-9}	6×10^{-5}
		I 4×10^{-8}	2×10^{-3}	1×10^{-9}	5×10^{-5}
	Te-127	S 2×10^{-6}	8×10^{-3}	6×10^{-8}	3×10^{-4}
		I 9×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
	Te-129m	S 8×10^{-8}	1×10^{-3}	3×10^{-9}	3×10^{-5}
		I 3×10^{-8}	6×10^{-4}	1×10^{-9}	2×10^{-5}
	Te-129	S 5×10^{-6}	2×10^{-2}	2×10^{-7}	8×10^{-4}
		I 4×10^{-6}	2×10^{-2}	1×10^{-7}	8×10^{-4}
	Te-131m	S 4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I 2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
	Te-132	S 2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I 1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
Terbium (65)	Tb-160	S 1×10^{-7}	1×10^{-3}	3×10^{-9}	4×10^{-5}
		I 3×10^{-8}	1×10^{-3}	1×10^{-9}	4×10^{-5}
Thallium (81)	Tl-200	S 3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I 1×10^{-6}	7×10^{-3}	4×10^{-8}	2×10^{-4}
	Tl-201	S 2×10^{-6}	9×10^{-3}	7×10^{-8}	3×10^{-4}
		I 9×10^{-7}	5×10^{-3}	3×10^{-3}	2×10^{-4}
	Tl-202	S 8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I 2×10^{-7}	2×10^{-3}	8×10^{-9}	7×10^{-5}
	Tl-204	S 6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I 3×10^{-8}	2×10^{-3}	9×10^{-10}	6×10^{-5}

Element (atomic number)	Isotope[1]	Table I Restricted Area Column 1 Air (μCi/ml)	Table I Restricted Area Column 2 Water (μCi/ml)	Table II Unrestricted Area Column 1 Air (μCi/ml)	Table II Unrestricted Area Column 2 Water (μCi/ml)
Thorium [(90)]	Th–227	S 3×10^{-10}	5×10^{-4}	1×10^{-11}	2×10^{-5}
		I 2×10^{-10}	5×10^{-4}	6×10^{-12}	2×10^{-5}
	Th–228	S 9×10^{-12}	2×10^{-4}	3×10^{-13}	7×10^{-6}
		I 6×10^{-12}	4×10^{-4}	2×10^{-13}	1×10^{-5}
	Th–230	S 2×10^{-12}	5×10^{-5}	8×10^{-14}	2×10^{-6}
		I 1×10^{-11}	9×10^{-4}	3×10^{-13}	3×10^{-5}
	Th–231	S 1×10^{-6}	7×10^{-3}	5×10^{-8}	2×10^{-4}
		I 1×10^{-6}	7×10^{-3}	4×10^{-8}	2×10^{-4}
	Th–232	S 3×10^{-11}	5×10^{-5}	1×10^{-12}	2×10^{-6}
		I 3×10^{-11}	1×10^{-3}	1×10^{-12}	4×10^{-5}
	Th–natural	S 6×10^{-11}	6×10^{-5}	2×10^{-12}	2×10^{-6}
		I 6×10^{-11}	6×10^{-4}	2×10^{-12}	2×10^{-5}
	Th–234	S 6×10^{-8}	5×10^{-4}	2×10^{-9}	2×10^{-5}
		I 3×10^{-8}	5×10^{-4}	1×10^{-9}	2×10^{-5}
Thulium (69)	Tm–170	S 4×10^{-8}	1×10^{-3}	1×10^{-9}	5×10^{-5}
		I 3×10^{-8}	1×10^{-3}	1×10^{-9}	5×10^{-5}
	Tm–171	S 1×10^{-7}	1×10^{-2}	4×10^{-9}	5×10^{-4}
		I 2×10^{-7}	1×10^{-2}	8×10^{-9}	5×10^{-4}
Tin (50)	Sn–113	S 4×10^{-7}	2×10^{-3}	1×10^{-8}	9×10^{-5}
		I 5×10^{-8}	2×10^{-3}	2×10^{-9}	8×10^{-5}
	Sn–125	S 1×10^{-7}	5×10^{-4}	4×10^{-9}	2×10^{-5}
		I 8×10^{-8}	5×10^{-4}	3×10^{-9}	2×10^{-5}
Tungsten (74)	W–181	S 2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I 1×10^{-7}	1×10^{-2}	4×10^{-9}	3×10^{-4}
	W–185	S 8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I 1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
	W–187	S 4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I 3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
Uranium (92)	U–230	S 3×10^{-10}	1×10^{-4}	1×10^{-11}	5×10^{-6}
		I 1×10^{-10}	1×10^{-4}	4×10^{-12}	5×10^{-6}
	U–232	S 1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-5}
		I 3×10^{-11}	8×10^{-4}	9×10^{-13}	3×10^{-5}
	U–233	S 5×10^{-10}	9×10^{-4}	2×10^{-11}	3×10^{-5}
		I 1×10^{-10}	9×10^{-4}	4×10^{-12}	3×10^{-5}
	U–234	S[4] 6×10^{-10}	9×10^{-4}	2×10^{-11}	3×10^{-5}
		I 1×10^{-10}	9×10^{-4}	4×10^{-12}	3×10^{-5}
	U–235	S[4] 5×10^{-10}	8×10^{-4}	2×10^{-11}	3×10^{-5}
		I 1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	U–236	S 6×10^{-10}	1×10^{-3}	2×10^{-11}	3×10^{-5}
		I 1×10^{-10}	1×10^{-3}	4×10^{-12}	3×10^{-5}
	U–238	S[4] 7×10^{-11}	1×10^{-3}	3×10^{-12}	4×10^{-5}
		I 1×10^{-10}	1×10^{-3}	5×10^{-12}	4×10^{-5}
	U–240	S 2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-5}
		I 2×10^{-7}	1×10^{-3}	6×10^{-9}	3×10^{-5}
	U–Natural	S[4] 1×10^{-10}	1×10^{-3}	5×10^{-12}	3×10^{-5}
		I 1×10^{-10}	1×10^{-3}	5×10^{-12}	3×10^{-5}
Vanadium (23)	V–48	S 2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-5}
		I 6×10^{-8}	8×10^{-4}	2×10^{-9}	3×10^{-5}
Xenon (54)	Xe–131m	Sub[2] 2×10^{-5}	———	4×10^{-7}	———
	Xe–133m	Sub 1×10^{-5}	———	3×10^{-7}	———
	Xe–133	Sub 1×10^{-5}	———	3×10^{-7}	———
	Xe–135	Sub 4×10^{-6}	———	1×10^{-7}	———
Ytterbium (70)	Yb–175	S 7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I 6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Yttrium (39)	Y–90	S 1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
		I 1×10^{-7}	6×10^{-4}	3×10^{-9}	2×10^{-5}
	Y–91m	S 2×10^{-5}	1×10^{-1}	8×10^{-7}	3×10^{-3}
		I 2×10^{-5}	1×10^{-1}	6×10^{-7}	3×10^{-3}
	Y–91	S 4×10^{-8}	8×10^{-4}	1×10^{-9}	3×10^{-5}
		I 3×10^{-8}	8×10^{-4}	1×10^{-9}	3×10^{-5}
	Y–92	S 4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I 3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
	Y–93	S 2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-5}
		I 1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
Zinc (30)	Zn–65	S 1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
		I 6×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
	Zn–69m	S 4×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
		I 3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
	Zn–69	S 7×10^{-6}	5×10^{-2}	2×10^{-7}	2×10^{-3}
		I 9×10^{-6}	5×10^{-2}	3×10^{-7}	2×10^{-3}
Zirconium (40)	Zr–93	S 1×10^{-7}	2×10^{-2}	4×10^{-9}	8×10^{-4}
		I 3×10^{-7}	2×10^{-2}	1×10^{-8}	8×10^{-4}
	Zr–95	S 1×10^{-7}	2×10^{-3}	4×10^{-9}	6×10^{-5}
		I 3×10^{-8}	2×10^{-3}	1×10^{-9}	6×10^{-5}
	Zr–97	S 1×10^{-7}	5×10^{-4}	4×10^{-9}	2×10^{-5}
		I 9×10^{-8}	5×10^{-4}	3×10^{-9}	2×10^{-5}
Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life less than 2 hours.		Sub[2] 1×10^{-6}	———	3×10^{-8}	———
Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours.		3×10^{-9}	9×10^{-5}	1×10^{-10}	3×10^{-6}
Any single radionuclide not listed above, which decays by alpha emission or spontaneous fission.		6×10^{-13}	4×10^{-7}	2×10^{-14}	3×10^{-8}

For purposes of these regulations, the designation 10–(number), indicates 10 raised to the minus (number) power.*

NOTES:

[1]Soluble (S); Insoluble (I).

[2]"Sub" means that values given are for submersion in a semispherical infinite cloud of airborne material.

[3]For purposes of these regulations, it may be assumed that the daughter activity concentrations in the following table are equivalent to an air concentration of 10^{-7} microcuries of radon–222 per milliliter of air in equilibrium with the daughters RaA, RaB, RaC, and RaC':

Alpha–Emitting Daughter Activity Collected Per Milliliter of Air

Maximum Time Between Collection and Measurement (hours)[a]	Microcuries/ml	Total alpha disintegrations per minute per ml
0.5	7.2×10^{-8}	0.16
1.0	4.5×10^{-8}	0.10
2.0	1.3×10^{-8}	0.028
3.0	0.3×10	0.0072

[a]The duration of sample collection and the duration of measurement should be sufficiently short compared to the time between collection and measurement, as not to have a statistically significant effect upon the results.

[4]For soluble mixtures of U–238, U–234 and U–235 in air chemical toxicity may be the limiting factor. If the percentage by weight (enrichment) of U–235 is less than 5, the concentration value for a 40–hour work week, Table I, is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40–hour work week shall not exceed 8×10^{-3} SA μCi–hr/ml, where SA is the specific activity of the uranium inhaled. The concentration value for Table II is 0.007 milligrams uranium per cubic meter of air. The specific activity for natural uranium is 6.77×10^{-7} curies per gram U. The specific activity for other mixtures of U–238, U–235 and U–234, if not known, shall be:

$SA = 3.6 \times 10^{-7}$ curies/gram U
U-depleted
$SA = (0.4 + 0.38\ E + 0.0034\ E^2)\ 10^{-6}$
$E \geq 0.72$

where E is the percentage by weight of U-235, expressed as percent.

NOTE: In any case where there is a mixture in air or water of more than one radionuclide, the limiting values for purposes of this Appendix should be determined as follows:

1. If the identity and concentration of each radionuclide in the mixture are known, the limiting values should be derived as follows: Determine, for each radionuclide in the mixture, the ratio between the quantity present in the mixture and the limit otherwise established in Appendix "A" for the specific radionuclide when not in a mixture. The sum of such ratios for all the radionuclides in the mixture may not exceed "1" (i.e., "unity")

Example: If radionuclides a, b, and c are present in concentrations C_a, C_b, and C_c, and if the applicable MPC's are MPC_a, MPC_b, and MPC_c respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_a}{MPC_a} + \frac{C_b}{MPC_b} + \frac{C_c}{MPC_c} \leq 1$$

2. If either the identity or the concentration of any radionuclide in the mixture is not known, the limiting values for purposes of Appendix "A" shall be:

a. For purposes of Table I, Col. 1 ..... 6×10^{-13}
b. For purposes of Table I, Col. 2 ..... 4×10^{-7}
c. For purposes of Table II, Col. 1 ..... 2×10^{-14}
d. For purposes of Table II, Col. 2 ..... 3×10^{-8}

3. If any of the conditions specified below are met, the corresponding values specified below may be used in lieu of those specified in paragraph 2, above.

a. If the identity of each radionuclide in the mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the concentration limit for the mixture is the limit specified in Appendix "A" for the radionuclide in the mixture having the lowest concentration limit; or

b. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in Appendix "A" are not present in the mixture, the concentration limit for the mixture is the lowest concentration limit specified in Appendix "A" for any radionuclide which is not known to be absent from the mixture; or

c. Radionuclide

	Table I Restricted Area Column 1 Air (μCi/ml)	Table I Restricted Area Column 2 Water (μCi/ml)	Table II Unrestricted Area Column 1 Air (μCi/ml)	Table II Unrestricted Area Column 2 Water (μCi/ml)
If it is known that Sr–90, I–125, I–126, I–129, I–131, (I–133 Table II only), Pb–210, Po–210, At–211, Ra–223, Ra–224, Ra–226, Ac–227, Ra–228, Th–230, Pa–231, Th–232, Th–nat, Cm–248, Cf–254, and Fm–256 are not present	——	9×10^{-5}	——	3×10^{-6}
If it is known that Sr–90, I–125, I–126, I–129, (I–131, I–133, Table II only), Pb–210, Po–210, Ra–223, Ra–226, Ra–228, Pa–231, Th–nat, Cm–248, Cf–254, and Fm–256 are not present	——	6×10^{-5}	——	2×10^{-6}
If it is known that Sr–90, I–129 (I–125, I–126, I–131, Table II only), Pb–210, Ra–226, Ra–228, Cm–248, and Cf–254 are not present	——	2×10^{-5}	——	6×10^{-7}
If it is known that (I–129, Table II only), Ra–226, and Ra–228 are not present	——	3×10^{-6}	——	1×10^{-7}
If it is known that alpha–emitters and Sr–90, I–129, Pb–210, Ac–227, Ra–228, Pa–230, Pu–241, and Bk–249 are not present	3×10^{-9}	——	1×10^{-10}	——
If it is known that alpha–emitters and Pb–210, Ac–227, Ra–228, and Pu–241 are not present	3×10^{-10}	——	1×10^{-11}	——
If it is known that alpha–emitters and Ac–227 are not present	3×10^{-11}	——	1×10^{-12}	——
If it is known that Ac–227, Th–230, Pa–231, Pu–238, Pu–239, Pu–240, Pu–242, Pu–244, Cm–248, Cf–249 and Cf–251 are not present	3×10^{-12}	——	1×10^{-13}	——

4. If the mixture of radionuclides consists of uranium and its daughter products in ore dust prior to chemical processing of the uranium ore, the values specified below may be used in lieu of those determined in accordance with paragraph 1 above or those specified in paragraphs 2 and 3 above.

a. For purposes of Table I, Column 1, 1×10^{-10} μCi/ml gross alpha activity; or 5×10^{-11} μCi/ml natural uranium; or 75 micrograms per cubic meter of air natural uranium.

b. For purposes of Table II, Column 1, 3×10^{-12} μCi/ml gross alpha activity; 2×10^{-12} μCi/ml natural uranium; or 3

micrograms per cubic meter of air natural uranium.

5. For purposes of this note, a radionuclide may be considered as not present in a mixture if (a) the ratio of the concentration of that radionuclide in the mixture (C_a) to the concentration limit for that radionuclide specified in Table II of Appendix "A" (MPC_a) does not exceed 1/10, (i.e., $C_a/MPC_a \leq 1/10$ and (b) the sum of such ratios for all radionuclides considered as not present in the mxiture [mixture] does not exceed 1/4 (i.e., $C_a/MPC_a + C_b/MPC_b + \ldots \leq 1/4$).

[Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-220, filed 12/8/80; Order 1095, § 402-24-220, filed 2/6/76; Order 1, § 402-24-220, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-24-230 Appendix B--Quantities exempt from labeling.

Material	Microcuries
Americium-241	0.01
Antimony-122	100
Antimony-124	10
Antimony-125	10
Arsenic-73	100
Arsenic-74	10
Arsenic-76	10
Arsenic-77	100
Barium-133	10
Barium-140	10
Bismuth-210	1
Bromine-82	10
Cadmium-109	10
Cadmium-115m	10
Cadmium-115	100
Calcium-45	10
Calcium-47	10
Carbon-14	100
Cerium-141	100
Cerium-143	100
Cerium-144	1
Cesium-131	1,000
Cesium-134m	100
Cesium-134	1
Cesium-135	10
Cesium-136	10
Cesium-137	10
Chlorine-36	10
Chlorine-38	10
Chromium-51	1,000
Cobalt-58m	10
Cobalt-58	10
Cobalt-60	1
Copper-64	100
Dysprosium-165	10
Dysprosium-166	100
Erbium-169	100
Erbium-171	100
Europium-152 (9.2 h)	100
Europium-152 (13 yr)	1
Europium-154	1
Europium-155	10
Fluorine-18	1,000
Gadolinium-153	10
Gadolinium-159	100
Gallium-72	10
Germanium-71	100
Gold-198	100
Gold-199	100
Hafnium-181	10
Holmium-166	100
Hydrogen-3	1,000
Indium-113m	100
Indium-114m	10
Indium-115m	100
Indium-115	10
Iodine-125	1
Iodine-126	1
Iodine-129	0.1
Iodine-131	1
Iodine-132	10
Iodine-133	1
Iodine-134	10
Iodine-135	10
Iridium-192	10
Iridium-194	100
Iron-55	100
Iron-59	10
Krypton-85	100
Krypton-87	10
Lanthanum-140	10
Lutetium-177	100
Manganese-52	10
Manganese-54	10
Manganese-56	10
Mercury-197m	100
Mercury-197	100
Mercury-203	10
Molybdenum-99	100
Neodymium-147	100
Neodymium-149	100
Nickel-59	100
Nickel-63	10
Nickel-65	100
Niobium-93m	10
Niobium-95	10
Niobium-97	10
Osmium-185	10
Osmium-191m	100
Osmium-191	100
Osmium-193	100
Palladium-103	100
Palladium-109	100
Phosphorus-32	10

Material	Microcuries
Platinum–191	100
Platinum–193m	100
Platinum–193	100
Platinum–197m	100
Platinum–197	100
Plutonium–239	0.01
Polonium–210	0.1
Potassium–42	10
Praseodymium–142	100
Praseodymium–143	100
Promethium–147	10
Promethium–149	10
Radium–226	0.01
Rhenium–186	100
Rhenium–188	100
Rhodium–103m	100
Rhodium–105	100
Rubidium–86	10
Rubidium–87	10
Ruthenium–97	100
Ruthenium–103	10
Ruthenium–105	10
Ruthenium–106	1
Samarium–151	10
Samarium–153	100
Scandium–46	10
Scandium–47	100
Scandium–48	10
Selenium–75	10
Silicon–31	100
Silver–105	10
Silver–110m	1
Silver–111	100
Sodium–22	10
Sodium–24	10
Strontium–85	10
Strontium–89	1
Strontium–90	0.1
Strontium–91	10
Strontium–92	10
Sulphur–35	100
Tantalum–182	10
Technetium–96	10
Technetium–97m	100
Technetium–97	100
Technetium–99m	100
Technetium–99	10
Tellurium–125m	10
Tellurium–127m	10
Tellurium–127	100
Tellurium–129m	10
Tellurium–129	100
Tellurium–131m	10
Tellurium–132	10
Terbium–160	10
Thallium–200	100
Thallium–201	100
Thallium–202	100
Thallium–204	10
Thorium (natural)[1]	100
Thulium–170	10
Thulium–171	10
Tin–113	10
Tin–125	10
Tungsten–181	10
Tungsten–185	10
Tungsten–187	100
Uranium (natural)[2]	100
Uranium–233	0.01
Uranium–234 – Uranium–235	0.01
Vanadium–48	10
Xenon–131m	1,000
Xenon–133	100
Xenon–135	100
Ytterbium–175	100
Yttrium–90	10
Yttrium–91	10
Yttrium–92	100
Yttrium–93	100
Zinc–65	10
Zinc–69m	100
Zinc–69	1,000
Zirconium–93	10
Zirconium–95	10
Zirconium–97	10

NOTES:

[1]Based on alpha disintegration rate of Th–232, Th–230 and their daughter products.

[2]Based on alpha disintegration rate of U–238, U–234, and U–235.

Material	Microcuries
Any alpha emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition	0.01
Any radionuclide other than alpha emitting radionuclides, not listed above or mixtures of beta emitters of unknown composition	0.1

NOTE: For purposes of WAC 402–24–090, 402–24–140 and 402–24–150, where there is involved a combination of isotopes in known amounts, the limit for the combination should be derived as follows: Determine, for each isotope in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific isotope when not in combination. The sum of such ratios for all the isotopes in the combination may not exceed "1" (i.e., "unity"). Example: For purposes of WAC 402–24–150, if a particular batch contains 20,000 μCi of Au–198 and 50,000 μCi of C–14, it may also include not more than 300 μCi of I–131. This limit was determined as follows:

20,000 μCi Au-198/100,000 μCi + 50,000 μCi C-14/100,000 μCi + 300 μCi I-131/1,000 μCi =1

The denominator in each of the above ratios was obtained by multiplying the figure in the table by 1,000 as provided in WAC 402-24-150.

[Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-24-230, filed 12/8/80; Order 1095, § 402-24-230, filed 2/6/76; Order 708, § 402-24-230, filed 8/24/72; Order 1, § 402-24-230, filed 7/2/71; Order 1, § 402-24-230, filed 1/8/69; Rules (part), filed 10/26/66.]

Chapter 402-28 WAC
USE OF X-RAYS IN THE HEALING ARTS

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

402-28-030 General provisions. [Order 708, § 402-28-030, filed 8/24/72; Order 1, § 402-28-030, filed 7/2/71; Order 1, § 402-28-030, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402-28-031, 402-28-032, 402-28-035.

402-28-050 Radiographic installations other than dental and veterinary medicine. [Order 1 § 402-28-050, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76. Later promulgation, see WAC 402-28-051 through 402-28-055.

402-28-060 Special requirements for mobile diagnostic radiographic equipment. [Order 1, § 402-28-060, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76.

402-28-070 Special requirements for chest photofluorographic installations. [Order 1, § 402-28-070, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by Order 1084, filed 1/14/76.

402-28-090 Therapeutic x-ray installations. [Order 1084, § 402-28-090, filed 1/14/76; Order 1, § 402-28-090, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 81-01-011 (Order 1570), filed 12/8/80. Statutory Authority: RCW 70.98.050.

402-28-100 Special requirements for x-ray therapy equipment operated at potentials of sixty kVp and below. [Order 1084, § 402-28-100, filed 1/14/76; Order 1, § 402-28-100, filed 1/8/69; Rules (part), filed 10/26/66.] Repealed by 81-01-011 (Order 1570), filed 12/8/80. Statutory Authority: RCW 70.98.050.

WAC 402-28-010 Purpose and scope. This chapter establishes requirements, for which a registrant is responsible, for use of x-ray equipment by or under the supervision of an individual authorized by and licensed in accordance with state statutes to engage in the healing arts. The provisions of this chapter are in addition to, and not in substitution for, other applicable provisions of these regulations. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-010, filed 12/8/80; Order 1084, § 402-28-010, filed 1/14/76; Order 1, § 402-28-101 (codified as WAC 402-28-010), filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-28-020 Definitions. As used in this chapter, the following definitions apply:

(1) "Accessible surface" means the external surface of the enclosure or housing provided by the manufacturer.

(2) "Added filter" means the filter added to the inherent filtration.

(3) "Aluminum equivalent" means the thickness of aluminum (type 1100 alloy) affording the same attenuation, under specified conditions, as the material in question. (The nominal chemical composition of type 1100 aluminum alloy is 99.00 percent minimum aluminum, 0.12 percent copper).

(4) "Assembler" means any person engaged in the business of assembling, replacing, or installing one or more components into an x-ray system or subsystem. An assembler may be the practitioner, his/her employee, an outside contractor, or an employee of an outside firm.

(5) "Attenuation block" means a block or stack, having dimensions 20 cm by 20 cm by 3.8 cm, of type 1100 aluminum alloy or other aluminum alloys having equivalent attenuation.

(6) "Automatic exposure control" means a device which automatically controls one or more technique factors in order to obtain at a preselected location(s) a required quantity of radiation (see also "Phototimer").

(7) "Barrier" (see "Protective barrier").

(8) "Beam axis" means a line from the source through the centers of the x-ray fields.

(9) "Beam–limiting device" means a device which provides a means to restrict the dimensions of the x–ray field.

(10) "Beam monitoring system" means a system designed to detect and measure the radiation present in the useful beam.

(11) "Cephalometric device" means a device intended for the radiographic visualization and measurement of the dimensions of the human head.

(12) "Certified components" means components of x–ray systems which have been certified by the manufacturer as meeting the requirements of the federal performance standard for x–ray equipment.

(13) "Certified system" means any x–ray system which has one or more certified component(s).

(14) "Changeable filters" means any filter, exclusive of inherent filtration, which can be removed from the useful beam through any electronic, mechanical or physical process.

(15) "Coefficient of variation (C)" means the ratio of the standard deviation to the mean value of a population of observations. It is estimated using the following equation:

$$C = \frac{s}{\bar{X}} = \frac{1}{\bar{X}} \left[\sum_{i=1}^{n} \frac{(X_{(i)} - \bar{X})^2}{n-1} \right] 1/2$$

where
s = Estimated standard deviation of the population.
$\bar{X}$ = Mean value of observations in sample.
$X_{(i)}$ = i^{th} observation sampled.
n = Number of observations in sample.

(16) "Contact therapy system" means an x–ray system wherein the x–ray tube port is put in contact with or within 5 centimeters of, the surface being treated.

(17) "Control panel" means that part of the x–ray control upon which are mounted the switches, knobs, pushbuttons, and other hardware necessary for manually setting the technique factors.

(18) "Cooling curve" means the graphical relationship between heat units stored and cooling time.

(19) "Dead–man switch" means a switch so constructed that a circuit closing contact can be maintained only by continuous pressure on the switch by the operator.

(20) "Department" means the Department of Social and Health Services which has been designated as the State Radiation Control Agency.

(21) "Detector" (See "Radiation detector").

(22) "Diagnostic source assembly" means the tube housing assembly with a beam–limiting device attached.

(23) "Diagnostic x–ray system" means an x–ray system designed for irradiation of any part of the human body for the purpose of recording or visualization for diagnostic purposes.

(24) "Direct scattered radiation" means that scattered radiation which has been deviated in direction only by materials irradiated by the useful beam (See also "Scattered radiation").

(25) "Entrance exposure rate" means the roentgens per unit time where the useful beam enters the patient.

(26) "Equipment" (See "X–ray equipment").

(27) *"Exposure" means the quotient of dQ divided by dm where dQ is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass dm are completely stopped in air. (The special unit of exposure is the roentgen.)

NOTE:

*When the word, exposure, is used in this part to mean one or more irradiations of a person for a healing arts purpose, or in a more general sense, it will not be underlined [italicized].

(28) "Field emission equipment" means equipment which uses an x–ray tube in which electron emission from the cathode is due solely to the action of an electric field.

(29) "Filter" means material placed in the useful beam to absorb preferentially selected radiations.

(30) "Fluoroscopic imaging assembly" means a component which comprises a reception system in which x–ray photons produce a fluoroscopic image. It includes equipment housings, electrical interlocks if any, the primary protective barrier, and structural material providing linkage between the image receptor and the diagnostic source assembly.

(31) "Full beam detector" means a radiation detector of such size that the total cross section of the maximum size useful beam is intercepted.

(32) "General purpose radiographic x–ray system" means any radiographic x–ray system which, by design, is not limited to radiographic examination of specific anatomical regions.

(33) "Gonad shield" means a protective barrier for the testes or ovaries.

(34) "Half–value layer (HVL)" means the thickness of specified material which attenuates the beam of radiation to an extent such that the exposure rate is reduced to one–half of its original value. In this definition the contribution of all scattered radiation, other than any which might be present initially in the beam concerned, is deemed to be excluded.

(35) "Healing arts screening" means the testing of an asymptomatic population using x–ray machines for the detection or evaluation of health indications when such tests are not specifically and individually ordered by a licensed practitioner of the healing arts legally authorized to prescribe such x–ray tests for the purpose of diagnosis or treatment.

(36) "Heat unit" means a unit of energy equal to the product of the peak kilovoltage, miliamperes, and seconds, i.e., kVp x mA x second.

(37) "Image intensifier" means a device consisting of an image intensifier tube installed in its housing which

instantaneously converts an x-ray pattern into a light image of higher energy density.

(38) "Image receptor" means any device, such as a fluorescent screen or radiographic film, which transforms incident x-ray photons either into a visible image or into another form which can be made into a visible image by further transformations.

(39) "Image receptor support" means that part of a mammographic system designed to support the image receptor in a plane perpendicular to the x-ray beam during a mammographic examination.

(40) "Inherent filtration" means the filtration of the useful beam provided by the permanently installed components of the tube housing assembly.

(41) "Interlock" means a device arranged or connected such that the occurrence of an event or condition is required before a second event or condition can occur or continue to occur.

(42) "Irradiation" means the exposure of matter to ionizing radiation.

(43) "Kilovolts peak (kVp)" (See "Peak tube potential").

(44) "kV" means kilovolts.

(45) "kWs" means kilowatt second which is equal to the product of peak kilovolts, amperes, and seconds or 10^{-3} X kV. X mA. X sec.

(46) "Lead equivalent" means the thickness of lead affording the same attenuation, under specified conditions, as the material in question.

(47) "Leakage radiation" means radiation emanating from the diagnostic or therapeutic source assembly except for:

(a) the useful beam and

(b) radiation produced when the exposure switch or timer is not activated.

(48) "Leakage technique factors" means the technique factors associated with the tube housing assembly which are used in measuring leakage radiation. They are defined as follows:

(a) for capacitor energy storage equipment, the maximum rated peak tube potential and the maximum rated number of exposures in an hour for operation at the maximum rated peak tube potential with the quantity of charge per exposure being 10 milliampere seconds, or the minimum obtainable from the unit, whichever is larger.

(b) for field emission equipment rated for pulsed operation, the maximum rated peak tube potential and the maximum rated number of x-ray pulses in an hour for operation at the maximum rated peak tube potential.

(c) for all other equipment, the maximum rated peak tube potential and the maximum rated continuous tube current for the maximum rated peak tube potential.

(49) "Light field" means that area of the intersection of the light beam from the beam-limiting device and one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the illumination is one-fourth of the maximum in the intersection.

(50) "Line-voltage regulation" means the difference between the no-load and the load line potentials expressed as a percent of the load line potential; that is,

$$\text{Percent line-voltage regulation} = 100\,(V_n - V_l)/V_l$$

where:

$V_{(n)}$ = No-load line potential

$V_{(l)}$ = No-load line potential

(51) "mA" means tube current in milliamperes.

(52) "mAs" means milliampere second or the product of the tube current in milliamperes and the time of exposure in seconds.

(53) "Maximum line current" means the root mean squared current in the supply line of an x-ray machine operating at its maximum rating.

(54) "Mobile equipment" (See "X-ray equipment").

(55) "Peak tube potential" means the maximum value of the potential difference across the x-ray tube during an exposure.

(56) "Phototimer" – means a method for controlling radiation exposures to image receptors by the total amount of radiation which reaches a radiation monitoring device(s). The radiation monitoring device(s) is part of an electronic circuit which controls the time the tube is activated (See also "Automatic exposure control").

(57) "Portable equipment" (See "X-ray equipment").

(58) "Position indicating device (PID)" means a device, on dental x-ray equipment which indicate the beam position and establishes a definite source-surface (skin) distance. The device may or may not incorporate or serve as a beam-limiting device.

(59) "Primary protective barrier" (See "Protective barrier").

(60) "Protective apron" means an apron made of radiation absorbing materials, used to reduce radiation exposure.

(61) "Protective barrier" means a barrier of radiation absorbing material(s) used to reduce radiation exposure.

(a) "Primary protective barrier" means the material, excluding filters, placed in the useful beam, for protection purposes, to reduce the radiation exposure.

(b) "Secondary protective barrier" means a barrier sufficient to attenuate the stray radiation to the required degree.

(62) "Protective glove" means a glove made of radiation absorbing materials used to reduce radiation exposure.

(63) "Qualified expert" means an individual who has demonstrated to the satisfaction of the Department possession of knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs.

(64) "Radiation detector" means a device which in the presence of radiation provides by either direct or indirect means, a signal or other information suitable for use in measuring one or more quantities of incident radiation.

(65) "Radiation therapy simulation system" means a fluoroscopic or radiographic x-ray system intended for

localizing the volume to be exposed during radiation therapy and confirming the position and size of the therapeutic irradiation field.

(66) "Radiograph" means an image receptor on which the image is created directly or indirectly by an x–ray pattern and results in a permanent record.

(67) "Radiographic imaging system" means any system whereby a permanent or semi–permanent image is recorded on an image receptor by the action of ionizing radiation.

(68) "Rating" means the operating limits of an x–ray system or subsystem as specified by the component manufacturer.

(69) "Recording" means producing a permanent form of an image resulting from x–ray photons (e.g., film, video tape).

(70) "Response time" means the time required for an instrument system to reach 90 percent of its final reading when the radiation–sensitive volume of the instrument system is exposed to a step change in radiation flux from zero sufficient to provide a steady state midscale reading.

(71) "Scattered radiation" means radiation that, during passage through matter, has been deviated in direction (See also "Direct scattered radiation").

(72) "Secondary protective barrier" (see "Protective barrier").

(73) "Shutter" means a device attached to the tube housing assembly which can totally intercept the useful beam and which has a lead equivalency at least that of the tube housing assembly.

(74) "SID" (see "Source–image receptor distance").

(75) "Source" means the focal spot of the x–ray tube.

(76) "Source–image receptor distance (SID)" means the distance from the source to the center of the input surface of the image receptor.

(77) "Special purpose x–ray equipment" means that which is designed for irradiation of specific body parts.

(78) "Spot check" means an abbreviated calibration procedure which is performed to assure that a previous calibration continues to be valid.

(79) "Spot film device" means a device intended to transport and/or position a radiographic image receptor between the x–ray source and fluoroscopic image receptor, including a device intended to hold a cassette over the input end of an image intensifier for the purpose of making a radiograph.

(80) "Spot film" means a radiograph which is made during a fluoroscopic examination to record permanently conditions which exist during that fluoroscopic procedure.

(81) "Stationary equipment" (See "X–ray equipment").

(82) "Stray radiation" means the sum of leakage and scattered radiation.

(83) "Technique factors" means the conditions of operation. They are specified as follows:

(a) For capacitor energy storage equipment, peak tube potential in kV and quantity of charge in mAs.

(b) For field emission equipment rated for pulsed operation, peak tube potential in kV and number of x–ray pulses.

(c) For all other equipment, peak tube potential in kV and:

(i) either tube current in mA and exposure time in seconds,

(ii) or the product of tube current and exposure time in mAs.

(84) "Transmission detector" means a radiation detector through which the useful beam or part of the useful beam passes.

(85) "Treatment volume" means the region, in the patient, to which a specified dose is to be delivered.

(86) "Tube" means an x–ray tube, unless otherwise specified.

(87) "Tube housing assembly" means the tube housing with tube installed. It includes high–voltage and/or filament transformers and other appropriate elements when they are contained within the tube housing.

(88) "Tube rating chart" means the set of curves which specify the rated limits of operation of the tube in terms of the technique factors.

(89) "Useful beam" means the radiation which passes through the tube housing port and the aperture of the beam–limiting device when the exposure switch or timer is activated.

(90) "Variable–aperture beam–limiting device" means a beam–limiting device which has capacity for stepless adjustment of the x–ray field size.

(91) "Visible area" means that portion of the input surface of the image receptor over which incident x–ray photons produce a visible image.

(92) "Wedge filter" means an added filter with changing radio–opacities used to achieve more uniform optical densities on the image receptor when a body part of varying absorption characteristics is radiographed.

(93) "X–ray control" means a device which controls input power to the x–ray high–voltage generator and/or the x–ray tube. It includes equipment which controls the technique factors of an x–ray exposure.

(94) "X–ray equipment" means an x–ray system, subsystem, or component thereof. Types of x–ray equipment are as follows:

(a) 'Mobile' means x–ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled.

(b) 'Portable' means x–ray equipment designed to be hand–carried.

(c) 'Stationary' means x–ray equipment which is installed in a fixed location.

(95) "X–ray field" means that area of the intersection of the useful beam and any one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the exposure rate is one–fourth of the maximum in the intersection.

(96) "X–ray high–voltage generator" means a device which transforms electrical energy from the potential

supplied by the x-ray control to the tube operating potential. The device may also include means for transforming alternating current to direct current, filament transformers for the x-ray tube(s), high-voltage switches, electrical protective devices, and other appropriate elements.

(97) "X-ray system" means an assemblage of components for the controlled production of x-rays. It includes minimally an x-ray high-voltage generator, an x-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components which function with the system are considered integral parts of the system.

(98) "X-ray subsystem" means any combination of two or more components of an x-ray system for which there are requirements specified in this part.

(99) "X-ray tube" means any electron tube which is designed to be used primarily for the production of x-rays. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-020, filed 12/8/80; Order 1084, § 402-28-020, filed 1/14/76; Order 1, § 402-28-020, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-28-031 General requirements--Administrative controls. (1) No person shall make, sell, lease, transfer, lend or install x-ray equipment or the accessories used in connection with such equipment unless such accessories and equipment, when properly placed in operation and properly used, will meet the requirements of these regulations.

(2) The registrant shall be responsible for directing the operation of the x-ray machines which are in his/her control. The registrant or registrant's agent shall assure that the following provisions are met in the operation of the x-ray machine(s):

(a) An x-ray machine which does not meet the provisions of these regulations shall not be operated for diagnostic or therapeutic purposes, if so directed by the department.

(b) Individuals who will be operating the x-ray equipment shall be adequately instructed in safe operating procedures and shall be able to demonstrate competence, upon request from the department, in the correct use of the equipment. Required areas of competency are listed in Appendix F.

(c) In the vicinity of each x-ray system's control panel a chart shall be provided, which specifies for most examinations which are performed by that system a listing of information, including but not limited to the following, for each projection within that examination:

(i) Patient's anatomical size versus technique factors to be utilized,

(ii) Type of and size of the film or film-screen combination to be used,

(iii) Type of grid to be used if any, and its focal distance,

(iv) Source to image receptor distance to be used,

(v) Type and placement of gonad shielding to be used, and

(vi) If applicable, settings for automatic exposure devices.

(d) Written safety procedures and rules shall be provided to each individual operating x-ray equipment. The operator shall be able to demonstrate familiarity with these rules.

(e) Except for patients who cannot be moved out of the room and the patient being examined, only the staff and ancillary personnel required for the medical procedure or training shall be present in the room during the radiographic exposure. Other than the patient being examined:

(i) All individuals shall be positioned such that no part of the body including the extremities not protected by 0.5 mm lead equivalent will be struck by the useful beam.

(ii) Staff and ancillary personnel shall be protected from the direct scatter radiation by protective aprons or whole body protective barriers of not less than 0.25 mm lead equivalent.

(iii) Patients who cannot be removed from the room shall be protected from the direct scatter radiation by whole body protective barriers of 0.25 mm lead equivalent or shall be so positioned that the nearest portion of the body is at least 2 meters from both the tube head and the nearest edge of the image receptor.

(iv) When a portion of the body of any staff or ancillary personnel is potentially subjected to stray radiation which could result in that individual receiving one quarter of the maximum permissible dose as defined in WAC 402-24-020 of these regulations, additional protective devices may be required by the department.

(f) Gonad shielding of not less than 0.25 mm lead equivalent shall be used for patients who have not passed the reproductive age during radiographic procedures in which the gonads are in the direct (useful) beam, except for cases in which this would interfere with the diagnostic procedure.

(g) Persons shall not be exposed to the useful beam except for healing arts purposes, each exposure of which has been authorized by a licensed practitioner of the healing arts. This provision specifically prohibits deliberate exposure for the following purposes:

(i) Exposure of an individual for training, demonstration or other purposes unless there are also healing arts requirements and proper prescription has been provided.

(ii) Exposure of an individual for the purpose of healing arts screening without prior written approval of the state health officer.

(h) When a patient or film must be provided with auxiliary support during a radiation exposure:

(i) Mechanical holding devices shall be used when the technique permits. The safety rules, required by WAC 402-28-020, shall list individual projections where holding devices cannot be utilized;

(ii) Written safety procedures, as required by WAC 402-28-031(2)(d), shall indicate the requirements for selecting a holder and the procedure the holder shall follow;

(iii) The human holder shall be protected as required by WAC 402-28-031(2)(e)(i); the holder who is occupationally exposed to radiation shall be provided with a personnel monitoring device, worn at the collar outside

the lead apron and records of exposures shall be maintained;

(iv) No person shall be used routinely to hold film or patients;

(v) In those cases where the patient must hold the film any portion of the body other than the area of clinical interest struck by the useful beam shall be protected by not less than 0.5 mm lead equivalent material;

(vi) Such holding shall be permitted only in very unusual and rare situations;

(vii) For the holder who is occupationally exposed to radiation, a record shall be made of the examination and shall include patient identification, the name of the human holder, date of the examination, number of exposures and technique factors utilized for the exposure(s) whenever the primary beam has knowingly intersected any portion of the holder's body.

(i) Personnel monitoring. All persons who are associated with the operation of an x–ray system are subject to the occupational exposure limits and the requirements for the determination of the doses which are stated in WAC 402–24–024. In addition: When protective clothing or devices are worn on portions of the body and a monitoring device(s) is required, at least one such monitoring device shall be utilized as follows:

(i) When an apron is worn, the monitoring device shall be worn at the collar outside of the apron.

(ii) The dose to the whole body based on the maximum dose attributed to the most critical organ shall be recorded on the reports required by WAC 402–24–170 of these regulations. If more than one device is used or a record is made of the data, each dose shall be identified with the area where the device was worn on the body.

(j) Healing arts screening. Any person proposing to conduct a healing arts screening program shall not initiate such a program without prior approval of the state health officer. When requesting such approval, that person shall submit the information outlined in Appendix G of this part. If any information submitted becomes invalid or outdated, the state health officer shall be notified immediately. [Statutory Authority: RCW 70.98-.050. 81–01–011 (Order 1570), § 402–28–031, filed 12/8/80; Order 1084, § 402–28–031, filed 1/14/76. Formerly WAC 402–28–030 (part).]

WAC 402–28–032 General requirements--Plan review. (1) Prior to construction, the floor plans and equipment arrangement of all installations (new or modifications of existing installations) utilizing x–rays for diagnostic or therapeutic purposes shall be submitted to a qualified expert for determination of shielding requirements and submitted to the Department for subsequent review. Review shall not imply approval.

The required information is denoted in Appendices A and B of chapter 402–28 WAC.

(2) The review of such plans shall not preclude the requirement of additional modifications should a subsequent analysis of operating conditions indicate the possibility of an individual receiving a dose in excess of the limits prescribed in WAC 402–24–020, WAC 402–24–035, and WAC 402–24–040. [Order 1084, § 402–28–032, filed 1/14/76. Formerly WAC 402–28–030 (part).]

WAC 402–28–035 General requirements for all diagnostic x–ray systems. In addition to other requirements of this chapter, all diagnostic x–ray systems shall meet the following requirements:

(1) *Warning label.* The control panel containing the main power switch shall bear the warning statement, legible and accessible to view: "WARNING: This x–ray unit may be dangerous to patient and operator unless safe exposure factors and operating instructions are observed."

(2) *Battery charge indicator.* On battery–powered generators, visual means shall be provided on the control panel to indicate whether the battery is in a state of charge adequate for proper operation.

(3) *Leakage radiation from the diagnostic source assembly.* The leakage radiation from the diagnostic source assembly measured at a distance of 1 meter in any direction from the source shall not exceed 100 milliroentgens in 1 hour when the x–ray tube is operated at its leakage technique factors.

(4) *Radiation from components other than the diagnostic source assembly.* The radiation emitted by a component other than the diagnostic source assembly shall not exceed 2 milliroentgens in 1 hour at 5 centimeters from any accessible surface of the component when it is operated in an assembled x–ray system under any conditions for which it was designed. Compliance shall be determined by measurements averaged over an area of 100 square centimeters with no linear dimension greater than 20 centimeters.

(5) *Beam quality*

(a) The half–value layer (HVL) of the useful beam for a given x–ray tube potential shall not be less than the values shown in WAC 402–28–035, Table I. If it is necessary to determine such half–value layer at an x–ray tube potential which is not listed in Table I linear interpolation or extrapolation may be made.

WAC 402–28–035 TABLE I

Design operating range (kilovolts peak)	Measured potential (kilovolts peak)	Half–value layer (millimeters of aluminum equivalent)	Half–value layer (millimeter of aluminum equivalent for dental units[1])
Below 50 —	30	0.3	1.5
	40	0.4	1.5
	49	0.5	1.5
50 to 70 —	50	1.2	1.5
	60	1.3	1.5
	70	1.5	1.5

WAC 402–28–035 TABLE I

Design operating range (kilovolts peak)	Measured potential (kilovolts peak)	Half–value layer (millimeters of aluminum equivalent)	Half–value layer (millimeter of aluminum equivalent for dental units[1])
Above 70 —	71	2.1	2.1
	80	2.3	2.3
	90	2.5	2.5
	100	2.7	2.7
	110	3.0	3.0
	120	3.2	3.2
	130	3.5	3.5
	140	3.8	3.8
	150	4.1	4.1

(b) The above HVL criteria will be considered to have been met if it can be demonstrated that the aluminum equivalent of the total filtration in the primary beam is not less than that shown in WAC 402–28–035 Table II.

WAC 402–28–035 TABLE II

Filtration Required vs. Operating Voltage

Operating Voltage (kVp)	Total Filtration (inherent plus added) (millimeters aluminum equivalent)
Below 50	0.5 millimeters
50 to 70	1.5 millimeters
Above 70	2.5 millimeters
Dental Units[2]: Below 70	1.5 millimeters
Above 70	2.5 millimeters

(c) Beryllium window tubes have a minimum of 0.5 mm aluminum equivalent filtration permanently mounted in the useful beam.

(d) For capacitor energy storage equipment, compliance shall be determined with the maximum quantity of charge per exposure.

(e) The required minimal aluminum equivalent filtration shall include the filtration contributed by all materials which are always present between the focal spot of the tube and the patient. (e.g., a tabletop when the tube is mounted "under the table" and inherent filtration of the tube)

(f) Filtration control. For x–ray systems which have variable kVp and variable filtration for the useful beam, a device shall link the kVp selector with the filter(s) and shall prevent an exposure unless the minimum amount of filtration required by WAC 402–28–035(5)(a) or (b) is in the useful beam for the given kVp which has been selected.

(6) *Multiple tubes.* Where two or more radiographic tubes are controlled by one exposure switch, the tube or tubes which have been selected shall be clearly indicated prior to initiation of the exposure. Such indication shall be both on the x–ray control panel and near or on the tube housing assembly which has been selected.

(7) *Mechanical support of tube head.* The tube housing assembly supports shall be adjusted such that the tube housing assembly will remain stable during an exposure unless the tube housing movement during exposure is a designed function of the x–ray system.

(8) *Technique indicators*

(a) The technique factors to be used during an exposure shall be indicated before the exposure begins, except when automatic exposure controls are used, in which case the technique factors which are set prior to the exposure shall be indicated.

(b) On equipment having fixed technique factors, the requirement, in WAC 402–28–035(8)(a) may be met by permanent markings. Indication of technique factors shall be visible from the operator's position except in the case of spot films made by the fluoroscopist.

[1]This applies only to units installed after the effective date of these regulations.

[2] This applies only to units installed after the effective date of these regulations. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–28–035, filed 12/8/80; Order 1084, § 402–28–035, filed 1/14/76. Formerly WAC 402–28–030 (part).]

WAC 402–28–040 ***Fluoroscopic x–ray systems.*** All fluoroscopic x–ray systems shall meet the following requirements:

(1) Limitation of useful beam.

(a) The fluoroscopic tube shall not produce x–rays unless the primary barrier is in position to intercept the entire useful beam at all times.

(b) The entire cross section of the useful beam shall be intercepted by the primary protective barrier of the fluoroscopic image assembly at any SID.

(c) Nonimage–intensified fluoroscopy and spot filming; the x–ray field shall not extend beyond the entire visible area of the image receptor during both fluoroscopic procedures and spot–filming procedures. In addition:

(i) Means shall be provided for stepless adjustment of the field size;

(ii) The minimum field size at the greatest SID shall be equal to or less than 5 centimeters by 5 centimeters;

(iii) For equipment manufactured after the effective date of these regulations when the angle between the image receptor and the beam axis of the x–ray beam is variable, means shall be provided to indicate when the axis of the x–ray beam is perpendicular to the plane of the image receptor; and

(iv) Compliance with WAC 402–28–040(1)(c) shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor.

(d) For image–intensified fluoroscopic equipment without a spot film device, neither the length nor the width of the x–ray field in the plane of the image receptor shall exceed that of the visible area of the image receptor by more than 3 percent of the SID. The sum of

the excess length and the excess width shall be no greater than 4 percent of the SID. For image-intensified fluoroscopic equipment with a spot film device, the x-ray beam shall be no larger than the largest spot film for which the device is designed. Measurements shall be made at the minimum SID available but at no less than 8 inches table top to film plane distance. In addition:

(i) Means shall be provided to permit further limitation of the field;

(ii) The minimum field size at the greatest SID shall be equal to or less than 5 centimeters by 5 centimeters;

(iii) For equipment manufactured after the effective date of these regulations when the angle between the image receptor and beam axis is variable, means shall be provided to indicate when the axis of the x-ray beam is perpendicular to the plane of the image receptor; and

(iv) Compliance shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor. For rectangular x-ray fields used with circular image reception, the error in alignment shall be determined along the length and width dimensions of the x-ray field which pass through the center of the visible area of the image receptor.

(2) *Activation of the fluoroscopic tube.* X-ray production in the fluoroscopic mode shall be controlled by a deadman switch. When recording serial fluoroscopic images, the fluoroscopist shall be able to terminate the x-ray exposure(s) at any time, but means may be provided to permit completion of any single exposure of the series in process.

(3) *Entrance exposure rate allowable limits.*

(a) For equipment with automatic brightness control, the exposure rate measured at the point where the center of the useful beam enters the patient should be as low as practicable and shall not exceed ten roentgens per minute, except during recording of fluoroscopic images or when provided with optional high level control. When so provided, an audible signal shall indicate use of the high level control; special means of activating, via a deadman switch, shall be necessary for activation of high level control.

(b) For equipment without automatic brightness control, when provided with optional high level control, the equipment shall not be operable at any combination of tube potential and current which will result in an exposure rate in excess of 5 roentgens per minute at the point where the center of the useful beam enters the patient unless the high level control is activated.

(i) Special means of activation of high level controls, such as additional pressure applied continuously by the operator, shall be required to avoid accidental use.

(ii) A continuous signal audible to the fluoroscopist shall indicate that the high level control is being employed.

(c) Measuring compliance of entrance exposure rate limits. Compliance with WAC 402-28-040(3) shall be determined as follows:

(i) Movable grids and compression devices shall be removed from the useful beam during the measurement.

(ii) If the source is below the table, exposure rate shall be measured 1 centimeter above the tabletop or cradle.

(iii) If the source is above the table, the exposure rate shall be measured at 30 centimeters above the tabletop with the end of the beam-limiting device or spacer positioned as closely as possible to the point of measurement.

(iv) In a C-arm type of fluoroscope, the exposure rate shall be measured 30 centimeters from the input surface of the fluoroscopic imaging assembly.

(d) Periodic measurement of entrance exposure rate limits.

(i) Periodic measurements of the exposure rate shall be made. An adequate period for such measurements shall be annually or after any maintenance of the system which might affect the exposure rate.

(ii) Results of these measurements shall be available where any fluoroscopist may have ready access to them while using that fluoroscope. Results of the measurements shall include the maximum possible R/minute, as well as the physical factors used to determine all data; the name of the person performing the measurements; and the date the measurements were performed.

(iii) Use of monitoring devices (e.g. commercially available film badges, thermoluminescent dosimeters, or low energy dosimeters) may be used to perform the test, provided the measurements are made as noted in the following subdivision WAC 402-28-040(3)(d)(iv).

(iv) Conditions of measurement.

(A) the measurement shall be made under the conditions that satisfy the requirements of WAC 402-28-040(3)(a)(iii).

(B) the kVp shall be the peak kV that the x-ray system is capable of producing;

(C) the high level control, if present, shall not be activated;

(D) the x-ray system(s) that incorporates automatic exposure control (automatic brightness control, etc.) shall have sufficient material (e.g. lead or lead equivalence) placed in the useful beam to produce the maximum milliamperage of the x-ray system; and

(E) X-ray system(s) that do not incorporate automatic exposure control shall utilize the maximum milliamperage of the x-ray system. Materials (e.g. an attenuation block) may be placed in the useful beam to protect the imaging system.

(4) *Barrier transmitted radiation rate limits.*

(a) The exposure rate due to transmission through the primary protective barrier with the attenuation block in the useful beam, combined with radiation from the image intensifier, if provided, shall not exceed 2 milliroentgens per hour at 10 centimeters from any accessible surface of the fluoroscopic imaging assembly beyond the plane of the image receptor for each roentgen per minute of entrance exposure rate.

(b) Measuring compliance of barrier transmission.

(i) The exposure rate due to transmission through the primary protective barrier combined with radiation from the image intensifier shall be determined by measurements averaged over an area of 100 square centimeters with no linear dimension greater than 20 centimeters.

(ii) If the source is below the tabletop, the measurement shall be made with the input surface of the fluoroscopic imaging assembly positioned 30 centimeters above the tabletop.

(iii) If the source is above the tabletop and the SID is variable, the measurement shall be made with the end of the beam-limiting device or spacer as close to the tabletop as it can be placed, provided that it shall not be closer than 30 centimeters.

(iv) Movable grids and compression devices shall be removed from the useful beam during the measurement.

(v) The attenuation block shall be positioned in the useful beam 10 centimeters from the point of measurement of entrance exposure rate and between this point and the input surface of the fluoroscopic imaging assembly.

(5) *Indication of potential and current.* During fluoroscopy and cinefluorography, x-ray tube potential and current shall be continuously indicated.

(6) *Source-skin distance.* The source to skin distance shall not be less than:

(a) 38 centimeters on stationary fluoroscopes manufactured after the effective date of this regulation,

(b) 35.5 centimeters on stationary fluoroscopes which are in operation prior to the effective date of these regulations,

(c) 30 centimeters on all mobile fluoroscopes, and

(d) 20 centimeters for image intensified fluoroscopes used for specific surgical application. The users operating manual must provide precautionary measures to be adhered to during the use of device.

(7) *Fluoroscopic timer.*

(a) Means shall be provided to preset the cumulative on-time of the fluoroscopic tube. The maximum cumulative time of the timing device shall not exceed 5 minutes without resetting.

(b) A signal audible to the fluoroscopist shall indicate the completion of any preset cumulative on-time. Such signal shall continue to sound while x-rays are produced until the timing device is reset. Alternately, the timing device may terminate exposures at the end of the preset time.

(8) *Mobile fluoroscopes.* In addition to the other requirements of WAC 402-28-040:

(a) In the absence of a table top, a cone or spacer frame shall limit the target-to-skin distance to not less than twelve inches.

(b) Image intensification shall always be provided. Conventional fluoroscopic screens shall not be used.

(c) It shall be impossible to operate a machine when the collimating cone or diaphragm is not in place.

(9) *Control of scattered radiation.*

(a) Fluoroscopic table designs when combined with normal operating procedures shall be such that no unprotected part of any staff or ancillary person's body shall be exposed to unattenuated scattered radiation which originates from under the table. The attenuation required shall be not less than 0.25 mm lead equivalent.

(b) Equipment configuration when combined with procedures shall be such that no portion of any staff or ancillary person's body, except the extremities, shall be exposed to the unattenuated scattered radiation emanating from above the table top unless:

(i) The radiation has passed through not less than 0.25 mm lead equivalent material (e.g., drapes, Bucky-slot cover-sliding or folding panel, or self supporting curtains) in addition to any lead equivalency provided by the protective apron referred to in WAC 402-28-031(2)(e).

(ii) Exceptions to WAC 402-28-040(9)(b) may be made in some special procedures where a sterile field will not permit the use of the normal protective barriers. Where the use of prefitted sterilized covers for the barriers is practical, the Department shall not permit such exception.

(10) *Radiation therapy simulation systems.* Radiation therapy simulation systems shall be exempt from all the requirements of WAC 402-28-040(1), (4) and (7): *Provided*, That:

(a) Such systems are designed and used in such a manner that no individual other than the patient is in the x-ray room during periods of time when the system is producing x-rays; and

(b) Such systems as do not meet the requirements of WAC 402-28-040(7), and are provided with a means of indicating the cumulative time during which individual patient has been exposed to x-rays. Procedures shall require that the timer be reset between examinations in such cases. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-040, filed 12/8/80; Order 1084, § 402-28-040, filed 1/14/76; Order 1, § 402-28-040, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-28-051 Radiographic systems other than fluoroscopic, dental intraoral, or veterinarian systems--Beam limitation. The useful beam shall be limited to the area of clinical interest and show evidence of collimation. This shall be deemed to have been met if a positive beam limiting device has been properly used or if evidence of collimation is shown on at least three sides or three corners of the film, (for example, projections on the shutters of the collimator, cone cutting at the corners or a border at the film's edge.)

(1) *General purpose stationary and mobile x-ray systems.*

(a) There shall be provided a means for stepless adjustment of the size of the x-ray field. The minimum field size at a SID of 100 centimeters shall be equal to or less than 5 by 5 centimeters.

(b) Means shall be provided for visually defining the perimeter of the x-ray field. The total misalignment of the edges of the visually defined field with the respective edges of the x-ray field along either the length or width of the visually defined field shall not exceed 2 percent (5 percent for equipment manufactured prior to August 1974) of the distance from the source to the center of the visually defined field when the surface upon which it appears is perpendicular to the axis of the x-ray beam.

(2) *In addition to the requirements of WAC 402-28-051(1) above all stationary x-ray systems shall meet the following requirements:*

(a) Means shall be provided to indicate when the axis of the x–ray beam is perpendicular to the plane of the image receptor, to align the center of the x–ray field with respect to the center of the image receptor to within 2 percent (5 percent for equipment manufactured prior to August 1974) of the SID, and to indicate the SID to within 2 percent (5 percent for equipment manufactured prior to August, 1974);

(b) The beam–limiting device shall numerically indicate the field size in the plane of the image receptor to which it is adjusted;

(c) Indication of field size dimensions and SID's shall be specified in inches and/or centimeters and shall be such that aperture adjustments result in x–ray field dimensions in the plane of the image receptor which correspond to those of the image receptor to within 2 percent (5 percent for equipment manufactured prior to August 1974) of the SID when the beam axis is perpendicular to the plane of the image receptor.

(3) *Radiographic equipment designed for only one image receptor size at a fixed SID shall be provided with means to limit the field at the plane of the image receptor to dimensions no greater than those of the image receptor, and to align the center of the x–ray field with the center of the image receptor to within 2 percent of the SID.*

(4) *Special purpose x–ray systems.*

(a) These systems shall be provided with means to limit the x–ray field in the plane of the image receptor so that such field does not exceed each dimension of the image receptor by more than 2 percent (5 percent for equipment manufactured prior to August 1974) of the SID when the axis of the x–ray beam is perpendicular to the plane of the image receptor.

(b) These systems shall be provided with means to align the center of the x–ray field with the center of the image receptor to within 2 percent (5 percent for equipment manufactured prior to August 1974) of the SID.

(c) The above WAC 402–28–051(4)(a) and 402–28–051(4)(b) may be met with a system that meets the requirements for a general purpose x–ray system as specified in WAC 402–28–051(1) or, when alignment means are also provided, may be met with either:

(i) An assortment of removable, fixed–aperture, beam–limiting devices sufficient to meet the requirement for each combination of image receptor size and SID for which the unit is designed (each such device shall have clear and permanent markings to indicate the image receptor size and SID for which it is designed); or

(ii) A beam–limiting device having multiple fixed apertures sufficient to meet the requirement for each combination of image receptor size and SID for which the unit is designed. Permanent, clearly legible markings shall indicate the image receptor size and SID for which each aperture is designed and shall indicate which aperture is in position for use.

(5) *Systems designed for or provided with special attachments for mammography.* Radiographic systems designed for mammography only and general purpose radiographic systems, when special attachments for mammography are in service, shall be provided with means to limit the useful beam such that the x–ray field at the plane of the image receptor does not extend beyond any edge of the image receptor at any designed SID except the edge of the image receptor designed to be adjacent to the chest wall where the x–ray field may not extend beyond such edge by more than 2 percent of the SID. The requirement can be met with a system which performs as prescribed in WAC 402–28–051(4)(c). When the beam–limiting device and image receptor support device are designed to be used to immobilize the breast during a mammographic procedure and the SID may vary, the SID indication specified in WAC 402–28–051(4)(c)(i) and (ii) shall be the maximum SID for which the beam–limiting device or aperture is designed. In addition, each image receptor support intended for installation on a system designed only for mammography shall have clear and permanent markings to indicate the maximum image receptor size for which it is designed. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–28–051, filed 12/8/80; Order 1084, § 402–28–051, filed 1/14/76. Formerly WAC 402–28–050 (part).]

WAC 402–28–052 Radiographic systems other than fluoroscopic, dental intraoral, or veterinary systems—Radiation exposure control devices. (1) *Timers.* Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition, it shall be impossible to make an exposure when the timer is set to a zero or off position if either position is provided.

(2) *X–ray control (exposure switch):*

(a) A control which shall be the equivalent of a dead–man switch, shall be incorporated into each x–ray system such that an exposure can be terminated at any time except for:

(i) Exposure of one–half second or less, or

(ii) During serial radiography when means shall be provided to permit completion of any single exposure of the series in process.

(b) Each x–ray control shall be located in such a way as to meet the following requirements:

(i) Stationary x–ray systems shall be required to have the x–ray exposure switch permanently mounted in a protected area so that the operator is required to remain in that protected area during the entire exposure (see Appendix B for design);

(ii) Mobile and portable x–ray systems which shall have:

(A) An exposure cord which can extend for a minimum of 12 feet from the patient; or

(B) A protective barrier of 0.25 millimeter lead equivalent between the patient and the operator.

(c) Each x–ray control shall provide visual evidence to the operator that x–rays are being produced and an audible signal that the exposure has terminated.

(3) *Automatic exposure controls (phototimers).* When an automatic exposure control is provided:

(a) Indication shall be made on the control panel when this mode of operation is selected;

(b) When the x-ray tube potential is equal to or greater than 50 kVp, the minimum exposure time for field emission equipment rated for pulsed operation shall be equal to or less than the interval equivalent to two pulses;

(c) The minimum exposure time for all equipment other than that specified in WAC 402-28-052(3)(b) shall be equal to or less than 1/60 second or a time interval required to deliver 5 mAs, whichever is greater.

(4) *Reproducibility.* When four timer tests are performed, at identical timer settings the average time period (T) shall be greater than or equal to five times the maximum period $T_{(max)}$ less the minimum period $T_{(min)}$. T shall be equal to or less than 0.5 seconds.

$\bar{T}$ greater than or equal to 5 $[T_{(max)} - T_{(min)}]$

[Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-052, filed 12/8/80; Order 1084, § 402-28-052, filed 1/14/76. Formerly WAC 402-28-050 (part).]

WAC 402-28-053 Radiographic systems other than fluoroscopic, dental intraoral, or veterinary systems--Source-to-skin or receptor distance. (1) *Limitation.* All radiographic systems shall be provided with a durable, securely fastened means to limit the source-to-skin distance to not less than 30 centimeters. The requirement can be met when the collimator or cone provides the required limits.

(2) *Source to receptor distance measuring device.* All radiographic systems shall be provided with a device or reference, other than a collimator light localizer which will measure the selected source to receptor distance to within 2.5 centimeters. [Statutory Authority: RCW 70-.98.050. 81-01-011 (Order 1570), § 402-28-053, filed 12/8/80; Order 1084, § 402-28-053, filed 1/14/76. Formerly WAC 402-28-050 (part).]

WAC 402-28-054 Radiographic systems other than fluoroscopic, dental intraoral, or veterinary systems--Exposure reproductibility. The exposure produced shall be reproducible to within the following criteria: When all technique factors are held constant, the coefficient of variation shall not exceed 0.10.

(1) *For manual exposure control mode.* This shall be deemed to have been met if when four exposures at identical technique factors are made that the value of the average exposure E(with bar over it) is greater than five times the maximum exposure, $E_{(max)}$, minus the minimum exposure, $E_{(min)}$.

$\bar{E} > 5 \quad [E_{(max)} - E_{(min)}]$

(2) *For phototimed exposure control mode.* This shall be deemed to have been met if when four exposures at identical technique factors are made that the value of the average exposure E (with bar over it) is greater than five times the maximum exposure, E (max), minus the minimum exposure, E (min). The four exposures are to be made under the following conditions in phototimed mode:

(a) The kV is held constant.

(b) The mA, if selectable, is held constant.

(c) The selected density, if selectable, is held constant.

(d) Selection of phototimer radiation detectors (single or multiple detectors selected) is varied for each of the four exposures, if selectable.

(e) The same attenuator is placed in the x-ray field between the selected phototimer radiation detectors (photocells) and the radiation detector used to determine the four exposure values.

(f) The selected phototime radiation detectors (photocells) are within the x-ray field during each exposure measurement and are covered completely by the attenuator. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-054, filed 12/8/80; Order 1084, § 402-28-054, filed 1/14/76. Formerly WAC 402-28-050 (part).]

WAC 402-28-055 Radiographic systems--Standby radiation from capacitor energy storage equipment. Radiation emitted from the x-ray tube when the exposure switch or timer is not activated shall not exceed a rate of 2 milliroentgens per hour at 5 centimeters from any accessible surface of the diagnostic source assembly, with the beam-limiting device fully open. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-055, filed 12/8/80; Order 1084, § 402-28-055, filed 1/14/76. Formerly WAC 402-28-050 (part).]

WAC 402-28-080 Intraoral dental radiographic systems. In addition to the provisions of WAC 402-28-031, WAC 402-28-032, and WAC 402-28-035 the requirements of this section apply to x-ray equipment and associated facilities used for dental radiography. Criteria for extraoral dental radiographic systems are covered in WAC 402-28-051, WAC 402-28-052, and WAC 402-28-053.

(1) *Source-to-skin distance (SSD).* X-ray systems designed for use with an intraoral image receptor shall be provided with means to limit source-to-skin distance to not less than:

(a) 18 centimeters if operable above 50 kilovolts peak, or

(b) 10 centimeters if not operable above 50 kilovolts peak.

(2) *Field limitation*

(a) Radiographic systems designed for use with an intraoral image receptor shall be provided with means to limit the x-ray beam such that:

(i) If the minimum source-to-skin distance (SSD) is 18 centimeters or more, the x-ray field, at the minimum SSD, shall be containable in a circle having a diameter of no more than 7 centimeters; and

(ii) If the minimum SSD is less than 18 centimeters, the x-ray field, at the minimum SSD, shall be containable in a circle having a diameter of no more than 6 centimeters.

(b) An open ended position indicating device shall be used. The shielding shall be equivalent to that required for the diagnostic source assembly (WAC 402-28-035(3)).

(3) *Timers.* Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition,

(a) Termination of exposure shall cause automatic resetting of the timer to its initial setting or to zero.

(b) It shall not be possible to make an exposure when the timer is set to a zero or off position if either position is provided.

(c) Reproducibility. When four timer tests taken at identical timer settings are performed the average time period (T(with bar over it)) shall be greater than or equal to five times the maximum period ($T_{(max)}$) less the minimum period ($T_{(min)}$). T(with bar over it) shall be less than or equal to 5 seconds.

$\bar{T}$ greater than or equal to 5 $[T_{(max)} - T_{(min)}]$

(4) *X-ray control exposure switch:*

(a) A control, which shall be the equivalent of a dead-man switch, shall be incorporated into each x-ray system such that an exposure can be terminated at any time, except for exposures of one-half second or less.

(b) Each x-ray control shall be located in such a way as to meet the following criterion:

For stationary x-ray systems it shall be required that the control switch be permanently mounted in a protected area (e.g., corridor outside the room) so that the operator is required to remain in that protected area during the entire exposure. This requirement pertains only to new installations.

(c) The x-ray control shall provide visual indication observable at or from the operator's protected position whenever x-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.

(5) *Exposure reproductibility.* The exposure produced shall be reproducible to within the following criteria:

When all technique factors are held constant, the coefficient of variation shall not exceed 0.10. This shall be deemed to have been met if when four exposures at identical technique factors are made that the value of the average exposure (E(with bar over it)) is greater than or equal to five times the maximum exposure ($E_{(max)}$ minus the minimum exposure $E_{(min)}$.

$\bar{E}$ greater than or equal to 5 $[E_{(max)} - E_{(min)}]$

(6) *Operating controls.*

(a) Patient and film holding devices shall be used when the techniques permit.

(b) Neither the tube housing nor the position indicating device shall be hand held during an exposure. The tube housing shall remain stable during exposure.

(c) The x-ray system shall be arranged and operated in such a manner that the useful beam at the patient's skin does not exceed the dimensions specified in WAC 402-28-080(2)(a).

(d) Dental fluoroscopy without image intensification shall be prohibited. [Statutory Authority: RCW 70.98-.050. 81-01-011 (Order 1570), § 402-28-080, filed 12/8/80; Order 1084, § 402-28-080, filed 1/14/76; Order 1, § 402-28-080, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-28-091 Therapeutic x-ray installations less than 1 MeV. (1) *Equipment requirements.*

(a) *Leakage radiation.* When the tube is operated at its leakage technique factors, the leakage radiation shall not exceed the value specified at the distance specified for the classification of that x-ray system:

(i) Contact therapy systems. Leakage radiation shall not exceed 100 milliroentgens per hour at 5 centimeters from the surface of the tube housing assembly;

(ii) 0-150 kVp systems. Systems which are manufactured or installed prior to the effective date of WAC 402-28-091 shall have a leakage radiation which does not exceed 1 roentgen in 1 hour at 1 meter from the source;

(iii) 0-150 kVp systems. Systems which are manufactured on or after the effective date of WAC 402-28-091 shall have a leakage radiation which does not exceed 100 milliroentgens in 1 hour at 1 meter from the source;

(iv) 151 to 999 kVp systems. The leakage radiation shall not exceed 1 roentgen in 1 hour at 1 meter from the source except systems that operate in excess of 500 kVp may have a leakage radiation at 1 meter from the source equivalent to the exposure within 1 hour of the useful beam at 1 meter from the source multiplied by a factor of 0.001.

(b) *Permanent beam limiting devices.* Permanent fixed diaphragms or cones used for limiting the useful beam shall provide the same or higher degree of protection as that required by the tube housing assembly.

(c) *Removable and adjustable beam limiting devices.*

(i) Removable beam limiting devices shall, for the portion of the useful beam to be blocked by these devices, transmit not more than 1 percent of the original x-ray beam at the maximum kilovoltage and maximum treatment filter;

(ii) Adjustable beam limiting devices installed after the effective date of WAC 402-28-091 shall meet the requirements of WAC 402-28-091(1)(c)(i);

(iii) Adjustable beam limiting devices installed before the effective date of WAC 402-28-091 shall, for the portion of the x-ray beam to be blocked by these devices, transmit not more than 5 percent of the original x-ray beam at the maximum kilovoltage and maximum treatment filter.

(d) *Filter system.* The filter system shall be so designed that:

(i) Filters cannot be accidently displaced from the useful beam at any possible tube orientation;

(ii) Each filter is marked as to its material of construction and its thickness or wedge angle for wedge filters;

(iii) It shall be possible for the operator to determine the presence or absence of each filter and the orientation of each wedge filter in the useful beam when the operator is at the control panel, either by display at the control panel or by direct observation; and

(iv) The radiation at 5 centimeters from the filter insertion slot opening does not exceed 30 roentgens per hour under any operating conditions.

(e) *Tube immobilization.* The tube housing assembly shall be capable of being immobilized during stationary treatments.

(f) *Focal spot marking.* The tube housing assembly shall be so marked that it is possible to determine the location of the focal spot to within 5 millimeters, and such marking shall be readily accessible for use during calibration procedures.

(g) *Beam monitor system.* Systems of greater than 150 kVp manufactured after the effective date of WAC 402-28-091 shall be provided with a beam monitor system which:

(i) Shall include a full-beam transmission detector and which is placed on the patient side of any fixed added filters other than a wedge filter;

(ii) Shall have the detector interlocked to prevent incorrect positioning in the useful beam;

(iii) Shall not allow irradiation until a preselected value of exposure in roentgens has been made at the treatment control panel;

(iv) Shall independently terminate irradiation when the preselected number of roentgens has been reached;

(v) Shall be so designed that, in the event of a system malfunction or electrical power failure, the dose administered to a patient prior to the system malfunction or power failure can be accurately determined;

(vi) Shall have a display at the control panel from which the dose at a reference point in the treatment volume can be calculated;

(vii) Shall have a control panel display which maintains the dose reading until intentionally reset to zero; and

(viii) Shall have a control panel display which does not have scale multiplying factors and utilizes a design such that increasing dose is displayed by increasing numbers.

(h) *Timer.*

(i) A timer shall be provided which has a display at the treatment control panel. The timer shall be graduated in minutes and fractions of minutes. The timer shall have a preset time selector and an elapsed time indicator;

(ii) The timer shall be a cumulative timer which activates with radiation and retains its reading after irradiation is interrupted or terminated. After irradiation is terminated and before irradiation can be reinitiated, it shall be necessary to cycle the preset time selector through zero time;

(iii) The timer shall terminate irradiation when a preselected time has elapsed;

(iv) The timer shall permit accurate presetting and determination of exposure times as short as 1 second;

(v) The time shall not permit an exposure if set at zero;

(vi) The timer shall comply with the provisions of WAC 402-28-091(1)(m) where applicable;

(vii) The timer shall not activate until the shutter is opened, when patient irradiation is controlled by a shutter mechanism.

(i) *Control panel functions.* The control panel, in addition to the displays required in other provisions of chapter 402-28 WAC shall have:

(i) An indication of whether electrical power is available at the control panel and if activation of the x-ray tube is possible;

(ii) An indication of whether x-rays are being produced;

(iii) Means for indicating kV and x-ray tube current;

(iv) The means for terminating an exposure at any time;

(v) A locking device which will prevent unauthorized use of the x-ray system; and

(vi) For x-ray equipment manufactured after the effective date of WAC 402-28-091, a positive display of specific filter(s) in the beam.

(j) *Multiple tubes.* When a control panel may energize more than one x-ray tube:

(i) It shall be possible to activate only one x-ray tube at any time;

(ii) There shall be an indication at the control panel identifying which x-ray tube is energized; and

(iii) There shall be an indication at the tube housing assembly when that tube is energized.

(k) *Source-to-patient distance.* There shall be means of determining the source-to-patient distance to within 1 centimeter.

(l) *Shutters.* Unless it is possible to bring the x-ray output to the prescribed exposure parameters within 5 seconds, the entire useful beam shall be automatically attenuated by a shutter having a lead equivalency not less than that of the tube housing assembly. In addition:

(i) After the unit is at operating parameters, the shutter shall be controlled electrically by the operator from the control panel;

(ii) An indication of shutter position shall appear at the control panel.

(m) *Low filtration x-ray tubes.* Each x-ray system equipped with a beryllium or other low-filtration window shall be clearly labeled as such upon the tube housing assembly and at the control panel.

(2) *Facility design requirements for systems capable of operating above 50 kVp.*

In addition to shielding adequate to meet requirements of chapters 402-22 and 402-24 WAC of these regulations and the shielding plan review provisions of WAC 402-28-032, the treatment room shall meet the following design requirements:

(a) *Warning lights.* Treatment rooms to which access is possible though more than one entrance shall be provided with warning lights, in a readily observable position near the outside of all access doors, which will indicate when the the useful beam is "on." Also, it is required that entrances other than the main one be equipped with interior locks, activated for the period of exposure, and that the main entrance be under control of the operator.

(b) *Voice communication.* Provision shall be made for two–way aural communication between the patient and the operator at the control panel; however, where excessive noise levels make aural communication impractical, other methods of communication shall be used.

(c) *Viewing systems.* Windows, mirrors, closed–circuit television, or an equivalent system shall be provided to permit continuous observation of the patient during irradiation and shall be so located that the operator can observe the patient from the control panel. When the primary viewing system is by electronic means (e.g., television), an alternate viewing system shall be available for use in the event of electronic failure.

(d) *Additional requirements.* Treatment rooms which contain an x–ray system capable of operating above 150 kVp shall meet the following additional requirements:

(i) All necessary shielding, except for any beam interceptor, shall be provided by fixed barriers;

(ii) The control panel shall be outside the treatment room;

(iii) All doors of the treatment room shall be electronically connected to the control panel such that x–ray production cannot occur unless all doors are closed;

(iv) When the doors referred to in WAC 402–28–091(2)(d)(iii) are opened while the x–ray tube is activated:

(A) X–ray production shall terminate within 1 second; or

(B) The radiation at a distance of 1 meter from the source shall be reduced to less than 100 milliroentgens per hour within 1 second.

(v) After the radiation output of the x–ray tube has been affected by the opening of any door referred to in WAC 402–28–091(2)(d)(iii), it shall be possible to restore the x–ray system to full operation only upon:

(A) Closing the door; and subsequently

(B) Reinitiating the exposure at the control panel.

(e) *Surveys, calibrations, spot checks, and operating procedures.*

(i) All new facilities, and existing facilities not previously surveyed, shall have a survey made by, or under the direction of, a qualified expert. Such surveys shall also be done after any change in the facility or equipment which might cause a significant increase in radiation hazard.

(ii) The expert shall report his findings in writing to the person in charge of the facility and a copy of the report shall be maintained by the registrant for inspection by the department.

(iii) The survey and report shall indicate all instances where the installation in the opinion of the qualified expert is in violation of applicable regulations and cite all items of noncompliance.

(f) *Calibrations.*

(i) The calibration of an x–ray system shall be performed at intervals not to exceed one year and after any change or replacement of components which could cause a change in the radiation output.

(ii) The calibration of the radiation output of the x–ray system shall be performed by or under the direction of a qualified expert who is physically present at the facility during such calibration.

(iii) Calibration of the radiation output of an x–ray system shall be performed with a calibrated instrument. The calibration of such instrument shall be directly traceable on a national standard. The instrument shall have been calibrated within the preceding 2 years.

(iv) The calibrations made pursuant to WAC 402–28–091(2)(e)(i) shall be such that the dose at a reference point in soft tissue can be calculated to within + 5 percent.

(v) The calibration of the x–ray system shall include, but not be limited to, the following determinations:

(A) Verification that the x–ray system is operating in compliance with the design specifications;

(B) The exposure rates for each combination of field size, technique factors, filter, and treatment distance used;

(C) The degree of congruence between the radiation field and the field indicated by the localizing device if such device is present; and

(D) An evaluation of the uniformity of the radiation field symmetry for the field sizes used and any dependence upon tube housing assembly orientation.

(vi) Records of calibration performed pursuant to WAC 402–28–091(2)(e) shall be maintained by the registrant for 2 years after completion of the calibration.

(vii) A copy of the most recent x–ray system calibration shall be available for use by the operator at the control panel.

(g) *Spot checks.* Spot checks shall be performed on x–ray systems capable of operation at greater than 150 kVp. Such spot checks shall meet the following requirements:

(i) The spot check procedures shall be in writing and shall have been developed by a qualified expert;

(ii) The measurements taken during the spot checks shall demonstrate the degree of consistency of the operating characteristics which can affect the radiation output of the x–ray system;

(iii) The spot check procedure shall specify the frequency at which tests or measurements are to be performed;

(iv) The procedure shall also note conditions which shall require that the system be recalibrated in accordance with WAC 402–28–091(2)(f); and

(v) Records of spot check measurements performed pursuant to WAC 402–28–091(2)(g) shall be maintained by a registrant for 2 years following such measurement.

(h) *Operating procedures.*

(i) Therapeutic x–ray systems shall specify the frequency at which tests or measurements are to be performed;

(ii) When a patient must be held in position for radiation therapy, mechanical supporting or restraining devices shall be used;

(iii) The tube housing assembly shall not be held by an individual during exposures;

(iv) No individual other than the patient shall be in the treatment room unless such individual is protected

by a barrier sufficient to meet the requirements of chapter 402-24 WAC of these regulations. No individual other than the patient shall be in the treatment room during exposures when the kVp exceeds 150;

(v) The x-ray system shall not be used in the administration of radiation therapy unless the requirements of WAC 402-28-091(2)(e)(i) and (f)(iv) have been met. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-091, filed 12/8/80.]

WAC 402-28-101 X-ray and electron therapy systems with energies of one MeV and above. Chapter 402-44 WAC except WAC 402-44-110(3) and (4) shall apply to medical facilities using therapy systems with energies 1 MeV and above.

(1) *Definitions.* In addition to the definitions provided in WAC 402-28-020, the following definitions shall be applicable to WAC 402-28-101.

(a) "Applicator" means a structure which indicates the extent of the treatment field at a given distance from the virtual source and which may or may not incorporate the beam limiting device.

(b) "Beam scattering filter" means a filter used in order to scatter a beam of electrons.

(c) "Central axis of the beam" means a line passing through the virtual source and the center of the plane figure formed by the edge of the final beam limiting device.

(d) "Dose monitoring system" means a system of devices for the detection and display of quantities of radiation.

(e) "Dose monitor unit" means a unit from which the absorbed dose can be calculated.

(f) "Existing equipment" means therapy systems subject to WAC 402-28-101 which were manufactured on or before the effective date of these regulations.

(g) "Field flattening filter" means a filter used to homogenize the dose rate over the area of a useful beam of x-rays.

(h) "Field size" means the dimensions of an area in a plane perpendicular to the specified direction of the beam of incident radiation at a specified depth in a phantom and defined by specified isodose lines.

(i) "Gantry" means that part of the system supporting and allowing possible movements of the radiation head.

(j) "Interruption of irradiation" means the stopping of irradiation with the possibility of continuing irradiation without resetting of the operating conditions at the control panel.

(k) "Isocenter" means a fixed point in space located at the intersection of the rotation axes of the principal movements of the therapy system.

(l) "Moving beam therapy" mean radiation therapy with relative displacement of the useful beam and the patient during irradiation.

(m) "New equipment" means systems subject to WAC 402-28-101 which were manufactured after effective date of these regulations.

(n) "Normal treatment distance" means the distance between the virtual source and a reference point on the central axis of the beam. The reference is located at a position where the patient will be placed during radiation therapy.

(o) "Patient" means an individual subjected to examination and treatment.

(p) "Phantom" means a volume of material behaving in a manner similar to tissue with respect to the attenuation and scattering of radiation.

(q) "Primary dose monitoring system" means a system which will monitor the quantity of radiation produced during irradiation and which will terminate irradiation when a preselected number of dose monitor units have been acquired.

(r) "Radiation treatment prescription" means the absorbed dose which is intended to be delivered to the treatment volume.

(s) "Radiation head" means the structure from which the useful beam emerges.

(t) "Redundant dose monitoring combination" means a combination of two dose monitoring systems in which both systems are arranged to terminate irradiation in accordance with a preselected number of dose monitor units.

(u) "Secondary dose monitoring system" means a system which will terminate irradiation in the event of failure of the primary system.

(v) "Shadow tray" means a device attached to the radiation head to support auxiliary beam limiting material.

(w) "Stationary beam therapy" means radiation therapy without relative displacement of the useful beam and the patient during irradiation.

(x) "Target" means that part of a radiation source which intercepts a beam of accelerated particles with subsequent emission of other radiation.

(y) "Termination of irradiation" means the stopping of irradiation in a fashion which will not permit continuance of irradiation without the resetting of operating conditions at the control panel.

(z) "Treatment field" means the area of the patient's skin which is to be irradiated.

(aa) Treatment volume means that portion of the patient's body which is to be irradiated.

(bb) "Virtual source" means a point from which radiation appears to originate.

(2) *Requirements for equipment.*

(a) *Leakage radiation to the patient area.*

(i) New equipment should meet the following requirements:

(A) For all operating conditions, the dose equivalent in rem due to leakage radiation, including x-ray, electrons, and neutrons, at any point in a circular plane of 2 meters radius centered on and perpendicular to the central axis of the beam at the normal treatment distance and outside the maximum useful beam, should not exceed 0.1 percent of the maximum dose equivalent in rem of the unattenuated useful beam measured at the point of intersection of the central axis of the beam and the plane surface. Measurements shall be averaged over an area up to but not exceeding 100 square centimeters at the positions specified.

(B) For each system the registrant shall determine, or obtain from the manufacturer, the leakage radiation existing at the positions specified in WAC 402-28-101(2)(a)(i)(A) for specified operating conditions. Records for leakage radiation shall be maintained at the installation for inspection by the department.

(ii) Existing equipment (that installed prior to the effective date of the regulations) should meet the following requirements:

(A) The leakage radiation, excluding neutrons, at any point in the area specified by WAC 402-28-101(2)(a)(i)(A), where such area intercepts the central axis of the beam 1 meter from the virtual source, should not exceed 0.1 percent of the maximum dose equivalent in rems of the unattenuated useful beam measured at the point of intersection of the central axis of the beam and the surface of the reference circular plane. Measurements should be averaged over an area up to but not exceeding 100 square centimeters at the positions specified.

(B) For each system, the registrant should determine, or obtain from the manufacturer, the leakage radiation existing at the positions specified in WAC 402-28-101(2)(a)(ii)(A) for specified operating conditions. Records for radiation leakage shall be maintained at the installation for inspection by the department.

(b) *Leakage radiation outside the patient area.*

(i) The dose equivalent in rem due to leakage radiation, except in the area specified in WAC 402-28-101(2)(a), when measured at any point 1 meter from the path of the charged particle, before the charged particle strikes the target or window, should not exceed 0.1 percent for x-ray leakage nor 0.5 percent for neutron leakage of the maximum dose equivalent in rems of the unattenuated useful beam measured at the point of intersection of the central axis of the beam and the circular plane specified in WAC 402-28-101(2)(a).

(ii) The registrant should determine, or obtain from the manufacturer, the actual leakage radiation existing at the positions specified in WAC 402-28-101(2)(a) for specified operating conditions. Measurements should be averaged over an area up to but not exceeding 100 square centimeters at the positions specified.

(c) *Beam limiting devices.* Adjustable or interchangeable beam limiting devices shall be provided and such devices shall transmit no more than 2 percent of the useful beam for the portion of the useful beam which is to be attenuated by the beam limiting device. The neutron component of the useful beam shall not be included in this requirement. Measurements shall be averaged over an area up to but not exceeding 100 square centimeters at the normal treatment distance.

(d) *Filters.*

(i) If the absorbed dose rate information required by WAC 402-28-101(2)(p) related exclusively to operation with a field flattening or beam scattering filter in place, such filter shall be removable only by the use of tools.

(ii) In systems which utilize a system of wedge filters, interchangable field flattening filters, or interchangeable beam scattering filters:

(A) Irradiation shall not be possible until a selection of a filter has been made at the treatment control panel;

(B) An interlock system shall be provided to prevent irradiation if the filter selected is not in the correct position;

(C) An indication of the wedge filter orientation with respect to the treatment field shall be provided at the control panel, by direct observation or by electronic means, when wedge filters are used;

(D) A display shall be provided at the treatment control panel showing the filter(s) in use;

(E) Each filter which is removable from the system shall be clearly identified as to that filter's material of construction, thickness, and the wedge angle for wedge filters; and

(F) An interlock shall be provided to prevent irradiation if any filter selection operation carried out in the treatment room does not agree with the filter selection operation carried out at the treatment control panel.

(e) *Beam quality.* The registrant shall determine, or obtain from the manufacturer, data sufficient to assure that the following beam quality requirements are met:

(i) The absorbed dose resulting from x-rays in a useful electron beam at a point on the central axis of the beam 10 centimeters greater than the practical range of the electrons shall not exceed the values stated in Table III. Linear interpolation shall be used for values not stated.

TABLE III

Maximum Energy of Electron Beam in MeV	X-ray Absorbed Dose as a Fraction of Maximum Absorbed Dose
1	0.03
15	0.05
35	0.10
50	0.20

(ii) Compliance with WAC 402-28-101(2)(e)(i) shall be determined using:

(A) A measurement within a phantom with the incident surface of the phantom at the normal treatment distance and normal to the central axis of the beam;

(B) The largest field size available which does not exceed 15 centimeters by 15 centimeters; and

(C) A phantom whose cross-sectional dimensions exceed the measurement radiation field by at least 5 centimeters and whose depth is sufficient to perform the required measurement.

(iii) The absorbed dose at a surface located at the normal treatment distance, at the point of intersection of that surface with the central axis of the useful beam during x-ray irradiation, shall not exceed the limits stated in Table IV. Linear interpolation shall be used for values not stated.

TABLE IV

Maximum Photon Energy in MeV	Absorbed Dose at the Surface as a Fraction of the Maximum Absorbed Dose
1	0.80
2	0.70
5	0.60
15	0.50
35	0.40
50	0.20

(iv) Compliance with WAC 402-28-101(2)(e)(iii) shall be determined by:

(A) Measurements made within a phantom using an instrument which will allow extrapolation to the surface absorbed dose;

(B) Use of a phantom whose size and placement meet the requirements of WAC 402-28-101(2)(e)(iii);

(C) Removal of all beam modifying devices which can be removed without the use of tools, except for beam scattering or beam flattening filters; and

(D) The largest field size available which does not exceed 15 centimeters by 15 centimeters.

(v) The registrant shall determine, or obtain from the manufacturer, the maximum percentage absorbed dose due to stray neutrons in the useful beam for specified operating conditions.

(f) *Beam monitors.* All therapy systems shall be provided with radiation detectors in the radiation head.

(i) New equipment shall be provided with at least two radiation detectors. The detectors shall be incorporated into two monitoring systems arranged either as a primary/primary combination or as a primary/secondary combination.

(ii) Existing equipment shall be provided with at least one radiation detector. This detector shall be incorporated into a primary system.

(iii) The detectors and system into which the detector is incorporated shall meet the following requirements:

(A) Each primary system shall have a detector which is a transmission full beam detector and which is placed on the patient side of any fixed added filters other than a wedge filter.

(B) The detectors shall be removable only with tools and shall be interlocked to prevent incorrect positioning.

(C) Each detector shall be capable of independently monitoring and controlling the useful beam.

(D) Each detector shall form part of a dose monitoring system from whose readings in dose monitor units the absorbed dose at a reference point in the treatment volume can be calculated.

(E) For new equipment the design of the dose monitoring systems of WAC 402-28-101(2)(h) shall assure that the malfunctioning of one system shall not affect the correct functioning of the second system. In addition:

(I) The failure of any element common to both systems shall terminate the useful beam.

(II) The failure of any element common to both systems which could affect the correct operation of both systems shall terminate irradiation.

(F) Each dose monitoring system shall have a legible display at the treatment control panel. Each display shall:

(I) Maintain a reading until intentionally reset to zero;

(II) Have only one scale and no scale multiplying factors in new equipment; and

(III) Utilize a design such that increasing dose is displayed by increasing numbers and shall be so designed that, in the event of an overdosage of radiation, the absorbed dose may be accurately determined under all normal conditions of use or foreseeable failures.

(G) In the event of power failure, the dose monitoring information required in WAC 402-28-101(2)(h) displayed at the control panel at the time of failure shall be retrievable in at least one system.

(g) *Beam symmetry.*

(i) For new equipment, each therapy machine shall have the capability of comparing the dose rates in each of the four quadrants of the central 80 percent of the useful beam. Beam symmetry information shall be displayed at the treatment control panel, and such display shall be capable of indicating a differential of more than 5 percent between any two of the quadrant dose rates. Beam asymmetry in excess of 20 percent shall automatically terminate the useful beam.

(ii) Beam symmetry requirements of WAC 402-28-101(2)(g)(i) shall be met if the user can demonstrate to the satisfaction of the department that adequate fail-safe protection against the beam asymmetry is incorporated into the inherent design of the accelerator.

(iii) On existing equipment where the department has determined that beam symmetry is inadequate the use of an automatic beam asymmetry warning system may be required.

(h) *Selection and display of dose monitor units.*

(i) Irradiation shall not be possible until a selection of a number of dose monitor units has been made at the treatment control panel.

(ii) After useful beam termination, it shall be necessary manually to reset the preselected dose monitor units before treatment can be reinitiated.

(iii) The preselected number of dose monitor units shall be displayed at the treatment control panel until reset manually for the next irradiation.

(i) *Termination of irradiation by the dose monitoring system.*

(i) Each of the required monitoring systems shall be capable of independently terminating an irradiation. Provision shall be made to test the correct operation of each system.

(ii) Each primary system shall terminate irradiation when the preselected number of dose monitor units has been detected by the system.

(iii) Each secondary system shall terminate irradiation when 102 percent of the preselected number of dose monitor units has been detected by the system.

(iv) For new equipment, indicators on the control panel shall show which monitoring system has terminated the beam.

(j) *Interruption switches.* It shall be possible to interrupt irradiation and equipment movements at any time from the operator's position at the treatment control panel. Following any interruption, it shall be possible to restart irradiation by operator action without any reselection of operating conditions. If any change is made of a preselected value during an interruption the equipment shall go to termination condition.

(k) *Termination switches.* It shall be possible to terminate irradiation and equipment movements, or go from an interruption condition to termination conditions, at any time from the operator's position at the treatment control panel.

(l) *Timer.*

(i) A timer shall be provided which has a display at the treatment control panel. The timer shall be graduated in minutes and decimals of minutes. The timer shall have a preset time selector and an elapsed time indicator.

(ii) The timer shall be a cumulative timer which switches on and off with the radiation and retains its reading after irradiation is interrupted or terminated. It shall be necessary to zero and subsequently reset the elapsed time indicator and the preset time selector after irradiation is terminated before irradiation shall again be possible.

(iii) The timer shall terminate irradiation when a preselected time has elapsed if the dose monitoring systems fail to do so.

(m) *Selection of radiation type.* Equipment capable of both x–ray therapy and electron therapy shall meet the following requirements:

(i) Irradiation shall not be possible until a selection of radiation type has been made at the treatment control panel.

(ii) An interlock system shall be provided to insure that the equipment can emit only the radiation type which has been selected.

(iii) An interlock system shall be provided to prevent irradiation if any selected operations carried out in the treatment room do not agree with the selected operations carried out in the treatment control panel.

(iv) An interlock system shall be provided to prevent irradiation with x–rays when electron applicators are fitted and irradiation with electrons when accessories for x–ray therapy are fitted.

(v) The radiation type selected shall be displayed at the treatment control panel before and during irradiation.

(n) *Selection of energy.* Equipment capable of generating radiation beams of different energies shall meet the following requirements:

(i) Irradiation shall not be possible until a selection of energy has been made at the treatment control panel.

(ii) An interlock system shall be provided to insure that the equipment can emit only the energy of radiation which has been selected.

(iii) An interlock system shall be provided to prevent irradiation if any selected operations carried out in the treatment room do not agree with the selected operations carried out at the treatment control panel.

(iv) The energy selected shall be displayed at the treatment control panel before and during irradiation.

(o) *Selection of stationary beam therapy or moving beam therapy.* Equipment capable of both stationary beam therapy and moving beam therapy shall meet the following requirements:

(i) Irradiation shall not be possible until a selection of stationary beam therapy or moving beam therapy has been made at the treatment control panel.

(ii) An interlock system shall be provided to insure that the equipment can operate only in the mode which has been selected.

(iii) An interlock system shall be provided to prevent irradiation if any selected operations carried out in the treatment room do not agree with the selected operations carried out at the treatment control panel.

(iv) An interlock system shall be provided to terminate irradiation if the movement stops during moving beam therapy.

(v) Moving beam therapy shall be so controlled that the required relationship between the number of dose monitor units and movement is obtained.

(vi) The mode of operation shall be displayed at the treatment control panel.

(p) *Absorbed dose rate.* For new equipment, a system shall be provided from whose readings the absorbed dose rate at a reference point in the treatment volume can be calculated.[3] In addition:

(i) The quotient of the number of dose monitor units by time shall be displayed at the treatment control panel.

(ii) If the equipment can deliver, under any conditions, an absorbed dose rate at the normal treatment distance more than twice the maximum value specified by the manufacturer's anticipated dose rate for any machine parameters utilized, a device shall be provided which terminates irradiation when the absorbed dose rate exceeds a value twice the specified maximum. The value at which the irradiation will be terminated shall be in a record maintained by the registrant.

(q) *Location of focal spot and beam orientation.* The registrant shall determine, or obtain from the manufacturer, the location with reference to an accessible point on the radiation head of:

(i) The x–ray target or the virtual source of x–rays;

(ii) The electron window or the scattering foil;

(iii) All possible orientations of the useful beam.

(r) *System checking facilities.* Capabilities shall be provided so that all radiation safety interlocks can be checked. When preselection of any of the operating conditions requires action in the treatment room and at the treatment control panel, selection at one location shall not give a display at the other location until the requisite selected operations in both locations have been completed.

(s) *Shadow trays shall be designed such that the skin entrance-dose due to electrons produced within the shadow tray are minimized.*

(t) *Facility and shielding requirements.*. In addition to chapter 402-24 WAC, the following design requirements shall apply:

(i) Except for entrance doors or beam interceptors, all the required barriers shall be fixed barriers.

(ii) The treatment control panel shall be located outside the treatment room.

(iii) Windows, mirrors, closed-circuit television, or other equivalent viewing systems shall be provided to permit continuous observation of the patient during irradiation and shall be so located that the operator may observe the patient from the treatment control panel. When the viewing system is by electronic means (e.g., television), an alternate viewing system shall be provided for use in the event of failure of the primary system.

(iv) Provision shall be made for two-way aural communication between the patient and the operator at the treatment control panel. However, where excessive noise levels make aural communications impractical, other methods of communication shall be used.

(v) Treatment rooms to which access is possible through more than one entrance shall be provided with warning lights, which will indicate when the useful beam is "on" in a readily observable position near the outside of all access doors.

(vi) Interlocks shall be provided such that all entrance doors shall be closed before treatment can be initiated or continued. If the radiation beam is interrupted by any door opening, it shall be possible to restore the machine to operation only by closing the door and reinitiating exposure by manual action at the control panel.

(u) *Surveys, calibrations, spot checks and operating procedures.*

(i) Survey.

(A) All new facilities, and existing facilities not previously surveyed, shall have a survey made by, or under the direction of, a qualified expert. Such surveys shall also be done after any change in the facility or equipment which might cause a significant increase in radiation hazard.

(B) The registrant shall obtain a written report of the survey from the qualified expert and a copy of the report shall be transmitted by the registrant to the department.

(C) The survey and report shall indicate all instances where the installation, in the opinion of the qualified expert, is in violation of applicable regulations and shall cite the section violated.

(ii) Calibrations.

(A) The calibration of systems subject to WAC 402-28-101 shall be performed before the system is first used for irradiation of patient and thereafter at time intervals which do not exceed 6 months and after any change which might significantly alter the calibration, spatial distribution, or other characteristics of the therapy beam.

(B) The calibration shall be performed under the direct supervision of a qualified expert.

(C) Calibration of the dose equivalent of the therapy beam shall be performed with a measurement instrument the calibration of which is directly traceable to national standards of exposure or absorbed dose and which shall have been calibrated within the preceding 2 years.

(D) Calibrations made pursuant to WAC 402-28-101(2)(u)(ii) shall be such that the dose at a reference point in soft tissue can be calculated within + 5 percent.

(E) The calibration of the therapy beam shall include but not be limited to the following determinations:

(I) Verification that the equipment is operating in compliance with the design specifications concerning the light localizer, the side light and back-pointer alignment with the isocenter, when applicable, variation in the axis of rotation for the table, gantry and jaw system, and beam flatness and symmetry at specified depths.

(II) The exposure rate or dose rate in air and at various depths of water for the range of field sizes used, for each effective energy, and for each treatment distance used for radiation therapy.

(III) The congruence between the radiation field and the field indicated by the localizing device.

(IV) The uniformity of the radiation field and its dependency upon the direction of the useful beam.

(V) The calibration determinations above shall be provided in sufficient detail such that the absorbed dose to tissue in the useful beam may be calculated to within + 5 percent.

(F) Records of the calibration performed pursuant to WAC 402-28-101(2)(u)(ii) shall be maintained by the registrant for 2 years after completion of the calibration.

(G) A copy of the latest calibration performed pursuant to WAC 402-28-101(2)(u)(ii) shall be available for use by the operator at the treatment control panel.

(iii) Spot checks. Spot checks shall be performed on the system subject to WAC 402-28-101. Such spot checks shall meet the following requirements:

(A) The spot check procedures shall be in writing and shall have been developed by a qualified expert.

(B) The measurements taken during spot checks shall demonstrate the degree of consistency of the operating characteristics which can affect the radiation output of the system or the radiation delivered to a patient during a therapy procedure.

(C) The spot check procedures shall specify the frequency at which tests or measurements are to be performed.

(D) For systems in which beam quality can vary significantly, spot checks shall include quality checks.

(E) Where a system has built-in devices which provide a self-check of any parameter during irradiation, the spot check procedures shall require that the parameter be independently verified at specific time intervals.

(F) The reason for spot checks which are erratic or inconsistent with calibration data shall be promptly investigated and corrected before the system is used for patient irradiation.

(G) Whenever a spot check indicates a significant change in the operating characteristics of a system, as specified in the qualified expert's spot check procedures,

the system shall be recalibrated as required in WAC 402-28-101(2)(u)(ii).

(H) Records of spot check measurements performed pursuant to WAC 402-28-101(2)(u)(iii) shall be maintained by the registrant for a period of one year or for twice as long as the spot check cycle, whichever is greater.

(I) Operating procedures.

(I) No individual other than the patient shall be in the treatment room during treatment of a patient.

(II) If a patient must be held in position during treatment, mechanical supporting or restraining devices shall be used.

(III) The system shall not be used in the administration of radiation therapy unless WAC 402-28-101(2)(u)(i), (ii), and (iii) have been met.

[3]The radiation detectors specified in WAC 402-28-101(2)(f) may form part of this system.

[Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-101, filed 12/8/80.]

WAC 402-28-110 Veterinary medicine radiographic installations. (1) *Equipment.*

(a) The protective tube housing shall be of diagnostic type.

See WAC 402-28-035(4).

(b) Diaphragms, cones, or a stepless adjustable collimator shall be provided for collimating the useful beam to the area of clinical interest and shall provide the same degree of protection as is required of the housing.

(c) The total filtration permanently in the useful beam shall not be less than 0.5 millimeters aluminum equivalent for machines operating up to 50 kVp, 1.5 millimeters aluminum equivalent for machines operating between 50-70 kVp, and 2.5 millimeters aluminum equivalent for machines operating above 70 kVp.

(d) A device shall be provided to terminate the exposure after a preset time or exposure.

(e) A dead-man type of exposure switch shall be provided, together with an electrical cord of sufficient length, so that the operator can stand out of the useful beam and at least six (6) feet from the animal during all x-ray exposures.

(2) *Structural shielding.* All wall, ceiling, and floor areas shall be equivalent to or provided with applicable protective barriers as required in WAC 402-28-032(1).

(3) *Operating procedures.*

(a) The operator shall stand well away from the useful beam and the animal during radiographic exposures.

(b) In any application in which the operator is not located behind a protective barrier, clothing consisting of a protective apron having a lead-equivalent of not less than 0.5 millimeters shall be worn by the operator and any other individuals in the room during exposures.

(c) No individual other than the operator shall be in the x-ray room while exposures are being made unless such individual's assistance is required.

(d) When an animal or film must be held in position during radiography, mechanical supporting or restraining devices should be used. If the animal must be held by an individual, that individual shall be protected with appropriate shielding devices, such as protective gloves and apron, and that individual shall be so positioned that no part of that individual's body will be struck by the useful beam. The requirements of WAC 402-24-070, PERSONNEL MONITORING, and WAC 402-28-031(2)(h)(iv) apply to such individuals. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-110, filed 12/8/80; Order 1084, § 402-28-110, filed 1/14/76; Order 1, § 402-28-110, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-28-120 Appendix A--Information on radiation shielding required for plan reviews. In order for the Department to provide an evaluation, technical advice and official review on shielding requirements for a radiation installation, the following information is needed.

(1) *The plans should show, as a minimum, the following:*

(a) The normal location of the radiation producing equipment's radiation port; the port's travel and traverse limits; general direction(s) of the radiation beam; locations of any windows; the location of the operator's booth; and the location of the equipment's control console.

(b) Structural composition and thickness of all walls, doors, partitions, floor, and ceiling of the room(s) concerned.

(c) Height, floor to floor, of the room(s) concerned.

(d) The type of occupancy of all adjacent areas inclusive of space above and below the room(s) concerned. If there is an exterior wall, show distance to the closest existing occupied area(s).

(e) The make and model of the radiation producing equipment including the maximum energy output (for x-ray machines this is the kilovolt peak potential).

(f) The type of examination(s) or treatment(s) which will be performed with the equipment (e.g., dental, orthodontal, chest, gastrointestinal, fluoroscopic, podiatry, fixed therapy, rotational therapy, etc.).

(2) *Information on the anticipated workload used in shielding calculations will be provided to the department.* [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-120, filed 12/8/80; Order 1084, § 402-28-120, filed 1/14/76.]

WAC 402-28-130 Appendix B--Minimum design requirements for an x-ray machine operator's booth--New installations only. (1) *Space requirements:*

(a) The operator shall be allotted not less than 7.5 square feet of unobstructed floor space in the booth.

(i) The minimum space as indicated above may be any geometric configuration with no dimension of less than 2 feet.

(ii) The space shall be allotted excluding any encumbrance by the console, such as overhang or cables, or other similar encroachments.

(iii) An extension of a straight line drawn between any joint on the edge of the booth shielding and (a) a point one foot horizontally beyond the nearest vertical edge of the chest cassette holder or (b) any corner of the examination table shall not impinge on the unobstructed space.

(iv) The booth walls shall be at least 7 feet high and shall be permanently fixed to the floor or other structure as may be necessary.

(v) When a door or movable panel is used as an integral part of the booth structure, it must have a permissive device which will prevent an exposure when the door or panel is not closed (this type of booth structure is not recommended).

(2) *Switch placement:*

(a) The operator's switch for the radiographic machine shall be fixed within the booth and:

(i) Shall be at least 40 inches from any open edge of the booth wall which is proximal to the examining table.

(ii) Shall allow the operator to use the majority of the available viewing windows.

(3) *Viewing system requirements:*

(a) Each booth shall have at least one viewing device which will:

(i) Be so placed that the operator can view the patient during any exposure, and

(ii) The device shall be so placed that the operator can have full view of any occupant of the room and should be so placed that the operator can view any entry into the room. If any door, which allows access to the room, cannot be seen from the booth, then that door must have a permissive device controlling the exposure which will prevent the exposure if the door is not closed.

(b) When the viewing system is a window, the following requirements also apply:

(i) It shall have a visible area of at least 1 square foot.

(ii) The distance between the proximal edge of the window and the open edge of the booth shall not be less than 18 inches.

(iii) The glass shall have at least the same lead equivalence as that required in the booth's wall in which it is to be mounted.

(c) When the viewing system is by mirrors, the mirror(s) shall be so located as to accomplish the general requirements as in (a) above.

(d) When the viewing system is by electronic means (e.g. TV etc.):

(i) The camera shall be so located as to accomplish the general requirements in (a) above, and

(ii) There shall be an alternate viewing system as a back up for electronic failure. [Order 1084, § 402-28-130, filed 1/14/76.]

WAC 402-28-990 Appendix C--X-ray film developing guidelines--Time temperature chart. APPENDIX C—*X-ray Film Developing Guidelines—Time Temperature Chart.* This appendix is included for convenience and information and is not intended to be a regulation.

Thermometer Readings (Degrees) C	F	Minimum Developing Times (Minutes)
27 –	80	2
	79	2
	78	2 1/2
	77	2 1/2
24 –	76	3
	75	3
	74	3 1/2
	73	3 1/2
22 –	72	4
	71	4
	70	4 1/2
	69	4 1/2
20 –	68	5
	67	5 1/2
	66	5 1/2
	65	6
18 –	64	6 1/2
	63	7
	62	8
	61	8 1/2
16 –	60	9 1/2

It is recommended that:

(1) *Processing of film.* All films shall be processed in such a fashion as to achieve adequate sensitometric performance. This criterion shall be adjudged to have been met if either of the following items can be met.

(a) Film manufacturers published recommendations as regards time and temperature are followed, or

(b) Each film shall be developed in accord with the time–temperature chart.

(2) *Manual processing of film.*

(a) Where film is developed manually, a system shall be available which consists of at least one three–sectional tank made of mechanically rigid, corrosion resistant material (each section of which shall be constructed so as to retain its solution separation from the other two) and has the overall temperature controlling capability of maintaining each solution such that the temperature of each solution will always fall within the range of 16 degrees C to 27 degrees C (60–80 degrees F).

(b) Devices shall be available which will:

(i) Give the actual temperature of the developer and

(ii) Give an audible or visible signal, after a preset time (in minutes of duration).

(c) Chemical–film processing control.

(i) Chemicals shall be mixed in accord with the chemical manufacturer's recommendations.

(ii) Developer replenisher shall be periodically added to the developer tank based on the area of the films which have been developed (e.g., 1 liter per 3100 in^2 of film or in accord with the recommendations of the chemical manufacturer). Solution may be removed from the tank to permit the addition of an adequate volume of replenisher.

(iii) All processing chemicals shall be completely replaced at least every 3 months.

(iv) At the time of the complete processing chemical change, a film shall be exposed to a density of approximately one, with one-half of the film being protected from the exposure. After full development, it will be maintained in the darkroom or vicinity and at the beginning of each work day at least one test film or film strip (exposed under techniques identical with those used for the original test film) shall be compared with the original test film to evaluate the adequacy of developing results and base fog level.

(3) *Automatic processors and other closed processing systems.*

(a) Preventive maintenance shall be performed on the unit, except for extended periods of non-use, on a frequency basis which is not less than that schedule recommended by the manufacturer. In the event that no schedule is available from the manufacturer a maintenance schedule shall be established which will preserve good film quality.

(b) After a full cleansing of the processor a film shall be exposed to a density of approximately one, with one half of the film protected from exposure. It will be developed and then kept near the unit and daily at least one test film (exposed under techniques identical with those for the original test film) shall be compared with the original test film to evaluate the adequacy of the unit's developing capability and base fog level.

(4) *Darkrooms.*

(a) Darkrooms shall be constructed so that film being processed, handled, or stored will be exposed only to light which has passed through a safelight filter.

(b) The radiance and spectral emission of the safelight (bulb and filter combination) shall be such that film shall not be "fogged" above the base level when exposed for 1 minute at a distance of about 120 centimeters from the lamp(s). Film manufacturer's recommendations for a safelight and its placement shall be adjudged to meet this criterion. [Order 1084, Appendix C (codified as WAC 402-28-990), filed 1/14/76.]

WAC 402-28-99001 Appendix D--Good practices. APPENDIX D—Good Practices. The following are included in this handbook of regulations as suggested good practices and are not intended to be a regulation. The topics presented in these good practices may, however, become incorporated into the Washington Administrative Code at a future date.

(1) Procedures and auxiliary equipment designed to minimize patient and personnel exposure commensurate with the needed diagnostic information should be utilized. This is interpreted to include but not limited to:

(a) The speed of film or screen and film combinations should be the fastest speed consistent with the diagnostic objective of the examinations.

(b) The radiation exposure to the patient should be the minimum exposure required to produce images of good diagnostic quality.

(c) Portable or mobile equipment should be used only for examinations where it is impractical to transfer the patient(s) to a stationary radiographic installation.

(2) Information and maintenance record and associated information. The registrant should maintain at least the following information for each x-ray machine:

(a) Maximum rating of technique factors.

(b) Model numbers of all certifiable components.

(c) Aluminum equivalent filtration of the useful beam, including any routine variation.

(d) Tube rating charts and cooling curves.

(e) Record of surveys, calibrations, maintenance, modifications (from the original schematics and drawings) performed on the x-ray machine after the effective date of these regulations, along with the names of persons who performed the service.

(f) A scale drawing of the room in which a stationary x-ray system is located. The drawing should denote the type of materials and their thickness (or lead equivalence) provided by each barrier of the room (walls, ceilings, floors, doors, windows). The drawing should also denote the type of occupancy of adjacent areas to include above and below the x-ray room of concern (e.g., hallways, offices, parking lots, and toilets). Estimates of the frequency of such occupancy shall also be noted on the drawing.

(g) A copy of all correspondence with this Department regarding that x-ray machine.

(3) Patient log. Each facility should keep a patient log which will indicate the following information as a minimum:

(a) Identification of the patient, including name, facility identification number or social security number, age, and sex.

(b) Date of x-ray examination.

(c) Examination or treatment given by routine or local title as denoted on the technique chart required in WAC 402-28-031(2)(c).

(d) Any deviation from the standard procedure or technique (including all repeat exposures) as denoted in the technique chart required in WAC 402-28-031(2)(c).

(e) When applicable, the x-ray system used.

(f) Name or cross index of individuals who performed the exam.

(4) Human holder log. A record shall be made of the examination and shall include the name of the human holder, date of the examination, number of exposures and technique factors utilized for the exposure(s);

(5) Personnel monitoring devices.

(a) When protective clothing or devices are worn on portions of the body and a monitoring device(s) is required, at least one such device shall be utilized as follows:

(i) When an apron is worn, the monitoring device shall be worn at the collar outside of the apron.

(ii) The dose to the whole body based on the maximum dose attributed to any one critical organ (which are the gonads, the blood forming organs, head and trunk, or lens of the eye) shall be recorded in the reports required by WAC 402-24-020. If more than one device is used and a record is made of the data, each dose shall be identified with the area where the device was worn on the body.

(b) Exposure of a personnel monitoring device to deceptively indicate a dose delivered to an individual is prohibited. [Order 1084, Appendix D (codified as WAC 402-28-99001), filed 1/14/76.]

WAC 402-28-99002 Appendix E--Performance standards for new and/or existing equipment. APPENDIX E—Performance Standards for New and/or Existing Equipment. The following standards are included in this Handbook of Regulations because x-ray equipment manufactured after August 1974 will comply with these federal standards. These standards are not presently incorporated into the Washington Administrative Code (Title 402 WAC) and are not intended to be a regulation. However, these standards may become incorporated into Title 402 WAC at a future date.

(1) *General requirements for all diagnostic x-ray systems.*

(a) *Filtration controls.* For x-ray systems which have variable kVp and variable filtration for the useful beam, a device shall link the kVp selector with the filter(s) and will prevent an exposure unless the minimum required amount of filtration is in the useful beam for the given kVp which has been selected.

(b) Multiple tubes. Where two or more radiographic tubes are controlled by one exposure switch, the tube or tubes which have been selected shall be clearly indicated prior to initiation of the exposure. This indication shall be both on the x-ray control and at or near the tube housing assembly which has been selected.

(2) *Fluoroscopic x-ray systems.*

(a) *Minimum field size.* Means shall be provided by stepless adjustment to reduce the x-ray field size to 5 by 5 centimeters or less at the maximum SID.

(b) *Image-intensified fluoroscopy and spot filming*

(i) During fluoroscopic or spot-filming procedures, neither the length nor the width of the x-ray field in the plane of the image receptor shall exceed the visible area of the image receptor by more than 3 percent of the SID. The sum of the excess length and the excess width shall be no greater than 4 percent of the SID.

(ii) Compliance shall be determined with the beam axis perpendicular to the image receptor. For rectangular x-ray fields used with circular image reception, the error in alignment shall be determined along the length and width dimensions of the x-ray field which pass through the center of the visible area of the image receptor.

(c) *Spot-film device - certified equipment only.* In addition to other requirements of this section:

(i) Means shall be provided between the source and the patient for adjustment of the x-ray field size in the plane of the film to the size of that portion of the film which has been selected on the spot-film selector. Such adjustment shall be automatically accomplished except when the x-ray field size in the plane of the film is smaller than that of the selected portion of the film.

(ii) It shall be possible to adjust the x-ray field size in the plane of the film to a size smaller than the selected position of the film. The minimum at the greatest SID, shall be equal to or less than 5 by 5 centimeters.

(iii) The center of the x-ray field in the plane of the film shall be aligned with the center of the selected portion of the film to within 2 percent of the SID.

(d) *Additional requirements - certified equipment only.* Certified equipment which does not incorporate an automatic *exposure* control (e.g. automatic brightness control or ionization chamber control) shall not be operable at any combination of tube potential and current which will result in an *exposure* rate in excess of 5 roentgens per minute at the point where the center of beam enters the patient except during recording of fluoroscopic images or when provided with an optional high level control.

(3) *Radiographic systems other than fluoroscopic, dental intraoral, or veterinarian systems.*

(a) *Radiation exposure control devices - timers.* Means shall be provided to terminate the exposure at a preset time interval, a preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition,

(i) Termination of exposure shall cause automatic resetting of the timer to its initial setting or to zero.

(ii) It shall not be possible to make an exposure when the timer is set to a zero or off position if either position is provided.

(iii) Each x-ray control shall be located in such a way as to meet the following criteria:

(A) For stationary x-ray systems it shall be required that the control be permanently mounted in a protected area so that the operator is required to remain in that protected area during the entire exposure (See Appendix B) or,

(B) For mobile and portable x-ray systems which are used for greater than one week in one location (one room or suite) shall meet the requirements of Appendix E, 4(a)(iii)(a) above.

(C) For mobile and portable X-ray systems which are used for more than 1 hour and less than 1 week at one location (one room, or suite) shall meet the requirement of Appendix E, 4(a)(iii)(B) or be provided with a 6.5 foot high protective barrier which is placed at least 6 feet from the tube housing assembly and at least 6 feet from the patient.

(D) For mobile and portable X-ray systems which are used to make an exposure(s) of only one patient at the use location shall meet the requirement of Appendix E, 4(a)(iii)(B) or (C) or to be provided with a method of control which will permit the operator to be at least 12 feet from the tube head assembly during an exposure.

(b) *Additional requirements applicable to certified systems only.* Diagnostic x-ray systems incorporating one or more certified component(s) shall be required to comply with the following requirement(s) which relate to that certified component in addition to other applicable requirements of these regulations:

(i) Reproducibility. The following requirement shall apply when the equipment is operated on an adequate power supply as specified by the manufacturer in accordance with the requirements of applicable federal standards.

(ii) Coefficient of variation. For any specific combination of selected technique factors, the estimated coefficient of variation of radiation exposures shall be no greater than 0.05.

(ii) Linearity. The following requirement applies when the equipment allows a choice of x–ray tube current settings and is operated on a power supply as specified by the manufacturer in accordance with the requirements of applicable federal standards for any fixed x–ray tube potential within the range of 40 percent to 100 percent of the maximum rated.

(iv) Average exposure ratios. The average ratios of *exposure* to the indicated milliampere–seconds product (mR/mAs) obtained at any two consecutive tube current settings shall not differ by more than 0.10 times their sum. This is:

$$\bar{X}_1 - \bar{X}_2 = 0.10\ (\bar{X}_1 + \bar{X}_2)$$

where X_1 (with bar over it) and X_2 (with bar over it) are the average mR/mAs values obtained at each of two consecutive tube current settings.

(v) Accuracy. Deviation of technique factors from indicated values shall not exceed the limits provided for that system by its manufacturer.

(vi) Beam limitation for stationary and mobile general purpose x–ray systems.

(A) When a light localizer is used to defined the x–ray field, it shall provide an average illumination of not less than 160 lux (15 footcandles) at 100 centimeters or at the maximum SID, whichever is less. The average illumination shall be based upon measurements made in the approximate center of each quadrant of the light field.

(B) The edge of the light field at 100 centimeters or at the maximum SID, whichever is less, shall have a contrast ratio, corrected for ambient lighting, of not less than 4 in the case of beam–limiting devices designed for use on stationary equipment, and a contrast ratio of not less than 3 in the case of beam–limiting devices designed for use on mobile equipment. The contrast ratio is defined as I_1/I_2 where I_1 is the illumination 3 millimeters from the edge of the light field toward the center of the field; and I_2 is the illumination 3 millimeters from the edge of the light field away from the center of the field. Compliance shall be determined with a measuring aperture (diameter) of 1 millimeter.

(vii) Beam limitation for portable x–ray systems shall meet the additional field limitation requirements of Appendix E, 4(b)(vi).

(viii) Field limitation and alignment on stationary general purpose x–ray systems.

(A) Means shall be provided for positive beam limitation which will, at the SID for which the device is designed, either cause automatic adjustment of the x–ray field in the plane of the image receptor to the image receptor size within 5 seconds after insertion of the image receptor or, if adjustment is accomplished automatically in a time interval greater than 5 seconds or is manual, will prevent production of x–rays until such adjustment is completed. At SID's at which the device is not intended to operate, the device shall prevent the production of x–rays.

(B) The x–ray field size in the plane of the image receptor, whether automatically or manually adjusted, shall be such that neither the length nor the width of the x–ray field differs from that of the image receptor by greater than 3 percent of the SID and that the sum of the length and width differences without regard to sign be no greater than 4 percent of the SID when the equipment indicates that the beam axis is perpendicular to the plane of the image receptor.

(C) The radiographic system shall be capable of operation, at the discretion of the operator, such that the field size at the image receptor can be adjusted to a size smaller than the image receptor. The minimum field size at a distance of 100 centimeters shall be equal to or less than 5 by 5 centimeters. Return to positive beam limitation as defined in (A) and (B) of this paragraph shall occur upon a change in image receptor.

(D) Positive beam limitation may be bypassed when radiography is conducted which does not use the cassette tray or permanently mounted vertical cassette holder, or when either the beam axis or table angulation is not within 10 degrees of the horizontal or vertical during any part of the exposure, or during stereoscopic radiography. If the bypass mode is provided, return to positive beam limitation shall be automatic.

(E) A capability may be provided for overriding positive beam limitation in the event of system failure or to perform special procedures which cannot be performed in the positive mode. If so provided, a key shall be required to override the positive mode. It shall be impossible to remove the key while the positive mode is overridden.

(4) *Intraoral dental radiography systems.*

(a) *Additional requirements applicable to certified systems only.* Only diagnostic x–ray systems incorporating one or more certified component(s) shall be required to comply with the following requirement(s) which relate to that certified component in addition to other applicable requirements of these regulations.

(i) Reproducibility. The following requirement shall apply when the equipment is operated on an adequate power supply as specified by the manufacturer.

(ii) Coefficient of variation. For any specific combination of selected technique factors, the estimated coefficient of variation of radiation *exposures* shall be no greater than 0.05.

(iii) Linearity. The following requirement applies when the equipment allows a choice of x–ray tube current settings and is operated on a power supply as specified by the manufacturer in accordance with the requirements of applicable federal standards for any fixed x–ray tube potential within the range of 40 percent to 100 percent of the maximum rated.

(iv) Average exposure ratios. The average ratios of *exposure* to the indicated milliampere–seconds product (mR/mAs) obtained at any two consecutive tube current settings shall not differ by more than 0.10 times their sum. This is:

$$\bar{X}_1 - \bar{X}_2 = 0.10\ (\bar{X}_1 + \bar{X}_2)$$

where X_1 (with bar over it) and X_2 (with bar over it) are the average mR/mAs values obtained at each of two consecutive tube current settings.

(v) Accuracy. Deviation of technique factors from indicated values shall not exceed the limits provided for that system by its manufacturer.

(b) *For mobile and portable x-ray systems which are:*

(i) used for greater than 1 week in 1 location (1 room or suite) shall meet the requirements of Appendix E, 4(a)(iii)(A).

(ii) used for more than 1 hour and less than 1 week at 1 location (1 room, or suite) shall meet the requirements of Appendix E, 4(a)(iii)(B) or to be provided with a 6.5 foot high protective barrier which is placed at least 6 feet from the tube housing assembly and at least 6 feet from the patient.

(iii) used to make an exposure(s) of only 1 patient at the use location shall meet the requirement of Appendix E, 4(a)(iii)(B) or (C) or be provided with a method of control which will permit the operator to be at least 12 feet from the tube head assembly during an exposure.

(5) *Therapeutic x-ray installations.*

(a) A filter indication system shall be used on all therapy machines using changeable filters. It shall be designed so as to permit easy recognition of any added filter in place. It shall indicate, from the control panel, the presence or absence of any filter. [Order 1084, Appendix E (codified as WAC 402-28-99002), filed 1/14/76.]

WAC 402-28-99003 Appendix F--Determination of competency. APPENDIX F—Determination of Competency. The following are areas in which the Department of Social and Health Services considers it important that an individual develop expertise for the competent operation of x-ray equipment.

(1) *Familiarization with equipment.*

(a) identification of controls.

(b) function of each control.

(c) suggested settings for routine examinations.

(2) *Radiation protection.*

(a) collimation

(b) filtration

(c) gonad shielding

(d) restriction of x-ray tube radiation to the image receptor.

(e) personnel protection.

(f) grids

(3) *Film processing.*

(a) film speed as relates to patient exposure.

(b) film processing parameters.

(4) *Emergency procedures.*

(a) termination of exposure in event of automatic timing device failure.

The American Society of Radiologic Technologists is in the process of developing a proficiency test. [Order 1084, Appendix F (codified as WAC 402-28-99003), filed 1/14/76.]

WAC 402-28-99004 Appendix G--Information to be submitted by persons proposing to conduct healing arts screening. Persons requesting that the department approve a healing arts screening program shall submit the following information and evaluation:

(1) Name and address of the applicant and, where applicable, the names and addresses of agents within this state.

(2) Diseases or conditions and frequency for which the x-ray examinations are to be used.

(3) Description in detail of the x-ray examinations proposed in the screening program.

(4) Description of the population to be examined in the screening program, i.e., age, sex, physical condition, and other appropriate information.

(5) An evaluation of any known alternate methods not involving ionizing radiation which could achieve the goals of the screening program and why these methods are not used in preference to the x-ray examinations.

(6) An evaluation by a qualified expert of the x-ray system(s) to be used in the screening program. The evaluation by the qualified expert shall show that such system(s) do satisfy all requirements of these regulations.

(7) A description of the diagnostic film quality control program.

(8) A copy of the technique chart for the x-ray examination procedures to be used.

(9) The qualifications of each individual who will be operating the x-ray system(s).

(10) The qualifications of the individual who will be supervising the operators of the x-ray system(s). The extent of supervision and the method of work performance evaluation shall be specified.

(11) The name and address of the individual who will interpret the radiograph(s).

(12) A description of the procedure to be used in advising the individuals screened and their private practitioners of the healing arts of the results of the screening procedure and any further medical needs indicated.

(13) A description of the procedures for the retention or disposition of the radiographs and other records pertaining to the x-ray examinations. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-28-99004, filed 12/8/80.]

Chapter 402-32 WAC
SELECTED USES OF RADIATION IN MEDICAL THERAPY

WAC 402-32-010 Scope. The provisions of this chapter apply to all licensees who use sealed sources in the healing arts and are in addition to, and not in substitution for, other applicable provisions of these regulations. [Order 1084, § 402-32-010, filed 1/14/76; Order

1, § 402-32-010, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-32-020 Interstitial, intracavitary and superficial applications. (1) *Accountability, storage, and handling.*

(a) Except as otherwise specifically authorized by the department, each licensee shall provide accountability of sealed sources and shall keep a record of the issue and return of all sealed sources to their place of storage.

(b) Each licensee shall conduct a quarterly physical inventory to account for all sources and devices received and possessed. Records of the inventories shall be maintained for inspection by the department and shall include the quantities and kinds of radioactive material, location of sources and devices, and the date of the inventory.

(c) Each licensee shall follow the radiation safety and handling instructions approved by the department, the United States Nuclear Regulatory Commission, an agreement state or a licensing state and furnished by the manufacturer on the label attached to the source, device or permanent container thereof, or in the leaflet or brochure which accompanies the source or device, and maintain such instruction in a legible and conveniently available form.

(d) Each licensee shall assure that needless or standard medical applicator cells containing radium-226, or cobalt-60 as wire are not opened while in the licensee's possession unless specifically authorized by a license issued to him by the department.

(2) *Testing sealed sources for leakage and contamination.*

(a) All sealed sources containing more than 100 microcuries of radioactive material with a half-life greater than thirty days, except iridium-192 seeds encased in nylon ribbon, shall be tested for contamination and/or leakage at intervals not to exceed six months or at such other intervals as are approved by the department, the United States Nuclear Regulatory Commission, an agreement state or a licensing state and described by the manufacturer on the label attached to the source, device, or permanent container thereof, or in the leaflet or brochure which accompanies the source or device. Each source or device shall be so tested prior to its first use unless the supplier furnishes a certificate that the source or device has been so tested within six months prior to the transfer.

(b) Leak tests shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample or in the case of radium, the escape of radon at the rate of 0.001 microcurie per twenty-four hours. The test sample shall be taken from the source or from the surfaces of the device in which the source is permanently or semipermanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department.

(c) Any leak test conducted pursuant to WAC 402-32-020(2)(a) which reveals the presence of 0.005 microcurie or more of removable contamination or in the case of radium, the escape of radon at the rate of 0.001 microcurie per twenty-four hours, shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the source from use and cause it to be decontaminated and repaired or to be disposed of in accordance with department regulations. A report shall be filed within five days of the test with the department, describing the equipment involved, the test results, and the corrective action taken.

(3) *Radiation surveys.*

(a) The maximum radiation level at a distance of 1 meter from the patient in whom brachytherapy sources have been inserted shall be determined by measurement or calculation. This radiation level shall be entered on the patient's chart and other signs as required under WAC 402-32-020(4).

(b) The radiation levels in the patient's room and the surrounding area shall be determined, recorded, and maintained for inspection by the department.

(c) The licensee shall assure that patients treated with cobalt-60, cesium-137, iridium-192, or radium-226 implants remain hospitalized until a source count and a radiation survey of the patient confirm that all implants have been removed.

(4) *Signs and records.*

(a) In addition to the requirements of WAC 402-24-090, the bed, cubicle, or room of the hospital brachytherapy patient shall be marked with a sign indicating the presence of brachytherapy sources. This sign shall incorporate the radiation symbol and specify the radionuclide, the activity, date, and the individual(s) to contact for radiation safety instructions. The sign is not required provided the exception in WAC 402-24-095(2) is met.

(b) The following information shall be included in the patient's chart:

(i) The radionuclide administered, number of sources, activity in millicuries and time and date of administration;

(ii) The exposure rate at 1 meter, the time the determination was made, and by whom;

(iii) The radiation symbol; and

(iv) The precautionary instructions necessary to assure that the exposure of individuals does not exceed that permitted under WAC 402-24-020. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-32-020, filed 12/8/80; Order 1084, § 402-32-020, filed 1/14/76; Order 1, § 402-32-020, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-32-030 Teletherapy. (1) *Equipment.*

(a) The housing shall be so constructed that, at one meter from the source, the maximum exposure rate does not exceed ten milliroentgens per hour when the beam control mechanism is in the "off" position. The average exposure rate measured at a representative number of points about the housing, each one meter from the source, shall not exceed two milliroentgens per hour.

(b) For teletherapy equipment installed after the effective date of these regulations, the leakage radiation measured at one meter from the source when the beam

control mechanism is in the "on" position shall not exceed 0.1 percent of the useful beam exposure rate.

(c) Adjustable or removable beam-defining diaphragms shall allow transmission of not more than five percent of the useful beam exposure rate.

(d) The beam control mechanism shall be of a positive design capable of acting in any orientation of the housing for which it is designed to be used. In addition to an automatic closing device, the mechanism shall be designed so that it can be manually returned to the "off" position with a minimum risk of exposure.

(e) The closing device shall be so designed as to return automatically to the "off" position in the event of any breakdown or interruption of the activating force and shall stay in the "off" position until activated from the control panel.

(f) When any door to the treatment room is opened, the beam control mechanism shall automatically and rapidly restore the unit to the "off" position and cause it to remain there until the unit is reactivated from the control panel.

(g) There shall be at the housing and at the control panel a warning device that plainly indicates whether the beam is on or off.

(h) The equipment shall be provided with a locking device to prevent unauthorized use.

(i) The control panel shall be provided with a timer that automatically terminates the exposure after a preset time.

(j) Provision shall be made to permit continuous observation of patients during irradiation.

(k) The treatment room shall be equipped with a radiation monitoring device which shall:

(i) Continuously monitor the condition of the teletherapy beam; and

(ii) Provide a continuous visible signal to the teletherapy unit operator.

(2) *Operation.* Except in the emergency condition when a source fails to retract, no individual shall be in the treatment room during irradiation unless that individual is the patient. Mechanical restraining or supporting devices shall be used for positioning the patient, if necessary.

(3) *Testing for leakage and contamination.* Teletherapy sources shall be tested for leakage and contamination in accordance with the procedures described in WAC 402-32-020(2). Tests of leakage may be made by wiping accessible surfaces of the housing port or collimator while the source is in the "off" position and measuring these wipes for transferred contamination. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-32-030, filed 12/8/80; Order 1084, § 402-32-030, filed 1/14/76; Order 1, § 402-32-030, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-32-100 Special requirements for teletherapy licensees. (1) *Requirement to perform full calibration requirements of teletherapy units.*

(a) Any licensee authorized under WAC 402-22-070 to use teletherapy units for treating humans shall cause full calibration measurements to be performed on each teletherapy unit:

(i) Prior to the first use of the unit for treating humans:

(A) Whenever spot-check measurements indicate that the output value differs by more than five percent from the value obtained at the last full calibration corrected mathematically for physical decay;

(B) Following replacement of the radiation source or following reinstallation of the teletherapy unit in a new location;

(C) Following any repair of the teletherapy unit that includes removal of the source or major repair of the components associated with the source exposure assembly; and

(D) At intervals not exceeding one year.

(b) Full calibration measurements required by paragraph (a) of this subsection shall include determination of:

(i) The exposure rate or dose rate to an accuracy within ±3 percent for the range of field sizes and for the range of distances (or for the axis distance) used in radiation therapy;

(ii) The congruence between the radiation field and the field indicated by the light beam localizing device;

(iii) The uniformity of the radiation field and its dependence upon the orientation of the useful beam;

(iv) Timer accuracy; and

(v) The accuracy of all distance measuring devices used for treating humans.

(c) Full calibration measurements shall be made in accordance with the procedures recommended by the Scientific Committee on Radiation Dosimetry of the American Association of Physicists in Medicine (Physics in Medicine and Biology, Vol. 16, No. 3, 1971, pp. 379-386).[1]

(d) The exposure rate or dose rate values determined in paragraph (b)(i) of this subsection shall be corrected mathematically for physical decay for intervals not exceeding one month.

(e) Full calibration measurements required by paragraph (a) of this subsection and physical decay corrections required by paragraph (d) of this subsection shall be performed by an expert qualified by training and experience in accordance with WAC 402-32-100(4).

(2) *Requirement to perform periodic spot-check measurements of teletherapy units.*

(a) Any licensee authorized under WAC 402-22-070(4) to use teletherapy units for treating humans shall cause spot-check measurements to be performed on each teletherapy unit at intervals not exceeding one month.

(b) Spot-check measurements required by paragraph (a) of this subsection shall include determination of:

(i) Timer accuracy;

(ii) The congruence between the radiation field and the field indicated by the light beam localizing device;

(iii) The accuracy of all distance measuring devices used for treating humans;

(iv) The exposure rate, dose rate, or a quantity related in a known manner to these rates for one typical set of operating conditions; and

(v) The difference between the measurement made in paragraph (b) of this subsection and the anticipated output, expressed as a percentage of the anticipated output (i.e., the value obtained at last full calibration corrected mathematically for physical decay).

(c) Spot–check measurements required by paragraph (a) of this subsection shall be performed in accordance with procedures established by an expert qualified by training and experience in accordance with WAC 402–32–100(4). (A qualified expert need not actually perform the spot–check measurements.) If a qualified expert does not perform the spot–check measurements, the results of the spot–check measurements shall be reviewed by a qualified expert within fifteen days.

(3) *Requirement to calibrate instruments used for full calibration and spot–check measurements.*

(a) Full calibration measurements required by WAC 402–32–100(1) shall be performed using a dosimetry system that has been calibrated by the National Bureau of Standards or by a Regional Calibration Laboratory accredited by the American Association of Physicists in Medicine. The dosimetry system shall have been calibrated within the previous two years and after any servicing that may have affected system calibration.

(b) Spot–check measurements required by WAC 402–32–100(2) shall be performed using a dosimetry system that has been calibrated in accordance with paragraph (a) of this subsection. Alternatively, a dosimetry system used solely for spot–check measurements may be calibrated by direct intercomparison with a system that has been calibrated in accordance with paragraph (a) of this subsection. This alternative calibration method shall have been performed within the previous one year and after each servicing that may have affected system calibration. Dosimetry systems calibrated by this alternative method shall not be used for full calibration measurements. The use of thermoluminescent dosimeter does not satisfy the requirements of this section.

(4) *Qualified expert.* The licensee shall determine if a person is an expert qualified by training and experience to calibrate a teletherapy unit and establish procedures for (and review the results of) spot–check measurements. The licensee shall determine that the qualified expert:

(a) Is certified by the American Board of Radiology in Therapeutic Radiological Physics, Radiological Physics, Roentgen–Ray and Osmina–Ray Physics, or X–ray and Radium Physics; or

(b) Has the following minimum training and experience:

(i) A Master's or Doctor's degree in physics, biophysics, radiological physics or health physics;

(ii) One year of full–time training in therapeutic radiological physics; and

(iii) One year of full–time experience in a radiotherapy facility including personal calibration and spot–check of at least one teletherapy unit.

(5) *Records.*

The licensee shall maintain, for inspection by the department, records of the measurements, tests, corrective actions, and instrument calibrations made under WAC 402–32–100 (1) and (2) and records of the licensee's evaluation of the qualified expert's training and experience made under WAC 402–32–100(4).

(a) Records of (i) full calibration measurements and (ii) calibration of instruments used to make these measurements shall be preserved for five years after completion of the full calibration.

(b) Records of (i) spot check measurements and corrective actions and (ii) calibration of instruments used to make spot check measurements shall be preserved for two years after completion of the spot check measurements and corrective actions.

(c) Records of the licensee's evaluation of the qualified expert's training and experience shall be preserved for five years after the qualified expert's last performance of a full calibration of the licensee's teletherapy unit.

[1]Licensees that have their teletherapy units calibrated by persons who do not meet these criteria for minimum training and experience may require a license amendment excepting them from the requirements of WAC 402–32–100(4). The request should include the name of the proposed qualified expert, a description of his training and experience including information similar to that specified in report of at least one calibration and spot–check program based on measurements personally made by the proposed expert within the last 10 years and written endorsement of the technical qualifications of the proposed expert from personal knowledge by a physicist certified by the American Board of Radiology in one of the specialties listed in. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–32–100, filed 12/8/80.]

Chapter 402–36 WAC
SPECIAL REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS

WAC

WAC 402-36-010 Purpose. The regulations in this chapter establish radiation safety requirements for persons utilizing sources of radiation for industrial radiography. The requirements of this part are in addition to and not in substitution for the other requirements of these regulations. [Order 1084, § 402-36-010, filed 1/14/76; Order 1, § 402-36-010, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-020 Scope. The regulations in this chapter apply to all licensees or registrants who use sources of radiation for industrial radiography; provided, however, that nothing in this part shall apply to the use of sources of radiation in the healing arts. [Order 1084, § 402-36-020, filed 1/14/76; Order 1, § 402-36-020, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-025 Definitions. As used in this part:

(1) "Enclosed radiography" means industrial radiography employing radiation machines conducted in an enclosed cabinet or room and includes cabinet radiography and shielded room radiography.

(a) "Cabinet radiography" means industrial radiography employing radiation machines conducted in an enclosure or cabinet so shielded that every location at the exterior meets the conditions specified in WAC 402-24-040 of these regulations.

(i) "Cabinet x-ray system" means an x-ray system with the x-ray tube installed in an enclosure (hereinafter termed "cabinet") which, independently of existing architectural structure except the floor on which it may be placed, is intended to contain at least that portion of a material being irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of x radiation. Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities. An x-ray tube used within a shielded part of a building, or x-ray equipment which may temporarily or occasionally incorporate portable shielding is not considered a cabinet x-ray system.

(b) "Shielded-room radiography" means industrial radiography conducted in a room so shielded that every location on the exterior meets the conditions specified in WAC 402-24-040 of these regulations.

(2) "Industrial radiography" means the examination of the macroscopic structure of materials by nondestructive methods utilizing sources of radiation. Industrial radiography as used in this chapter does not include well logging operations.

(3) "Permanent radiographic installation" means a shielded installation or structure designed or intended for radiography employing a radiographic exposure device and in which radiography is regularly performed.

(4) "Personal supervision" means supervision by a radiographer such that the radiographer is physically present at the radiography site and in such proximity that communication can be maintained and immediate assistance given as required. When a radiographer's assistant is using or handling sources of radiation, the radiographer must maintain direct surveillance.

(5) "Radiographer" means any individual who performs or who, in attendance at the site where sources of radiation are being used, personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of these regulations and all license conditions.

(6) "Radiographer's assistant" means any individual who, under the personal supervision of a radiographer, uses sources of radiation, related handling tools, or radiation survey instruments in industrial radiography.

(7) "Radiographic exposure device" means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure.

(8) "Shielded position" means the location within the radiographic exposure device or storage container which, by manufacturers design, is in one proper location for storage of the sealed source.

(9) "Source changer" means a device designed and used for replacement of sealed sources in radiographic exposure devices, including those also used for transporting and storage of sealed sources.

(10) "Storage container" means a device in which sealed sources are transported or stored.

(11) Temporary job site refers to any location which is not specifically authorized and described in a license or registration. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-025, filed 12/8/80; Order 1084, § 402-36-025, filed 1/14/76.]

WAC 402-36-030 Equipment control. Limits on levels of radiation for radiographic exposure devices and storage containers:

(1) Radiographic exposure devices measuring less than four inches from the sealed source storage position to any exterior surface of the device shall have no radiation level in excess of fifty milliroentgens per hour (50mR/hr) at six inches from any exterior surface of the device.

(2) Radiographic exposure devices measuring a minimum of four inches from the sealed source storage position to any exterior surface of the device, and all storage containers for sealed sources or outer containers for radiographic exposure devices, shall have no radiation level in excess of two hundred milliroentgens per hour (200mR/hr) at any exterior surface, and ten milliroentgens per hour (10mR/hr) at one meter from any exterior surface.

(3) The radiation levels specified are with the sealed source in the shielded (i.e., "off") position. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-030, filed 12/8/80; Order 1084, § 402-36-030, filed 1/14/76; Order 1, § 402-36-030, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-040 Locking of radiographic exposure devices. (1) Each radiographic exposure device shall be provided with a lock or outerlocked container designed to prevent unauthorized or accidental production of radiation or removal or exposure of a sealed source and shall be locked when returned to the shielded position at all times. In addition, during radiographic operations the sealed source assembly shall be locked in the shielded position each time the source is returned to that position.

(2) Each sealed source storage container and source changer shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers shall be kept locked when containing sealed sources except when under the direct surveillance of a radiographer or a radiographer's assistant.

(3) Radiographic exposure devices source changers, and storage containers, prior to being moved from one location to another and also prior to being secured at a given location, shall be locked and surveyed to assure that the sealed source is in the shielded position. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-040, filed 12/8/80; Order 1084, § 402-36-040, filed 1/14/76; Order 1, § 402-36-040, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-050 Storage precautions. Locked radiographic exposure devices and storage containers shall be physically secured to prevent tampering or removal by unauthorized personnel. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-050, filed 12/8/80; Order 1084, § 402-36-050, filed 1/14/76; Order 1, § 402-36-050, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-060 Radiation survey instruments. (1) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by this part and chapter 402-24 WAC. Instrumentation required by this section shall have a range such that two milliroentgens per hour through one roentgen per hour can be measured.

(2) Each radiation survey instrument shall be calibrated:

(a) At energies appropriate for use and at intervals not to exceed three months and after each instrument servicing;

(b) Such that accuracy within ± 20 percent can be demonstrated; and

(c) At two or more widely separated points, other than zero, on each scale.

(3) Records shall be maintained of these calibrations for two years after the calibration date for inspection by the department. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-060, filed 12/8/80; Order 1084, § 402-36-060, filed 1/14/76; Order 1, § 402-36-060, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-070 Leak testing, repair, tagging, opening, modification, and replacement of sealed sources. (1) The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing, repair, tagging, opening, or any other modification of any sealed source shall be performed only by persons specifically authorized to do so by the department, the U.S. Nuclear Regulatory Commission, or any Agreement State.

(2) Each sealed source shall be tested for leakage at intervals not to exceed 6 months. In the absence of a certificate from a transferor that a test has been made within the 6 month period prior to the transfer, the sealed source shall not be put into use until tested and results obtained.

(3) The leak test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the sealed source. An acceptable leak test for sealed sources in the possession of a radiography licensee would be to test at the nearest accessible point to the sealed source storage position, or other appropriate measuring point, by a procedure to be approved pursuant to WAC 402-22-070(5)(e). Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department for two years after the leak test is performed or until the sealed source is transferred or disposed of, whichever comes first.

(4) Any test conducted pursuant to paragraphs (2) and (3) of this section which reveals the presence of 0.005 microcurie or more of removable radioactive material shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall cause it to be decontaminated and repaired or to be disposed of, in accordance with regulations of the department. Within 5 days after obtaining results of the test, the licensee shall file a report with the department describing the involved equipment, the test results, and the corrective action taken.

(5) A sealed source which is not fastened to or contained in a radiographic exposure device shall have permanently attached to it a durable tag at least one inch square bearing the prescribed radiation caution symbol in conventional colors magenta or purple on a yellow background, and at least the instructions: "Danger – Radioactive Material – Do Not Handle – Notify Civil Authorities if Found." [Statutory Authority: RCW 70-.98.050. 81-01-011 (Order 1570), § 402-36-070, filed 12/8/80; Order 1084, § 402-36-070, filed 1/14/76; Order 1, § 402-36-070, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-080 Quarterly inventory. Each licensee shall conduct a quarterly physical inventory to account for all sealed sources received or possessed. The records of the inventories shall be maintained for two years from the date of inventory for inspection by the department and shall include the quantities and kinds of radioactive material, the location of sealed sources, and the date of the inventory device model, serial number and sealed source – serial number. [Statutory Authority:

RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-080, filed 12/8/80; Order 1084, § 402-36-080, filed 1/14/76; Order 1, § 402-36-080, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-090 Utilization logs. (1) Each licensee and/or registrant shall maintain current logs, which shall be kept available for inspection by the department for two years from the date of the recorded event, at the address specified in the license showing for each radiation exposure device the following information:

(a) A description (or make and model number) of each radiation exposure device or storage container in which the sealed source is located:

(b) The identity of the radiographer to whom assigned; and

(c) Locations where used and dates of use.

(2) The requirements of subsection (1) shall not apply in industrial radiography utilizing radiation machines in enclosed interlocked cabinets or rooms which are not occupied during radiographic operations, which are equipped with interlocks such that the radiation machine will not operate unless all openings are securely closed and which is so shielded that every location on the exterior meets conditions for an unrestricted area, as specified in WAC 402-24-040.

(3) A separately identified utilization log is not required if the equivalent information is available in records of the licensee or registrant and available at the address specified in the license. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-090, filed 12/8/80; Order 1084, § 402-36-090, filed 1/14/76; Order 1, § 402-36-090, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-095 Inspection and maintenance of radiographic exposure devices, storage containers and source changers. (1) The licensee shall conduct a program for inspection and maintenance of radiographic exposure devices, storage containers and source changers at intervals, not to exceed three months or prior to first use thereafter to assure proper functioning of components important to safety. Records of these inspections and maintenance shall be kept for two years.

(2) The licensee shall check for obvious defects in radiographic exposure devices, storage containers, and source changers prior to use each day the equipment is used.

(3) If any inspection conducted pursuant to WAC 402-36-095(1) reveals damage to components critical to radiation safety, the device shall be removed from service until repairs have been made.

(4) Any maintenance performed on radiographic exposure devices and accessories shall be in accordance with the manufacturer's specifications. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-095, filed 12/8/80; Order 1084, § 402-36-095, filed 1/14/76.]

WAC 402-36-100 Limitations--Personal radiation safety requirements for radiographers and radiographers' assistants. (1) No licensee or registrant shall permit any individual to act as a radiographer as defined in this chapter until such individual:

(a) Has been instructed in the subjects outlined in WAC 402-36-160;

(b) Has received copies of and instruction in the regulations contained in this part and the applicable sections of appropriate license(s), and the licensee's or registrant's operating and emergency procedures, and shall have demonstrated understanding thereof;

(c) Has demonstrated competence to use the source of radiation, related handling tools, and radiation survey instruments which will be employed in the individual's assignment; and

(d) Has demonstrated understanding of the instructions in this paragraph by successful completion of written test and a field examination on the subjects covered.

(2) No licensee or registrant shall permit any individual to act as a radiographer's assistant as defined in this part until such individual:

(a) Has received copies of and instruction in the licensee's or registrant's operating and emergency procedures;

(b) Has demonstrated competence to use under the personal supervision of the radiographer the sources of radiation, related handling tools, and radiation survey instruments which will be employed in the individual's assignment;

(c) Has demonstrated understanding of the instructions in this paragraph by successfully completing a written or oral test and a field examination on the subjects covered; and

(d) Records of the above training including copies of written tests and dates of oral tests and field examinations shall be maintained for three years.

(3) Each licensee or registrant shall maintain, for inspection by the department, records of training and testing which demonstrate that the requirements of WAC 402-36-100(1) and (2) and 402-22-070(5)(a) are met. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-100, filed 12/8/80; Order 1084, § 402-36-100, filed 1/14/76; Order 1, § 402-36-100, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-110 Operating and emergency procedures. The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:

(1) The handling and use of sources of radiation to be employed such that no individual is likely to be exposed to radiation doses in excess of the limits established in chapter 402-24 WAC Standards for Protection Against Radiation;

(2) Methods and occasions for conducting radiation surveys;

(3) Methods for controlling access to radiographic areas;

(4) Methods and occasions for locking and securing sources of radiation;

(5) Personnel monitoring and the use of personnel monitoring equipment including steps that must be taken immediately by radiography personnel in the event a pocket dosimeter is found to be off-scale;

(6) Transportation to field locations, including packing of sources of radiation in the vehicles, posting of vehicles, and control of sources of radiation during transportation;

(7) Minimizing exposure of individuals in the event of an accident;

(8) The procedure for notifying proper personnel in the event of a thief, loss, over exposure or accident involving sources of radiation;

(9) Maintenance of records; and

(10) The inspection and maintenance of radiographic exposure devices and storage containers. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-110, filed 12/8/80; Order 1084, § 402-36-110, filed 1/14/76; Order 708, § 402-36-110, filed 8/24/72; Order 1, § 402-36-110, filed 7/2/71; Order 1, § 402-36-110, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-120 Personnel monitoring control. (1) No licensee or registrant shall permit any individual to act as a radiographer or as a radiographer's assistant unless, at all times during radiographic operations, each such individual shall wear a film or TLD badge and either a direct reading pocket dosimeter. Pocket dosimeters shall be capable of measuring doses from zero to at least 200 milliroentgens. A film or TLD badge shall be assigned to and worn by only one individual.

(2) Pocket dosimeters and pocket chambers shall be read and doses recorded daily. Pocket dosimeters shall be charged at the beginning of each working day. Pocket dosimeters shall be checked at periods not to exceed one year for correct response to radiation. Acceptable dosimeters shall read within plus or minus 30 percent of the true radiation exposure. A film or TLD badge shall be immediately processed if a pocket dosimeter is discharged beyond its range during normal use. The film or TLD badge reports received from the film or TLD badge processor and records of pocket dosimeter readings shall be maintained for inspection by the department until it authorizes their disposal.

(3) The requirements for use of pocket dosimeter or pocket chamber shall not apply in industrial radiography utilizing radiation machines in enclosed interlocked cabinets or rooms which are not occupied during radiographic operations, which are equipped with interlocks such that the radiation machine will not operate unless all openings are securely closed and which are so shielded that every location on the exterior meets conditions for an unrestricted area, as specified in WAC 402-24-040. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-120, filed 12/8/80; Order 1084, § 402-36-120, filed 1/14/76; Order 1, § 402-36-120, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-125 Supervision of radiographers' assistants. Whenever a radiographer's assistant uses radiographic exposure devices, uses sealed sources or related source handling tools, or conducts radiation surveys required by WAC 402-36-150(2), (3), or (4) to determine that the sealed source has returned to the shielded position after an exposure, he shall be under the personal supervision, as defined in WAC 402-36-025(8), by a radiographer. The personal supervision shall include (1) the radiographer's personal presence at the site where the sealed sources are being used, (2) the ability of the radiographer to give immediate assistance if required, and (3) the radiographer to observe the performance of his/her assistant during the operations referred to in this section. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-125, filed 12/8/80.]

WAC 402-36-130 Security--Precautionary procedures in radiographic operations. (1) During each radiographic operation, the radiographer or radiographer's assistant shall maintain a direct surveillance of the operation to protect against unauthorized entry into a high radiation area, as defined in chapter 402-12 WAC except:

(a) Where the high radiation area is equipped with a control device or alarm system as described in WAC 402-24-090(1)(e)(ii) or

(b) Where the high radiation area is locked to protect against unauthorized or accidental entry.

(2) When not in operation or when not under direct surveillance, portable radiation exposure devices and mobile or portable radiation machines shall be physically secured to prevent removal by unauthorized personnel. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-130, filed 12/8/80; Order 1084, § 402-36-130, filed 1/14/76; Order 1, § 402-36-130, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-140 Posting. Notwithstanding any provisions in paragraph WAC 402-24-095 areas in which radiography is being performed or in which a radiographic exposure device is being stored shall be conspicuously posted and access to the area shall be controlled as required by WAC 402-24-090. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-140, filed 12/8/80; Order 1084, § 402-36-140, filed 1/14/76; Order 1, § 402-36-140, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-150 Radiation surveys and survey records. (1) No radiographic operation shall be conducted unless calibrated and operable radiation survey instrumentation as described in WAC 402-36-060 is available and used at each site where radiographic exposures are made.

(2) A physical radiation survey shall be made after each radiographic exposure utilizing radiographic exposure devices or sealed sources of radioactive material to determine that the sealed source has been returned to its shielded position. The entire circumference of the radiographic exposure device shall be surveyed. If the radiographic exposure device has a source guide tube, the survey shall include the guide tube.

(3) A physical radiation survey shall be made to determine that each sealed source is in its shielded condition prior to securing the radiographic exposure device or storage container as specified in WAC 402-36-040.

(4) A physical radiation survey shall be made of the boundary of the restricted area during radiographic operations not employing shielded room radiography. The maximum survey reading at the boundary shall be recorded. The records shall indicate approximate distance from source to boundaries, whether or not the exposed source is collimated and any occupied areas with exposure levels greater than 2 mR in any hour during radiographic operations.

(5) Records required by paragraphs (3) and (4) of this section shall be maintained for inspection by the department for two years after completion of the survey. If the survey was used to determine an individual's exposure, however, the records of the survey shall be maintained until the department authorizes their disposition. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-150, filed 12/8/80; Order 1084, § 402-36-150, filed 1/14/76; Order 1, § 402-36-150, filed 1/8/69; Rules (part), filed 10/26/66.]

WAC 402-36-153 Records required at temporary job sites. Each licensee or registrant conducting industrial radiography at a temporary site shall have the following records available at that site for inspection by the department:

(1) Appropriate license;

(2) Operating and emergency procedures;

(3) Applicable regulations;

(4) Survey records required pursuant to WAC 402-36-150 for the period of operation at the site;

(5) Daily pocket dosimeter records for the period of operation at the site;

(6) The latest instrument calibration and leak test record for specific devices in use at the site. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-153, filed 12/8/80.]

WAC 402-36-155 Special requirements for enclosed radiography. (1) Systems for enclosed radiography designed to allow admittance of individuals during x-radiation generation shall:

(a) Comply with all applicable requirements of chapter 402-36 WAC and WAC 402-24-040 of these regulations.

(b) Be evaluated at intervals not to exceed one year to assure compliance with the applicable requirements as specified in WAC 402-36-155(1)(a).

Records of these evaluations shall be maintained for inspection by the department for a period of two years after the evaluation.

(2) Cabinet x-ray systems designed to exclude individuals during x-radiation are exempt from the requirements of chapter 402-36 WAC except that:

(a) Operating personnel must be provided with either a film badge or a thermoluminescent dosimeter and reports of the results must be maintained for inspection by the department.

(b) No registrant shall permit any individual to operate a cabinet x-ray system until such individual has received a copy of and instruction in the operating procedures for the unit and has demonstrated competence in its use. Records which demonstrate compliance with this subparagraph shall be maintained for inspection by the department until disposition is authorized by the department.

(c) Tests for proper operation of high radiation area control devices or alarm systems, where applicable, must be conducted at the beginning of each day of use and recorded.

(d) The registrant shall perform an evaluation, at intervals not to exceed one year, to determine conformance with WAC 402-24-040 of these regulations.

Records of these evaluations shall be maintained for inspection by the department for a period of two years after the evaluation. [Statutory Authority: RCW 70.98-.050. 81-01-011 (Order 1570), § 402-36-155, filed 12/8/80; Order 1084, § 402-36-155, filed 1/14/76.]

WAC 402-36-157 Special requirements for permanent radiographic installation. Permanent radiographic installations having high radiation area entrance controls of the types described in WAC 402-24-090(1)(e)(ii) or where the high radiation area is locked to protect against unauthorized or accidental entry, shall also meet the following special requirement.

(1) Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation to which this section applies shall have both visible and audible warning signals to warn of the presence of radiation. The visible signal shall be actuated by radiation whenever the source is exposed. The audible signal shall be actuated when an attempt is made to enter the installation while the source is exposed.

(2) The alarm system shall be tested prior to the first use of the source in the installation and thereafter at intervals not to exceed three months. Records of the tests shall be kept for two years. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-157, filed 12/8/80.]

WAC 402-36-160 Appendix A--Minimum subjects to be covered in training radiographers. (1) *Fundamentals of radiation safety*

(a) Characteristics of ionizing radiation

(b) Units of radiation dose (mrem) and quantity of radioactivity (curie)

(c) Hazards of exposure to radiation

(i) Radiation protection standards

(ii) Biological effects of radiation dose

(d) Levels of radiation from sources of radiation

(e) Methods of controlling radiation dose

(i) Working time

(ii) Working distances

(iii) Shielding

(2) *Radiation detection instrumentation to be used*

(a) Use of radiation survey instruments

(i) Operation

(ii) Calibration

(iii) Limitations
(b) Survey techniques
(c) Use of personnel monitoring equipment
(i) Film badges
(ii) Pocket dosimeters
(iii) Thermoluminescent dosimeters
(3) *Radiographic equipment to be used*
(a) Remote handling equipment
(b) Radiographic exposure devices and sealed sources
(c) Storage containers
(d) Operation and control of x-ray equipment
(4) *The requirements of pertinent federal and state regulations*
(5) *The licensee's or registrant's written operating and emergency procedures*
(6) *Case histories of radiography accidents* [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-36-160, filed 12/8/80; Order 1084, § 420-36-160, filed 1/14/76; Order 1, § 402-36-160, filed 1/8/69; Rules (part), filed 10/26/66.]

Chapter 402-40 WAC
RADIATION SAFETY REQUIREMENTS FOR ANALYTICAL X-RAY EQUIPMENT

WAC

WAC 402-40-010 Purpose and scope. This chapter provides special requirements for analytical x-ray equipment. The requirements of this chapter are in addition to, and not in substitution for, applicable requirements in other chapters of these regulations. [Order 1084, § 402-40-010, filed 1/14/76.]

WAC 402-40-020 Definitions. (1) "Analytical x-ray equipment" means equipment used for x-ray diffraction or fluorescence analysis.

(2) "Analytical x-ray system" means a group of components utilizing x-rays to determine the elemental composition or to examine the microstructure of materials.

(3) "Fail-safe characteristics" mean a design feature which causes beam port shutters to close, or otherwise prevents emergence of the primary beam, upon the failure of a safety or warning device.

(4) "Local components" mean parts of an analytical x-ray system and include areas that are struck by x-rays such as radiation source housings, ports and shutter assemblies, collimators, sample holders, cameras, goniometers, detectors, and shielding, but do not include power supplies, transformers, amplifiers, readout devices, and control panels.

(5) "Normal operating procedures" mean step-by-step instructions necessary to accomplish the analysis. These procedures shall include sample insertion and manipulation, equipment alignment, routine maintenance by the registrant, and data recording procedures which are related to radiation safety.

(6) "Open-beam configuration" means a mode of operation of an analytical x-ray system in which an individual could accidentally place some part of their body into the primary beam during normal operation if no further safety devices are incorporated.

(7) "Primary beam" means ionizing radiation which passes through an aperture of the source housing via a direct path from the x-ray tube located in the radiation source housing. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-40-020, filed 12/8/80; Order 1084, § 402-40-020, filed 1/14/76.]

WAC 402-40-030 Equipment requirements. (1) *Safety device.* A device which prevents the entry of any portion of an individual's body into the primary x-ray beam path, or which causes the beam to be shut off upon entry into its path, shall be provided for all open-beam configurations. A registrant or licensee may apply to the department for an exemption from the requirement of a safety device. Such application shall include:

(a) A description of the various safety devices that have been evaluated;

(b) The reason each of these devices cannot be used; and

(c) A description of the alternative methods that will be employed to minimize the possibility of an accidental exposure, including procedures to assure that operators and others in the area will be informed of the absence of safety devices.

(2) *Warning devices.* Open-beam configurations shall be provided with a readily discernible indication of:

(a) X-ray tube status (ON-OFF) located near the radiation source housing, if the primary beam is controlled in this manner and at or near the port and/or

(b) Shutter status (OPEN-CLOSED) located near each port on the radiation source housing, if the primary beam is controlled in this manner.

(c) Warning devices shall be labeled so that their purpose is easily identified and the devices shall be conspicuous at the beam port. On new equipment installed after January 1, 1976, warning devices shall have fail-safe characteristics.

(3) *Ports.* Unused ports on radiation source housings shall be secured in the closed position in a manner which will prevent casual opening. Such security requirement will be deemed met if the beam port cannot be opened without the use of tools not part of the closure for units installed after January 1, 1981.

(4) *Labeling.* All analytical x-ray equipment shall be labeled with a readily discernible sign or signs bearing the radiation symbol and the words:

(a) "CAUTION - HIGH INTENSITY X-RAY BEAM," or words having a similar intent, on the x-ray source housing; and

(b) "CAUTION RADIATION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED," or words having a similar intent, near any

switch that energizes an x–ray tube if the radiation source is an x–ray tube; or

(c) "CAUTION – RADIOACTIVE MATERIAL," or words having a similar intent, on the source housing if the radiation source is a radionuclide.

(5) *Shutters.* On new equipment employing open–beam configurations installed after January 1, 1981, each port on the radiation source housing shall be equipped with a shutter that cannot be opened unless a collimator or a coupling has been connected to the port.

(6) *Warning lights.* An easily visible warning light labeled with the words "X–RAY ON," or words having a similar intent, shall be located:

(a) Near any switch that energizes an x–ray tube and near any x–ray port and shall be illuminated only when the tube is energized; or

(b) In the case of a radioactive source, near any switch that opens a housing shutter, and shall be illuminated only when the shutter is open.

(c) On equipment installed after January 1, 1981, warning lights shall have fail–safe characteristics.

(7) *Radiation source housing.* Each x–ray tube housing shall be so constructed that with all shutters closed the leakage radiation measured at a distance of 5 cm from its surface is not capable of producing a dose equivalent in excess of 2.5 mrem in one hour at any specified tube rating. If radioactive sources are used, corresponding dose limits shall not exceed 2.5 mrem per hour.

(8) *Generator cabinet.* Each x–ray generator shall be supplied with a protective cabinet which limits leakage radiation measured at a distance of 5 cm from its surface such that it is not capable of producing a dose equivalent in excess of 0.25 mrem in one hour. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–40–030, filed 12/8/80; Order 1084, § 402–40–030, filed 1/14/76.]

WAC 402–40–040 Facility requirements. (1) *Radiation levels.* The local components of an analytical x–ray system shall be located and arranged and shall include sufficient shielding or access control such that no radiation levels exist in any area surrounding the local component group which could result in a dose to an individual present therein in excess of the dose equivalent limits given in WAC 402–24–040 of these regulations. For systems utilizing x–ray tubes, these levels shall be met at any specified tube rating.

(2) *Surveys.* Radiation surveys, as required by WAC 402–24–085 of all analytical x–ray systems, sufficient to show compliance with WAC 402–40–040(1), shall be performed:

(a) Upon installation of the equipment, and at least once every twelve months thereafter;

(b) Following any change in the initial arrangement, number, or type of local components in the system;

(c) Following any maintenance requiring the disassembly or removal of a local component in the system;

(d) During the performance of maintenance and alignment procedures if the procedures require the presence of a primary x–ray beam when any local component in the system is disassembled or removed;

(e) Any time a visual inspection of the local components in the system reveals an abnormal condition; and

(f) Whenever personnel monitoring devices required in WAC 402–40–060(2)show a significant increase over the previous monitoring period or the readings are approaching 1/10 of the hands and forearm limit specified in WAC 402–24–020.

(g) Radiation survey measurements shall not be required if a registrant or licensee can demonstrate compliance to the satisfaction of the department with WAC 402–40–040(1) in some other manner.

(3) *Posting.* Each area or room containing analytical x–ray equipment shall be conspicuously posted with a sign or signs bearing the radiation symbol and the words "CAUTION – X–RAY EQUIPMENT," or words having a similar intent. [Statutory Authority: RCW 70.98-.050. 81–01–011 (Order 1570), § 402–40–040, filed 12/8/80; Order 1084, § 402–40–040, filed 1/14/76.]

WAC 402–40–050 Operating requirements. (1) *Procedures.* Routine operating procedures shall be written and available to all analytical x–ray equipment workers. No person shall be permitted to operate analytical x–ray equipment in any manner other than that specified in the procedures unless such person has obtained written approval of the radiation safety officer.

(2) *Bypassing.* No person shall bypass a safety device unless such person has obtained the written approval of the radiation safety officer. Such approval shall be for a specified period of time. When a safety device has been bypassed, a readily discernible sign bearing the words "SAFETY DEVICE NOT WORKING," or words having a similar intent, shall be placed on the radiation source housing. The requirements set forth in WAC 402–40–030(1) shall also be met. [Statutory Authority: RCW 70.98.050. 81–01–011 (Order 1570), § 402–40–050, filed 12/8/80; Order 1084, § 402–40–050, filed 1/14/76.]

WAC 402–40–060 Personnel requirements. (1) *Instruction.* No person shall be permitted to operate or maintain analytical x–ray equipment unless such person has received instruction in and demonstrated competence as to:

(a) Identification of radiation hazards associated with the use of the equipment;

(b) Significance of the various radiation warning and safety devices incorporated into the equipment, or the reasons they have not been installed on certain pieces of equipment and the extra precautions required in such cases;

(c) Proper operating procedures for the equipment;

(d) Symptoms of an acute localized exposure; and

(e) Proper procedures for reporting an actual or suspected exposure.

(2) *Personnel monitoring.* Finger or wrist dosimetric devices shall be provided to and shall be used by:

(a) Analytical x-ray equipment workers using systems having an open-beam configuration and not equipped with a safety device; and

(b) Personnel maintaining analytical x-ray equipment if the maintenance procedures require the presence of a primary x-ray beam when any local component in the analytical x-ray system is disassembled or removed.

(c) Reported dose values shall not be used for the purpose of determining compliance with WAC 402-24-020 of these regulations unless evaluated by a qualified expert. [Order 1084, § 402-40-060, filed 1/14/76.]

Chapter 402-44 WAC
RADIATION SAFETY REQUIREMENTS FOR PARTICLE ACCELERATORS

WAC

WAC 402-44-010 Purpose and scope. (1) This chapter establishes procedures for the registration and the use of particle accelerators.

(2) In addition to the requirements of this chapter, all registrants are subject to the requirements of chapters 402-10, 402-12, 402-16, 402-24, and 402-48 WAC. Registrants engaged in industrial radiographic operations are also subject to the requirements of chapter 402-36 WAC and registrants engaged in the healing arts are also subject to the requirements of chapter 402-28 WAC and/or chapter 402-32 WAC of these regulations. Registrants engaged in the production of radioactive material are also subject to the requirements of chapters 402-19 and 402-22 WAC. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-010, filed 12/8/80; Order 1084, § 402-44-010, filed 1/14/76.]

WAC 402-44-020 Registration requirements. No person shall receive, possess, use, transfer, own, or acquire a particle accelerator except as authorized in a registration issued pursuant to these regulations or as otherwise provided for in these regulations. The general procedures for registration of particle accelerator facilities are included in chapter 402-16 WAC of these regulations. [Order 1084, § 402-44-020, filed 1/14/76.]

WAC 402-44-030 General requirements for the issuance of a registration for particle accelerators. (Refer to chapter 402-16 WAC). In addition to the requirement of chapter 402-16 WAC a registration application for use of a particle accelerator will be approved only if the department determines that:

(1) The applicant is qualified by reason of training and experience to use the accelerator in question for the purpose requested in accordance with this chapter in such a manner as to minimize danger to public health and safety or property;

(2) The applicant's proposed equipment, facilities, operating and emergency procedures are adequate to protect health and minimize danger to public health and safety or property;

(3) The issuance of the registration will not be inimical to the health and safety of the public, and the applicant satisfies any applicable special requirement in WAC 402-44-040;

(4) The applicant has appointed a qualified radiation safety officer;

(5) The applicant and/or the staff has substantial experience in the use of particle accelerators and training sufficient for the intended uses;

(6) The applicant has established a radiation safety committee to approve, in advance, proposals for uses of particle accelerators, whenever deemed necessary by the department; and

(7) The applicant has an adequate training program for particle accelerator operators. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-030, filed 12/8/80; Order 1084, § 402-44-030, filed 1/14/76.]

WAC 402-44-040 Human use of particle accelerators. In addition to the requirements set forth in chapter 402-16 WAC a certificate of registration for use of a particle accelerator in the healing arts will be issued only if:

(1) Whenever deemed necessary by the department, the applicant has appointed a medical committee of at least three members to evaluate all proposals for research, diagnostic, and therapeutic use of a particle accelerator. Membership of the committee should include physicians expert in internal medicine, hematology, therapeutic radiology, and a person experienced in depth dose calculations and protection against radiation;

(2) The individuals designated on the application as the users have substantial training and experience in deep therapy techniques or in the use of particle accelerators to treat humans; and

(3) The individual designated on the application as the user must be a physician. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-040, filed 12/8/80; Order 1084, § 402-44-040, filed 1/14/76.]

WAC 402-44-050 General provisions. (1) This section establishes radiation safety requirements for the use of particle accelerators. The provisions of this section are in addition to, and not in substitution for, other applicable provisions of the regulations.

(2) The registrant shall be responsible for assuring that all requirements of this chapter are met. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), §

402-44-050, filed 12/8/80; Order 1084, § 402-44-050, filed 1/14/76.]

WAC 402-44-060 Limitations. (1) No registrant shall permit any person to act as a particle accelerator operator until such person:

(a) Has been instructed in radiation safety and shall have demonstrated an understanding thereof;

(b) Has received copies of and instruction in this chapter and the applicable requirements of chapters 402-24 and 402-48 WAC, pertinent registration conditions and the registrant's operating and emergency procedures, and shall have demonstrated understanding thereof;

(c) Has demonstrated competence to use the particle accelerator, related equipment, and survey instruments which will be employed in the individual's assignment; and

(2) The registrant shall maintain records which demonstrate compliance with the requirements of WAC 402-44-060(1).

(3) Either the radiation safety committee or the radiation safety officer shall have the authority to terminate the operations at a particle accelerator facility if such action is deemed necessary to protect health and minimize danger to public health and safety or property. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-060, filed 12/8/80; Order 1084, § 402-44-060, filed 1/14/76.]

WAC 402-44-070 Shielding and safety design requirements. (1) A qualified expert, specifically accepted by the department, shall be consulted in the design of a particle accelerator installation and called upon to perform a radiation survey when the accelerator is first capable of producing radiation.

(2) Each particle accelerator installation shall be provided with such primary and/or secondary barriers as are necessary to assure compliance with WAC 402-24-020 and WAC 402-24-040. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-070, filed 12/8/80; Order 1084, § 402-44-070, filed 1/14/76.]

WAC 402-44-080 Particle accelerator controls and interlock systems. (1) Instrumentation, readouts and controls on the particle accelerator control console shall be clearly identified and easily discernible.

(2) All entrances into a target room or other high radiation area shall be provided with interlocks that shut down the machine under conditions of barrier penetration.

(3) When a radiation safety interlock system has been tripped, it shall only be possible to resume operation of the accelerator by manually resetting controls at the position where the interlock has been tripped, and lastly at the main control console.

(4) Each safety interlock shall be on a circuit which shall allow its operation independently of all other safety interlocks.

(5) All safety interlocks shall be fail safe, i.e., designed so that any defect or component failure in the interlock system prevents operation of the accelerator.

(6) A "scram" button or other emergency power cutoff switch shall be located and easily identifiable in all high radiation areas. Such a cutoff switch shall include a manual reset so that the accelerator cannot be restarted from the accelerator control console without resetting the cutoff switch. [Statutory Authority: RCW 70.98-.050. 81-01-011 (Order 1570), § 402-44-080, filed 12/8/80; Order 1084, § 402-44-080, filed 1/14/76.]

WAC 402-44-090 Warning devices. (1) All locations designated as high radiation areas (except inside treatment rooms designed for human exposure) and entrances to all locations designated as high radiation areas shall be equipped with easily observable flashing or rotating warning lights that operate when, and only when, radiation is being produced.

(2) Except in facilities designed for human exposure, each high radiation area shall have an audible warning device which shall be activated for 15 seconds prior to the possible creation of such high radiation area. Such warning device shall be clearly discernible in all high radiation areas. The registrant shall instruct all personnel in the vicinity of the particle accelerator as to the meaning of this audible warning signal.

(3) Barriers, temporary or otherwise, and pathways leading to high radiation areas shall be identified in accordance with WAC 402-24-090. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-090, filed 12/8/80; Order 1084, § 402-44-090, filed 1/14/76.]

WAC 402-44-100 Operating procedures. (1) Particle accelerators, when not in operation, shall be secured to prevent unauthorized use.

(2) Only a switch on the accelerator control console shall be routinely used to turn the accelerator beam off and on. The safety interlock system shall not be used to turn off the accelerator beam except in an emergency, or as required in WAC 402-44-100(3).

(3) All safety and warning devices, including interlocks, shall be checked for proper operation at intervals not to exceed three months and after maintenance on such safety and warning devices. Results of such tests shall be maintained for inspection at the accelerator facility.

(4) Electrical circuit diagrams of the accelerator, and the associated interlock systems, shall be kept current and maintained for inspection by the department and available to the operator at each accelerator facility.

(5) If, for any reason, it is necessary to bypass a safety interlock or interlocks intentionally, such action shall be:

(a) Authorized by the radiation safety committee and/or radiation safety officer;

(b) Recorded in a permanent log and a notice posted at the accelerator control console; and

(c) Terminated as soon as possible.

(6) A copy of the current operating and the emergency procedures shall be maintained at the accelerator control panel. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-100, filed 12/8/80; Order 1084, § 402-44-100, filed 1/14/76.]

WAC 402-44-110 Radiation monitoring requirements. (1) There shall be available at each particle accelerator facility, appropriate portable monitoring equipment which is operable and has been calibrated for the appropriate radiations being produced at the facility. Such equipment shall be tested for proper operation daily and calibrated at intervals not to exceed six months, and after each servicing and repair.

(2) A radiation protection survey shall be performed and documented by a qualified expert specifically approved by the department when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.

(3) Except for facilities designed for human exposure, radiation levels in all high radiation areas shall be continuously monitored. The monitoring devices shall be electrically independent of the accelerator control and interlock systems and capable of providing a remote and local readout with visual and/or audible alarms at both the control panel and at entrance to high radiation areas, and other appropriate locations, so that people entering or present become aware of the existence of the hazard.

(4) All area monitors shall be calibrated at intervals not to exceed six months, and after each servicing and repair. Records of calibration shall be maintained by the facility for a minimum of two years.

(5) Whenever applicable, periodic surveys shall be made to determine the amount of airborne particulate radioactivity present in areas of airborne hazards.

(6) Whenever applicable, periodic smear surveys shall be made to determine the degree of contamination in target and other pertinent areas.

(7) All area surveys shall be made in accordance with the written procedures established by a qualified expert, or the radiation safety officer of the particle accelerator facility.

(8) Records of all radiation protection surveys, calibration results, instrumentation tests, and smear results shall be kept current and on file at each accelerator facility. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-110, filed 12/8/80; Order 1084, § 402-44-110, filed 1/14/76.]

WAC 402-44-120 Ventilation systems. (1) Means shall be provided to ensure that personnel are not exposed to airborne radioactive materials in excess of those limits specified in WAC 402-24-030, for restricted areas and WAC 402-24-050, for unrestricted areas.

(2) A registrant as required by WAC 402-24-050 shall not vent, release or otherwise discharge airborne radioactive material to an uncontrolled area which exceed the limits specified in WAC 402-24-220 Appendix A - Table II, except as authorized pursuant to WAC 402-24-135 or WAC 402-24-050(2). For purposes of this paragraph, concentrations may be averaged over a period not greater than one year. Every reasonable effort should be made to maintain releases of radioactive material to uncontrolled areas, as far below these limits as practicable. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-44-120, filed 12/8/80; Order 1084, § 402-44-120, filed 1/14/76.]

Chapter 402-48 WAC
NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS BY LICENSEES OR REGISTRANTS--INSPECTIONS

WAC

WAC 402-48-010 Purpose and scope. This chapter establishes requirements for notices, instructions and reports by licensees or registrants to individuals engaged in work under a license or registration and options available to such individuals in connection with department inspections of licensees or registrants to ascertain compliance with the provisions of the act and regulations, orders and licenses issued thereunder regarding radiological working conditions. The regulations in this chapter apply to all persons who receive, possess, use, own or transfer a source of radiation licensed by or registered with the department pursuant to the regulations in chapters 402-16 402-19 and 402-22 WAC. The definitions contained in WAC 402-12-050 also apply to this chapter. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-48-010, filed 12/8/80; Order 1084, § 402-48-010, filed 1/14/76.]

WAC 402-48-020 Posting of notices to workers. (1) Each licensee or registrant shall post current copies of the following documents:

(a) The regulations in this chapter and in chapter 402-24 WAC;

(b) The license, certificate of registration, conditions or documents incorporated into the license by reference and amendments thereto;

(c) The operating procedures applicable to work under the license or registration;

(d) Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, order issued pursuant to chapter 402-12 WAC, or any response from the licensee or registrant.

(2) If posting of a document specified in WAC 402-48-020(1)(a), (b), or (c) is not practicable, the licensee or registrant may post a notice which describes the document and states where it may be examined.

(3) Department Form RHF-3 "Notice to Employees", shall be posted by each licensee or registrant wherever individuals work in or frequent any portion of a restricted area.

(4) Documents, notices or forms posted pursuant to this section shall appear in a sufficient number of places to permit individuals engaged in work under the license or registration to observe them on the way to or from any particular work location to which the document applies, shall be conspicuous, and shall be replaced if defaced or altered.

(5) Department documents posted pursuant to WAC 402-48-020(1)(d) shall be posted within five working days after receipt of the documents from the department; the licensee's or registrant's response, if any, shall be posted for a minimum of five working days after dispatch from the licensee or registrant. Such documents shall remain posted for a minimum of five working days or until action correcting the violation has been completed, whichever is later. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-48-020, filed 12/8/80; Order 1084, § 402-48-020, filed 1/14/76.]

WAC 402-48-030 Instructions to workers. (1) All individuals working in or frequenting any portion of a restricted area:

(a) Shall be kept informed of the storage, transfer, or use of sources of radiation in such portions of the restricted area;

(b) Shall be instructed in the health protection considerations associated with exposure to radiation or radioactive material, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed;

(c) Shall be instructed in, and instructed to observe, to the extent within the worker's control, the applicable provisions of these regulations and licenses for the protection of personnel from exposures to radiation or radioactive material occurring in such areas;

(d) Shall be instructed as to their responsibility to report promptly to the licensee or registrant any condition which may lead to or cause a violation of the act, these regulations, and licenses or unnecessary exposure to radiation or radioactive material;

(e) Shall be instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material; and

(f) Shall be advised as to the radiation exposure reports which workers shall be furnished pursuant to WAC 402-48-040.

(2) The extent of these instructions shall be commensurate with potential radiological health protection considerations in the restricted area. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-48-030, filed 12/8/80; Order 1084, § 402-48-030, filed 1/14/76.]

WAC 402-48-040 Notifications and reports to individuals. (1) Radiation exposure data for an individual and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual shall be reported to the individual as specified in this section. The information reported shall include data and results obtained pursuant to these regulations, orders, and license conditions, as shown in records maintained by the licensee or registrant pursuant to these regulations. Each notification and report shall:

(a) Be in writing;

(b) Include appropriate identifying data such as the name of the licensee or registrant, the name of the individual, and the individual's social security number;

(c) Include the individual's exposure information; and

(d) Contain the following statement:

> "This report is furnished to you under the provisions of the Washington State Department of Social and Health Services, Radiation Control Section, Rules and Regulations for Radiation Protection. You should preserve this report for further reference."

(2) Each licensee or registrant shall advise each worker annually of the worker's exposure to radiation or radioactive material as shown in records maintained by the licensee or registrant pursuant to WAC 402-24-170(1) and (3).

(3) At the request of a worker formerly engaged in work controlled by the licensee or the registrant, each licensee or registrant shall furnish to each worker or former worker a report of the worker's exposure to radiation or radioactive material upon termination. Such report shall be furnished within 30 days from the time the request is made, or within 30 days after the exposure of the individual has been determined by the licensee or registrant, whichever is later; shall cover, within the period of time specified in the request, each calendar quarter in which the worker's activities involved exposure to radiation from radioactive material licensed by, or radiation machines registered with the department; and shall include the dates and locations of work under the license or registration in which the worker participated during this period.

(4) When a licensee or registrant is required pursuant to WAC 402-24-200 to report to the department any exposure of an individual to radiation or radioactive material, the licensee or the registrant shall also provide the individual a report on the individual's exposure data included therein. Such reports shall be transmitted at a time not later than the transmittal to the department.

(5) In addition to the requirements of WAC 402-48-040(3), at the request of a worker who is terminating employment in a given calendar quarter with the licensee or registrant in work involving radiation dose, or of a worker who, while employed by another person, is terminating assignment to work involving radiation dose in the licensee's facility in that calendar quarter, each licensee or registrant shall provide to each such worker, or to the worker's designee, at termination, a written report regarding the radiation dose received by that

worker from operations of the licensee or registrant during that specifically identified calendar quarter or fraction thereof, or provide a written statement of that dose if the finally determined personnel monitoring results are not available at that time. Estimated doses shall be clearly indicated as such. [Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-48-040, filed 12/8/80; Order 1084, § 402-48-040, filed 1/14/76.]

WAC 402-48-050 Presence of representatives of licensees or registrants and workers during inspection. (1) Each licensee or registrant shall afford to the Department at all reasonable times opportunity to inspect materials, machines, activities, facilities, premises, and records pursuant to these regulations.

(2) During an inspection, Department inspectors may consult privately with workers as specified in WAC 402-48-060. The licensee or registrant may accompany Department inspectors during other phases of an inspection.

(3) If, at the time of inspection, an individual has been authorized by the workers to represent them during Department inspections, the licensee or registrant shall notify the inspectors of such authorization and shall give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions.

(4) Each workers' representative shall be routinely engaged in work under control of the licensee or registrant and shall have received instructions as specified in WAC 402-48-030.

(5) Different representatives of licensees or registrants and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one workers' representative at a time may accompany the inspectors.

(6) With the approval of the licensee or registrant and the workers' representative an individual who is not routinely engaged in work under control of the licensee or registrant, for example, a consultant to the licensee or registrant or to the workers' representative, shall be afforded the opportunity to accompany Department inspectors during the inspection of physical working conditions.

(7) Notwithstanding the other provisions of this section, Department inspectors are authorized to refuse to permit accompaniment by any individual who deliberately interferes with a fair and orderly inspection. With regard to any area containing proprietary information, the workers' representative for that area shall be an individual previously authorized by the licensee or registrant to enter that area. [Order 1084, § 402-48-050, filed 1/14/76.]

WAC 402-48-060 Consultation with workers during inspections. (1) Department inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of Department regulations and licenses to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection.

(2) During the course of an inspection any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which the worker has reason to believe may have contributed to or caused any violation of the Act, these regulations, or license condition, or any unnecessary exposure of an individual to radiation from licensed radioactive material or a registered radiation machine under the licensee's or registrant's control. Any such notice in writing shall comply with the requirements of WAC 402-48-070(1).

(3) The provisions of WAC 402-48-060(2) shall not be interpreted as authorization to disregard instructions pursuant to WAC 402-48-030. [Order 1084, § 402-48-060, filed 1/14/76.]

WAC 402-48-070 Requests by workers for inspections. (1) Any worker or representative of workers who believes that a violation of the Act, of these regulations, or of license conditions exists or has occurred in work under a license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by giving notice of the alleged violation to the Washington State Department of Social and Health Services, Radiation Control Unit. Any such notice shall be in writing, shall set forth the specific grounds for the notice, and shall be signed by the worker or representative of the workers. A copy shall be provided to the licensee or registrant by the Radiation Control Unit no later than at the time of inspection except that, upon the request of the worker giving such notice, his name and the name of individuals referred to therein shall not appear in such copy or on any record published, released, or made available by the Department, except for good cause shown.

(2) If, upon receipt of such notice, the inspector for the Radiation Control Unit determines that the complaint meets the requirements set forth in WAC 402-48-070(1), and that there are reasonable grounds to believe that the alleged violation exists or has occurred, the inspector shall cause an inspection to be made as soon as practicable, to determine if such alleged violation exists or has occurred. Inspections pursuant to this section need not be limited to matters referred to in the complaint.

(3) No licensee or registrant shall discharge or in any manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under these regulations or has testified or is about to testify in any such proceeding or because of the exercise by such worker on behalf of the worker or other workers of any option afforded by this chapter. [Order 1084, § 402-48-070, filed 1/14/76.]

WAC 402-48-080 Inspections not warranted--Informal review. (1) If the Department of Social and Health Services, Radiation Control Unit determines, with respect to a complaint under WAC 402-48-070

that an inspection is not warranted because there are no reasonable grounds to believe that a violation exists or has occurred, the Radiation Control Unit shall notify the complainant in writing of such determination.

(a) If the complaint resulted from activities concerning naturally occurring, accelerator produced, radioactive materials and/or radiation producing machines: The complainant may obtain review of such determination by submitting a written statement of position to the Supervisor, Industrial Safety and Health, P.O. Box 207, Olympia, Washington 98504. Such request for informal review will be processed according to the provisions of WAC 296-350-460 and the provisions of the Interagency Agreement between the Department of Labor and Industries and the Department of Social and Health Services, Radiation Control Unit, if any.

(b) If the complaint resulted from activities concerning byproduct material, source material, and/or special nuclear material: The complainant may obtain review of such determination by submitting a written statement of position with the Department of Social and Health Services, Health Services Division, who will provide the licensee or registrant with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant. The licensee or registrant may submit an opposing written statement of position with the Department of Social and Health Services, Health Services Division, who will provide the complainant with a copy of such statement by certified mail. Upon the request of the complainant, the Department of Social and Health Services, Health Services Division, may hold an informal conference in which the complainant and the licensee or registrant may orally present their views. An informal conference may also be held at the request of the licensee or registrant, but disclosure of the identity of the complainant will be made only following receipt of written authorization from the complainant. After considering all written or oral views presented, the Department of Social and Health Services, Health Services Division, shall affirm, modify, or reverse the determination of the Radiation Control Unit and furnish the complainant and the licensee or registrant a written notification of the decision and the reason therefor.

(2) If the Radiation Control Unit determines that an inspection is not warranted because the requirements of WAC 402-48-070(1) have not been met, it shall notify the complainant in writing of such determination. Such determination shall be without prejudice to the filing of a new complaint meeting the requirements of WAC 402-48-070(1). [Order 1084, § 402-48-080, filed 1/14/76.]

Chapter 402-52 WAC
URANIUM AND/OR THORIUM MILL OPERATION AND STABILIZATION OF MILL TAILING PILES

WAC

WAC 402-52-005 Reclamation and decommissioning. A specific plan for reclamation and disposal of tailings and for decommissioning the site of uranium or thorium milling operations shall be included as part of the proposed action assessed under SEPA regulations and guidelines as required by WAC 402-22-070(6)(a) for licensing of environmentally significant operations. For any uranium or thorium mill in operation on or before the effective date of this regulation for which a plan for reclamation and disposal of tailings and decommissioning of the site has not been submitted and assessed, such a plan must be submitted to the department and a final environmental impact statement or final declaration of nonsignificance must accompany or precede the license renewal. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-52-005, filed 11/30/79, effective 1/1/80.]

WAC 402-52-010 Uranium and thorium mill tailing piles and ponds--Control. All uranium and thorium mill tailing piles and ponds shall be controlled in the following manner:

(1) Access to the pile area shall be controlled by the operator or owner and properly posted.

(2) The pile shall be maintained in such a manner that hazardous erosion of, or environmental hazard from, radioactive materials does not occur.

(3) Tailing piles shall be surrounded by a fence of sufficient size and strength to prevent range animals from gaining entry.

(4) Tailings should be stabilized as much as practicably achievable during operation to preclude off-site hazards and to minimize the extent of final stabilization.

(5) All plans for stabilization of mill tailings shall be submitted to the department for review prior to construction. The department may, however, require further controls at a future date after approval of such plans.

(6) The operator or owner shall cause regular monitoring of the milling site, the mill tailings, and adjacent areas to be made to determine environmental concentration of radioactive materials. The tailings pile or pond and associated diversion channels shall be inspected regularly to assure continued integrity of the stabilization or impoundment system and also immediately following any natural or man-made occurrence which could affect the integrity of the stabilization or effectiveness of the diversion channel. Maintenance needed to restore the system or diversion channels to their original effectiveness shall be performed as soon as possible. Records shall be maintained of all monitoring, inspection, and maintenance activities connected with this requirement.

(7) Steps should be taken to control dusting from dry surfaces of the tailings impoundment area or storage areas so as to keep releases of airborne radioactive effluents as low as is reasonably achievable below the limits specified in chapter 402-24 WAC.

(8) With the exception of use at a mill or for reprocessing at the site or another location, prior written approval of the department must be obtained before any tailings material is removed from any active or inactive mill.

(9) The department may waive individual requirements in regard to stabilization or utilization of tailings material if it can be shown that they are unnecessary or impracticable in specific areas. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-52-010, filed 11/30/79, effective 1/1/80; Order 1095, § 402-52-010, filed 2/6/76.]

WAC 402-52-015 Proposed tailing disposal facilities. (1) New tailing piles shall be located in areas of low population. Consideration should be given to the utilization of existing large tailings piles for the disposal of waste from small operations such as in situ extraction or heap leaching.

(2) The site shall be located such that disruption and dispersion by natural forces are eliminated or reduced to the maximum extent reasonably achievable. In particular, the site should be:

(a) Removed from set or dry water courses and located in an area with minimal upstream drainage with adequate provisions made for preventing surface run-off water from entering or eroding embankments;

(b) Sufficiently removed from permanent water courses to avoid contamination in event of flooding or failure of embankments;

(c) Sufficiently removed from water supplies to avoid seepage or contamination;

(d) Provided with upstream rainfall catchment areas or diversion channels to minimize or divert the maximum possible flooding; and

(e) Located where the topography provides good wind protection.

(3) The tailing shall be disposed below grade except where it can be demonstrated that an above-grade disposal program will provide reasonably equivalent isolation of the tailings from natural erosional forces.

(4) A tailings impoundment shall not be located near a potentially active fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand.

(5) The tailings impoundment should be designed to incorporate features which will promote deposition enhancing the thickness of the impoundment structure.

(6) Steps shall be taken to reduce seepage of toxic material into groundwater by:

(a) Lining the tailings impoundment area;

(b) Reducing the inventory of liquid in the impoundment by such means as dewatering and/or recycling water from the tailings impoundment to the mill;

(c) Neutralization of the tailings to promote immobilization of toxic materials; and/or

(d) Lining and/or compaction of ore storage areas.

(7) Preoperational monitoring shall be conducted for at least one full year prior to any major site construction.

(8) The requirements of WAC 402-52-010 and 402-52-020 shall also be met. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-52-015, filed 11/30/79, effective 1/1/80.]

WAC 402-52-020 Inactive mills--Stabilization procedures. All uranium mill tailing piles and ponds from inactive mills shall be stabilized prior to termination of the license such that ongoing active maintenance is not necessary to preserve isolation in the following manner:

(1) Ponds shall be drained and covered with materials that prevent wind erosion. Liquid drained from the ponds shall be disposed of in compliance with WAC 402-24-220, Appendix A, Table II, Col. 2.

(2) Taking into consideration the types of materials at each site, piles shall be leveled and graded so that there is, insofar as possible, a gradual slope to ensure that there shall be no low places on the pile where water might collect. Side slopes shall be stabilized by riprap, dikes, reduction of grades, vegetation, or any other method or combination of methods that will ensure stabilization. Sufficient natural cover shall be placed over tailings or wastes at the end of milling operations to result in a calculated reduction in surface exhalation of radon from the tailings or waste to less than two picocuries per square meter per second above natural background levels. Direct gamma exposure from the tailings or waste should be reduced to background levels. Plastic or other synthetic caps should not be used to reduce radon exhalation from the tailings or waste. Material used for cover must be essentially the same as far as radioactivity is concerned, as that of surrounding soils.

(3) If pile edges are adjacent to a river, creek gulch or other watercourse that might reasonably be expected to erode the edges during periods of high water, the exposed slopes shall be stabilized and the edges shall be diked and riprapped sufficiently to prevent erosion of the pile.

(4) Drainage ditches shall be provided around the pile edges sufficient to prevent surface runoff water from neighboring land from reaching and eroding the pile.

(5) The pile shall be stabilized against wind and water erosion. The method of stabilization may consist of vegetation or a cover of soil, soil containing rock or stone, rock or stone, cement or concrete products, petroleum products, or any other soil stabilization material presently recognized or which may be recognized in the future, or any combination of the foregoing as may be required for proper protection from wind, or water erosion.

(6) Where vegetation is used for pile stabilization, sufficient topsoil shall be placed to prevent plant uptake of the radioactive materials contained in the pile.

(7) The requirements of WAC 402-52-010 shall also be met. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-52-020, filed 11/30/79, effective 1/1/80; Order 1095, § 402-52-020, filed 2/6/76.]

WAC 402-52-025 Milling operations. (1) Milling operations shall be conducted so as to avoid site contamination and so that all airborne effluent releases are

reduced to as low as is reasonably achievable below the limits specified in chapter 402–24 WAC.

(2) Yellowcake drying and packaging operations should cease when effluent control devices are inoperative or not working at their reasonably expected best performance levels.

(3) The licensee shall have written operating procedures documenting steps to be taken to control dusting from the tailings pile and ore storage areas, and steps to be taken when effluent control devices are inoperative or not working at their reasonably expected best performance levels. [Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–52–025, filed 11/30/79, effective 1/1/80.]

Chapter 402–70 WAC
SCHEDULE OF FEES

WAC

WAC 402–70–010 Purpose and scope. This chapter establishes fees charged for licensing and inspection services rendered by the Radiation Control Program as authorized under section 3, chapter 110, Laws of 1979 1st ex. sess. These fees apply to owners and operators of uranium or thorium milling operations and their associated tailings or waste. [Statutory Authority: RCW 70-.98.080. 79–12–073 (Order 1459), § 402–70–010, filed 11/30/79, effective 1/1/80.]

WAC 402–70–020 Definitions. As used in this chapter, the following definitions apply:

(1) "Administrative amendment" means one that is routine in nature or has no health, safety or environmental significance.

(2) "Application" means a completed RHF–1 or equivalent with supporting documentation requesting the department to grant authority to receive, possess, use, transfer, own or acquire radioactive materials.

(3) "Department" means the department of social and health services which has been designated as the state radiation control agency.

(4) "Inspection" means an official examination or observation by the department including but not limited to tests, surveys and monitoring to determine compliance with rules, regulations, orders, requirements and conditions of the department.

(5) "License" means a license issued by the department in accordance with the regulations adopted by the department.

(6) "Major amendment" means one requiring evaluation of many aspects of licensed activities where the proposed action could present a potential risk to the public health and safety or which requires an environmental impact statement.

(7) "Minor amendment" means one where health, safety or environmental considerations may be easily resolved or an environmental impact statement is not required. [Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–70–020, filed 11/30/79, effective 1/1/80.]

WAC 402–70–030 Payment of fees. (1) *Application fees:* Each application for which a fee is prescribed shall be accompanied by a remittance in the full amount of the fee. No application will be processed prior to payment of the full amount specified. Applications for which no remittance is received may be returned to the applicant. All application fees will be charged irrespective of the department's disposition of the application or of a withdrawal of the application.

(2) *License fees:* A fee to cover the cost of the independent environmental assessment plus any cost of an extensive program review not covered by the application fee will be payable upon notification by the department when the review of the project is complete. The license fee will not exceed that specified in WAC 402–70–070. The fee must be received prior to issuance of the license.

(3) *Amendment fees:* The appropriate amendment fees shall accompany the application for amendment. The department will examine the expenditures for professional manpower and appropriate support services and will, where applicable, refund any overcharges or bill the applicant for the additional amendment fee. In no event will the fee exceed that specified in WAC 402–70–070(1). The fee for administrative amendments is a fixed charged. Unilateral amendments or amendments which result from written department requests may be exempted from these fees at the discretion of the department when the amendment is issued for the convenience of the department.

(4) *Renewal fees:* The renewal fee shall accompany the renewal application. Upon completion of the program review, the department will examine the expenditures for professional manpower and appropriate support services and will, where applicable, refund any overcharges.

(5) *Inspection fees:* An annual fee shall be charged to cover the cost of inspections for determining compliance with the provisions of the license including the manpower, laboratory and support services costs associated with the routine environmental monitoring undertaken. The department will examine the expenditures for professional manpower and appropriate support services and will, when applicable, refund any overcharges. In no event will the annual fee exceed that specified in WAC 402–70–070(2). [Statutory Authority: RCW 70.98.080. 79–12–073 (Order 1459), § 402–70–030, filed 11/30/79, effective 1/1/80.]

WAC 402–70–050 Method of payment. (1) Fee payments shall be by check, draft or money order made payable to the department of social and health services.

(2) Fees are due and payable upon submission of the application for license, license renewal or amendment, or upon notification by the department.

(3) The provisions of subsection (2) of this section notwithstanding, the department may enter into an agreement with any applicant or licensee to prorate any or all fees which may be required on whatever frequency or payment schedule which may be mutually satisfactory. Such agreement may provide for adjustments in the amount of the periodic payments to compensate for actual costs to the department for program review. The agreement shall be renewed in conjunction with each license renewal. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-70-050, filed 11/30/79, effective 1/1/80.]

WAC 402-70-070 Fees for licensing and compliance actions. (1) Licenses specifically authorizing the receipt, possession or use of natural uranium and its decay daughters for the extraction of uranium or thorium compound and for the reclamation and disposal of the associated tailings or waste shall be subject to the following fees for the listed licensing actions.

(a) Application fee	$ 27,000
(b) License fee	$ 165,000
(c) Amendment fee	
Major	$ 10,000
Minor	$ 800
Administrative	$ 85
(d) Renewal fee	$ 10,000

(2) Licenses specifically authorizing the receipt, possession, or use of natural uranium and its decay daughters for the extraction of uranium or thorium compound and for the reclamation and disposal of the associated tailings or waste shall be subject to an annual inspection fee of ninety thousand dollars to cover the cost of monitoring for compliance with the terms and conditions of the license. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-70-070, filed 11/30/79, effective 1/1/80.]

WAC 402-70-090 Failure by applicant or licensee to pay prescribed fees. In any case where the department finds that an applicant or a licensee has failed to pay a prescribed fee required by this chapter, the department will not process any application and may suspend or revoke any license or approval involved or may issue an order with respect to licensed activities as the department determines to be appropriate or necessary in order to carry out the provisions of this chapter. [Statutory Authority: RCW 70.98.080. 79-12-073 (Order 1459), § 402-70-090, filed 11/30/79, effective 1/1/80.]

Chapter 402-990 WAC
FORMS——APPLICATIONS FOR RADIOACTIVE MATERIAL LICENSE

Reviser's note: Forms set forth within this chapter were filed by the then Department of Health on January 8, 1969, entitled "Instructions for preparation of Application for radioactive material license", (Forms RHF-1, RHF-2, RHF-3, RHF-4, RHF-5, RHF-14-1, RHF-14-2).

STATE OF WASHINGTON

INSTRUCTIONS FOR PREPARATION OF APPLICATION FOR RADIOACTIVE MATERIAL LICENSE Forms RHF-1 and RHF-2

GENERAL INFORMATION

An applicant for a "Radioactive Material License" should complete Form RHF-1 in detail. The applicant should endeavor to cover his entire radioisotope program with one application, if possible. However, separate applications should be submitted for medical teletherapy and gamma irradiators. Supplemental sheets may be appended when necessary to provide complete information. *Item 16 must be completed on all applications. Submission of an incomplete application will often result in delay in issuance of the license because of the correspondence necessary to obtain information requested on the application.*

The Form RHF-2 should also be completed each time a medical request is made for a human use of radioisotopes. *Two copies* of the completed Form RHF 1 (and RHF-2 if a medical application) should be sent to the Washington State Department of Health, Radiation Control Agency, Smith Tower, Seattle, Washington 98104. One copy should be retained for the applicant's file.

COMPLETE EVERY ITEM — LEAVE NO BLANKS

EXPLANATION OF FORM RHF-1

Item No.

1 (a) The "applicant" is the organization or person legally responsible for possession and use of the radioactive material specified in the application.
(b) Indicate other address(es) at which radioactive material will be used if different from that listed in 1 (a). A post office box number is not acceptable.

2 The "department" is the department or similar subdivision where the radioactive material will be used.

3 Self-explanatory.

4 The "individual user" is the person experienced in use and safe handling of radioisotopes. *If the application is for "human use," the individual user must be a physician licensed by the State of Washington to dispense drugs in the practice of medicine and have extensive experience for each proposed clinical use.*

5 Self-explanatory.

6 (a) List by name each radioisotope desired, such as "Carbon 14," "Cobalt 60," etc.
(b) List chemical and/or physical form for *each* radioisotope and the quantity of *each* which the applicant desires to possess at any one time. If more than one chemical or physical form of a particular radioisotope is desired, a *separate* possession limit should be stated for each form. For example, an applicant desiring to use two chemical forms of Iodine 131 must specify both forms and a possesison limit for *each* form. Example:

Iodine 131	Iodide	10 millicuries
Iodine 131	Iodinated Human Serum Albumin	1 millicurie
Krypton 85	Gas	1000 millicuries

If the radioactive material is to be obtained as a sealed source(s), specify the manufacturer, model number, and amount of activity in *each* sealed source. Example:

Cobalt 60	3 Sealed Sources, 100 mci each (Iso Corp. Model Z-54)	300 millicuries

7 State the use of each radioactive material and chemical form specified in Item 6 (a) and (b). If the radioisotope is for "human use," *do not complete this item; complete Form RHF-2-Supplement A—Human Use.*

8- 9 These items must be completed for *each* individual named in Item 4. If more than one individual is listed in Item 4, clearly key the name of each individual to his experience.

10-16 Self-explanatory.

(over)

EXPLANATION OF FORM RHF-2-SUPPLEMENT A—HUMAN USE

Item No.

1 Self-explanatory.

2 Self-explanatory.

3 State Regulations provide that the using physician have substantial experience in the proposed use, the handling and administration of radioisotopes and, where applicable, the clinical management of radioactive patients. The physician must furnish suitable evidence of such experience with his application. Supplement A—Human Use—Page 3 is provided for conveniently presenting these details.

4 Name or describe each clinical use for each radioisotope and chemical form administered. List radiological protection procedures to be followed in sufficient detail to permit a realistic evaluation of the potential radiological hazards.

5 (a) Dosage for treatment of patients will depend upon the clinical judgment of the responsible physician; the State is only interested in the *proposed dosage range.*
(b) For experimental programs or new and unusual uses, the maximum single dose of radiomaterial to be administered should be included and the approximate number and frequency of such doses. Rationale for unusually high dosages should be presented. The proposed use should be outlined in detail demonstrating that radiological health safety to the patient will not be jeopardized. If the use duplicates, or is based on, a use reported in the technical literature, an abstract of such a report or article and a brief statement as to how such use will be followed or modified will suffice.

6 Radioisotopes furnished by AEC facilities are pharmaceutically UNREFINED. An applicant should include information regarding processing or standardization procedure if radioactive material will not be obtained in precalibrated form for oral administration or precalibrated and sterilized form for parenteral administration.

7 Self-explanatory.

8 (a) Give the name and address(es) of the hospital(s) which will admit your patients that have been administered radioisotopes.
(b) Submit a copy of the radiological protection instructions furnished to the hospital personnel regarding the care of patients to whom radioisotopes have been administered. Attach also a list of radiation instruments you will make available to the hospital.

9 (a), (b) To be completed by using physician.

10, 11, 12 It is recommended that these items be completed by the applicant physician's preceptor in the medical use of radioisotopes. The preceptoring physician is usually the chairman of the medical isotopes committee of the institution where clinical experience was acquired. However, the preceptor may be a staff physician experienced in the clinical use of radioisotopes under whom the using physician's radioisotope training and experience was acquired. If possible, the using physician's entire clinical radioisotope experience should be included. Additional comments may be presented in the space provided on page 4.

NOTE.—*For Medical-Institutional Type Program*

1 List the names, medical specialties, and radioisotope experience, if any, of each member of the local isotope committee.

2 State the procedures the local isotope committee will use to control the procurement and to approve uses of radioisotopes at the institution.

3 Submit a copy of instructions given to nurses who will care for patients containing radioactive material.

4 Submit a copy of radiological protection rules and procedures given to individuals using radioisotopes at the institution.

1-67—1M

Form RHF-1

Washington State Department of Health

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE

INSTRUCTIONS—Complete Items 1 through 16. if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: Washington State Department of Health, Radiation Control Section, Smith Tower, Seattle, Washington 98104. Upon approval of this application, the applicant will receive a State of Washington Radioactive Material License, issued in accordance with the general requirements contained in Washington State Department of Health, Radiation Control Regulations and the Washington Nuclear Energy and Radiation Control Act, Chapter 70.98 RCW.

NEW APPLICATION ☐ AMENDMENT TO LICENSE ☐ RENEWAL ☐

1. (a) NAME AND STREET ADDRESS OF APPLICANT. (Institution, firm, hospital, person, etc.)	(b) STREET ADDRESS(ES) AT WHICH RADIOACTIVE MATERIAL WILL BE USED. (If different from 1 (a).)
2. DEPARTMENT TO USE RADIOACTIVE MATERIAL.	3. PREVIOUS LICENSE NUMBER(S). (If this is an application for renewal of a license, please indicate and give number.)
4. INDIVIDUAL USER(S). (Name and title of individual(s) who will use or directly supervise use of radioactive materials. Give training and experience in Items 8 and 9.)	5. RADIATION PROTECTION OFFICER (Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9).
6. (a) RADIOACTIVE MATERIAL. (Elements and mass number of each.)	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM QUANTITY OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. (If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)

7. DESCRIBE PURPOSE FOR WHICH RADIOACTIVE MATERIAL WILL BE USED. (If radioactive material is for "human use," Supplement A (Form RHF-2) must be completed in lieu of this item. If radioactive material is in the form of sealed sources, include the make and model number of the storage container and/or device in which the source will be stored and/or used.) Attach extra sheets if necessary.

(over)

Form RHF-1 Page Two

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 (Use supplemental sheets if necessary).

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

9. EXPERIENCE WITH RADIATION (Actual use of radioisotopes or equivalent experience).

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE

10. RADIATION DETECTION INSTRUMENTS (Use supplemental sheets if necessary).

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm^2)	USE (Monitoring, Surveying, Measuring)

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED (For film badges, specify method of calibrating and processing, or name of supplier).

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached (Circle answer). Yes No

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved.

CERTIFICATE

(This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH WASHINGTON STATE DEPARTMENT OF HEALTH RADIATION CONTROL REGULATIONS AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

.....
Applicant named in Item 1

Date..... By:.....

.....
Title of certifying official authorized to act on behalf of the applicant

Form RHF-2 Page 1

Washington State Department of Health

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE

Supplement A—Human Use

If radioactive material is for "human use" (internal administration of radioactive material or the radiation therefrom to human beings), complete this supplement and attach to the application for radioactive material license.

1. (a) USING PHYSICIAN'S NAME	(b) NAME AND ADDRESS OF APPLICANT (If different from 1 (a))

2. THE USING PHYSICIAN INDICATED ABOVE IS LICENSED TO DISPENSE DRUGS IN THE PRACTICE OF MEDICINE BY THE STATE OF WASHINGTON. Circle Answer	YES	NO
3. A STATEMENT OF USING PHYSICIAN'S CLINICAL RADIOISOTOPE EXPERIENCE (PAGE 3 OF THIS SUPPLEMENT) IS SUBMITTED IN SUPPORT OF THIS APPLICATION. IF ANSWER IS NO, USE PAGE 2 OF THIS SUPPLEMENT TO EXPLAIN OR REFER TO OTHER APPLICATION OR RELATED DOCUMENTS ON WHICH THIS INFORMATION APPEARS. Circle Answer	YES	NO

PROPOSED DIAGNOSIS OR TREATMENT

4. (a) DESCRIBE PURPOSE FOR WHICH RADIOACTIVE MATERIAL WILL BE USED INCLUDING SPECIFIC CONDITIONS OR DISEASES TO BE DIAGNOSED OR TREATED (Use page 2 if necessary):

(b) CHEMICAL FORM ADMINISTERED:

(c) DESCRIBE PROCEDURES WHICH WILL BE OBSERVED TO MINIMIZE HAZARD FROM HANDLING, STORAGE, AND DISPOSAL OF THE RADIOACTIVE MATERIAL:

(d) DESCRIPTION AND SKETCHES OF SPECIAL DEVICES TO BE USED FOR ADMINISTERING RADIOACTIVE MATERIAL TO HUMAN BEINGS ARE:

(1) ATTACHED (Literature References Will Suffice).	Circle Answer	YES	NO
(2) ON FILE WITH WASHINGTON STATE DEPARTMENT OF HEALTH. REFER TO SPECIFIC DOCUMENT NO.	Circle Answer	YES	NO

5. PROPOSED DOSAGE SCHEDULE

(a) In millicuries for internally administered radioactive material other than discrete fixed sources; and in roentgens or rads, as appropriate, for internal or external irradiation from discrete fixed sources (gold seeds, cobalt needles, etc.) state separately for each condition or disease (use page 2 if necessary):

(b) INVESTIGATIVE PROPOSAL FOR EXPERIMENTAL, NEW OR UNUSUAL HUMAN USES IS ATTACHED. (Attachment should include outline of conditions to be evaluated, including data from animal studies and/or abstract of literature reference if any, number and type of patients (i.e., age group, moribund, etc.)). Circle Answer	YES	NO

6. IF RADIOACTIVE MATERIAL WILL NOT BE OBTAINED IN PRECALIBRATED FORM FOR ORAL ADMINISTRATION OR IN PRECALIBRATED AND STERILIZED FORM FOR PARENTERAL ADMINISTRATION, DESCRIBE IDENTIFICATION, PROCESSING, AND STANDARDIZATION PROCEDURES:

7. THE PROPOSED USE OF RADIOACTIVE MATERIAL HAS BEEN, OR WILL BE, APPROVED BY THE MEDICAL ISOTOPE COMMITTEE. Circle Answer	YES	NO

HOSPITAL FACILITIES FOR INDIVIDUAL PRACTICE USE ONLY

8. (a) THE APPLICANT HAS COMPLETED ARRANGEMENTS FOR A HOSPITAL TO ADMIT RADIOACTIVE PATIENTS WHENEVER ADVISABLE. Circle Answer	YES	NO
(b) A COPY OF INSTRUCTIONS TO BE FURNISHED TO THE HOSPITAL AS TO RADIOLOGICAL SAFETY PRECAUTIONS TO BE TAKEN AND AVAILABLE RADIATION INSTRUMENTATION IS ATTACHED. Circle Answer	YES	NO

(over)

Form RHF-2 Page 2

Washington State Department of Health

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE

Supplement A—Human Use (cont.)

This page may be completed by the physician's preceptor (if any) in the medical use of radioisotopes. When the information is not furnished by the preceptor, the name and present address of the preceptor (if any) should be shown in Item 12 below.

9. (a) USING PHYSICIAN'S NAME	(b) NAME AND ADDRESS OF APPLICANT (if different from 9 (a))

10. CLINICAL TRAINING AND EXPERIENCE OF PHYSICIAN WHO WILL USE RADIOACTIVE MATERIAL

(A) ISOTOPE	(B) CONDITION(S) DIAGNOSED OR TREATED	(C) NUMBER OF CASES	(D) TYPE OF PARTICIPATION FOR ALL CASES IN COLUMN D (Circle applicable numbers of items in accordance with key set forth below)
I-131	Diagnosis of thyroid function		1 2 3 4
	Treatment of hyperthyroidism		1 2 3 4
	Treatment of thyroid cancer		1 2 3 4
	Treatment of cardiac conditions		1 2 3 4
	Brain tumor localization		1 2 3 4
	Blood determinations		1 2 3 4
	Others:		1 2 3 4
			1 2 3 4
P-32 Soluble	Treatment of polycythemia and leukemia		1 2 3 4
	Brain tumor localization		1 2 3 4
	Treatment of bone metastases		1 2 3 4
	Others:		1 2 3 4
			1 2 3 4
			1 2 3 4
P-32 $CrPO_4$	Treatment of prostatic cancer		1 2 3 4
	Treatment of cervical cancer		1 2 3 4
	Treatment of pleural effusions and/or ascites		1 2 3 4
	Others:		1 2 3 4
			1 2 3 4
Au-198 Colloid	Treatment of prostatic cancer		1 2 3 4
	Treatment of cervical cancer		1 2 3 4
	Treatment of pleural effusions and/or ascites		1 2 3 4
	Others:		1 2 3 4
			1 2 3 4
			1 2 3 4
Cr-51	Blood determinations		1 2 3 4
	Others:		1 2 3 4
			1 2 3 4
Other Isotopes	Radium 226		1 2 3 4
			1 2 3 4
			1 2 3 4
			1 2 3 4

Key to above numbers (column D) **Active Participation and Discussion**

1. Examination of patients to determine suitability for radioisotope diagnosis and/or treatment and recommendations on dosage to be prescribed.
2. Collaboration in calibration and administration of dosages including related measurements and plotting of data.
3. Active period of training and experience of sufficient duration to permit followup of patients through treatment and posttreatment period including reevaluation as to effectiveness and complications.
4. Study and discussion of case histories to establish most efficacious diagnostic and/or therapeutic techniques for this radioisotope use.

11. TOTAL NUMBER OF HOURS OF PARTICIPATION IN CLINICAL TRAINING.....hours.

12. THE TRAINING AND EXPERIENCE INDICATED ABOVE WAS OBTAINED UNDER THE SUPERVISION OR GUIDANCE OF

....., AT..... .....
(Name of physician [preceptor]) (Institution) (Signature of preceptor)

Washington State Department of Health

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE

Supplement A—Human Use (cont.)

This page may be used for providing additional information. Please cross reference specific items.

Form RHF-3

STATE OF WASHINGTON

NOTICE TO EMPLOYEES

STANDARDS FOR PROTECTION AGAINST RADIATION

In the Radiation Control Regulations, the Department of Health Has Established Standards for Your Protection Against Radiation Hazards.

YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to:

1. Apply these regulations to work involving sources of radiation.
2. Post or otherwise make available to you a copy of the Department of Health regulations, licenses, and operating procedures which apply to work you are engaged in, and explain their provisions to you.

YOUR RESPONSIBILITY AS A WORKER

You should familiarize yourself with those provisions of the Department of Health regulations, and the operating procedures which apply to the work you are engaged in. You should observe their provisions for your own protection and protection of your co-workers.

WHAT IS COVERED BY THESE REGULATIONS

1. Limits on exposure to radiation and radioactive material in controlled and uncontrolled areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels, and safety interlock equipment;
5. Exposure records and reports; and
6. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The Department of Health regulations require that your employer give you a written report if you receive an exposure in excess of any applicable limit as set forth in the regulations or in the license. The basic limits for exposure to employees are set forth in RH 4.2* and RH 4.3* of the regulations. These sections specify limits on exposure to radiation and exposure to concentrations of radioactive material in air or water. *Now codified As WAC 402-24-020 and WAC 402-24-030.
2. If you work where personnel monitoring is required, and if you request information on your radiation exposures,
   (a) Your employer must give you a written report, upon termination of your employment, of your radiation exposures, and
   (b) Your employer must advise you annually of your exposure to radiation.

INSPECTIONS

All licensed or registered activities are subject to inspection by the Department of Health or its duly authorized representatives.

INQUIRIES

Inquiries dealing with the matters outlined above can be sent to the Department of Health, Radiation Control Agency, 1510 Smith Tower, Seattle, Washington 98104.

POSTING REQUIREMENT

Copies of this notice must be posted in a sufficient number of places where employees are employed in activities licensed or registered pursuant to parts II and III, by the Department of Health, to permit employees working in or frequenting any portion of a controlled area to observe a copy on the way to or from such area.

1-67—6M

Form RHF-4

STATE OF WASHINGTON

OCCUPATIONAL EXTERNAL RADIATION EXPOSURE HISTORY

IDENTIFICATION

1. NAME (Print—Last, first and middle)	2. SOCIAL SECURITY No.
3. DATE OF BIRTH (Month, day, year)	4. AGE IN FULL YEARS (N)

OCCUPATIONAL DOSE—PREVIOUS HISTORY

5. PREVIOUS EMPLOYMENT INVOLVING RADIATION EXPOSURE— List Name and Address of Employer	6. EMPLOYMENT PERIOD (From—to)	7. EXPOSURE PERIOD	PREVIOUS DOSE HISTORY	
			8. WHOLE BODY (REM)	9. INSERT ONE: Record or Calculated
10. REMARKS	11. ACCUMULATED OCCUPATIONAL DOSE TOTAL			

12. CALCULATIONS—Permissible Accumulated Occupational Dose Whole Body:

(A) Permissible Accumulated Occupational Dose 5(N-18)_____REM

(B) Total Accumulated Occupational Dose (From Item 11)_____REM

(C) Permissible Occupational Dose on Reserve_____REM

13. CERTIFICATION: I certify that the exposure history listed in Columns 5, 6, and 7 is correct and complete to the best of my knowledge and belief.

Employee's Signature Date

14. Name and Address of Licensee or Registrant.

FOR INSTRUCTIONS—SEE OVER

INSTRUCTIONS FOR PREPARATION OF FORM RHF-4

This form or a clear and legible record containing all the information required on this form must be completed by each licensee or registrant for each individual whom he proposes to expose to radiation dose in excess of 1.25 rem/calendar quarter.

Identification

Item 1. Self-explanatory.

Item 2. Self-explanatory except that, if individual has no social security number, the word "none" shall be inserted.

Item 3. Self-explanatory.

Item 4. Enter the age in full years. This is called "N" when used in calculating the permissible accumulated occupational dose. "N" is the age in years of the individual at his last birthday.

Occupational Dose

Item 5. List the name and address of each previous employer where occupational exposure to radiation was received. For periods of self-employment, insert the word "self-employed." Start with the most recent employer and work back.

Item 6. Give the dates of employment.

Item 7. List periods during which occupational exposure to radiation occurred.

Item 8. List the dose recorded for each period of exposure from records of previous occupational exposure of the individual as calculated.
Dose to the whole body shall be deemed to include any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye.
In any case where a licensee or registrant is unable to obtain a report of the individual's occupational exposure for periods when such individual was exposed to radiation it shall be assumed that such individual has received an exposure to the following occupational dose:

1. If prior to January 1, 1961
3.75 rem/calendar quarter; or [1]
2. If after January 1, 1961
1.25 rem/calendar quarter.

Calculated Dose

Item 9. After each entry in Item 8 indicate in Item 9 whether dose is obtained from records or calculated.

Item 10. Self-explanatory.

Total Accumulated Occupational Dose

Item 11. The total for the whole body is obtained by summation of all values in Item 8.

Calculations [1]

Item 12. The lifetime accumulated occupational dose for each individual and the permissible occupational dose in reserve are obtained by carrying out the following steps: The value for "N" should be taken from Item 4. Subtract 18 from "N" and multiply the difference by 5 rem (For example, John Smith, is age 32; $N = 32$, $5(32 - 18) = 70$ rem.) and enter under (A). Enter total exposure to date from Item 11 opposite (B). Subtract (B) from (A) and enter the difference opposite (C). The value in (C) represents the dose to the whole body to which that individual can be exposed as long as the dose in any calendar quarter does not exceed 3 rems. This value for permissible occupational dose on reserve is to be carried forward to **Form RHF-5, Item 6.**

Certification

Item 13. Upon completion of the report, the employee must certify that the information in Columns 5, 6, and 7 is accurate and complete to the best of his knowledge. The date is the date of his signature.

Item 14. Self-explanatory.

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1. If calculation of the individual's total accumulated occupational dose for all periods prior to January 1, 1961, under Item 8 yields a result higher than 5(N-18) for the individual as of that date; the excess may be disregarded. For this calculation, N should be the individual's age in years at his last birthday prior to January 1, 1961.

Form RHF-5

STATE OF WASHINGTON

CURRENT OCCUPATIONAL EXTERNAL RADIATION EXPOSURE

IDENTIFICATION

1. NAME (Print—Last, first and middle)	2. SOCIAL SECURITY No.
3. DATE OF BIRTH (Month, day, year)	4. AGE IN FULL YEARS (N)

OCCUPATIONAL DOSE

5. DOSE RECORDED FOR: Specify whole body; skin of whole body; or hands and forearms, feet and ankles.	6. Permissible occupational dose on reserve at beginning of period covered by this sheet.	7. METHOD OF MONITORING (*e.g.*, Film Badge—FB; Pocket Chamber—PC; Calculations—Calc.) GAMMA_____ BETA_____ NEUTRONS_____ X-RAY_____

8. PERIOD OF EXPOSURE (From—to)	DOSE FOR THE PERIOD (rem)				13. Running total for calendar quarter (rem)
	9. X or GAMMA	10. BETA	11. NEUTRON	12. TOTAL	

LIFETIME ACCUMULATED DOSE (REM)

14. Previous Total	15. Total Dose This Sheet	16. Total Accum. Occup. Dose	17. Perm. Acc. Occup. Dose 5(N-18) Rem	18. Perm. Occup. Dose on Res.

19. Name and Address of Licensee or Registrant.

FOR INSTRUCTIONS—SEE BACK

(1980 Ed.)

INSTRUCTIONS FOR PREPARATION OF FORM RHF-5

The preparation and safekeeping of this form or a clear and legible record containing all the information required on this form is required, as a current record of occupational external radiation exposures for each individual for whom personnel monitoring is required. Note that a separate copy of this form is to be used when recording external exposure to the whole body; skin of the whole body; or hands and forearms and feet and ankles.

Listed below by item are instructions and additional information directly pertinent to completing this form.

Identification

Item 1. Self-explanatory.

Item 2. Self-explanatory except that, if individual has no social security number, the word "none" shall be inserted.

Item 3. Self-explanatory.

Item 4. Enter the age in full years. This is called "N" when used in calculating the permissible accumulated occupational dose. "N" is the age in years of the individual at his last birthday.

Occupational Dose

Item 5. Separate form must be used when recording exposure to whole body; skin of whole body; hands and forearms, feet and ankles—Specify which exposure is being recorded in Item 5.

If an individual receives an occupational dose to the skin of the whole body from radiation of half-value layer less than 5 cm. of soft tissue, the dose to the skin of the whole body should be recorded on a separate form, unless the dose to the skin of the whole body as indicated by personnel monitoring devices has been included as dose to the whole body on a form maintained for recording whole body exposures.

If an individual receives a radiation dose to the hands and forearms, or feet and ankles, the dose to those portions of the body should be recorded on separate forms unless the dose to those parts of the body as indicated by personnel monitoring devices have been included as doses to the whole body on a form maintained for recording whole body exposure.

Dose to the whole body shall be deemed to include any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye.

Item 6. The permissible occupational dose on reserve is taken from previous records of exposure recorded by the licensee or registrant (*i. e.*, Item 18 of a previous Form RHF-5; or Item 12 of Form RHF-4 if the individual's exposure during the employment with the licensee or registrant begins with this record).

Item 7. Indicate the method used for monitoring the individual's exposure to each type of radiation to which he is exposed in the course of his duties. Abbreviations may be used.

Item 8. The period of exposure should specify the day the measurement of that exposure was initiated and the day on which it was terminated. For example, a film badge issued Monday morning, August 4, 1958, and picked up Friday, August 15, 1958, would be indicated 8/4/58—8/15/58.

Items 9, 10 and 11. Self-explanatory. The values are to be given in rem. All measurements are to be interpreted in the best method known and in accordance with 1.6.3.* Where calculations are made to determine dose, a copy of such calculations is to be maintained in conjunction with this record. In any case where the dose for a calendar quarter is less than 10% of the value specified in 4.2.1,** the phrase "less than 10%" may be entered in lieu of a numerical value.

Item 12. Add the values under Items 9, 10 and 11 for each period of exposure and record the total. In calculating the "Total" any entry "less than 10%" may be disregarded.

Item 13. The running total is to be maintained on the basis of calendar quarters.

Lifetime Accumulated Dose (Whole Body)

NOTE: If the licensee chooses to keep the individual's exposure below that permitted in 4.2.1, Items 14 through 18 need not be completed. However, in that case the total whole body dose for each calendar quarter recorded in Item 13 should not exceed 1.25 rem.

If an individual is exposed under the provisions of 4.2.2, complete Items 14 through 18 at the end of each calendar quarter and when the sheet is filled. Values in Item 13, when in the middle of a calendar quarter, and values in Item 18, must be brought forward to next sheet for each individual.

Item 14. Enter the previous total accumulated dose from previous dose records for the individual (*e. g.*, Item 16 if Form RHF-5 or Item 11 if Form RHF-4).

Item 15. Enter the sum of all totals under Item 12.

Item 16. Add Item 14 and Item 15 and enter that sum.

Item 17. Obtain the permissible accumulated occupational dose in rem for the whole body. Use the value for "N" from Item 4. Subtract 18 from "N" and multiply the difference by 5 rem (*e. g.*, John Smith, age 32; 5(32 — 18) = 70 rem).

Item 18. Determine the permissible occupational dose on reserve by subtracting Item 16 from Item 17. The permissible occupational dose on reserve is that portion of the permissible lifetime accumulated dose for the individual remaining at the end of the period covered by this sheet.

Item 19. Self-explanatory.

* Now codified as WAC 402-16-060(3)
**Now codified as WAC 402-24-020(1)

RHF-14-1

STATE OF WASHINGTON Page 1 of.....Pages

RADIOACTIVE MATERIALS LICENSE

Pursuant to the Nuclear Energy and Radiation Control Act, RCW 70.98, and the Radiation Control Regulations, Part III,* and in reliance on statements and representations heretofore made by the licenseee designated below, a license is hereby issued authorizing such licensee to transfer, receive, possess and use the radioactive material(s) designated below; and to use such radioactive materials for the purpose(s) and at the place(s) designated below. This license is subject to all applicable rules, regulations, and orders now or hereafter in effect of the State Department of Health and to any conditions specified below.

* Now codified as Chapter 402-20 WAC.

Licensee	3. License number
1. Name	4. Expiration date
2. Address	5. Reference number

6. Radioactive materials (element and mass number)	7. Chemical and/or physical form	8. Maximum quantity licensee may possess at any one time

CONDITIONS

9. Authorized use. (Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.)

Date.....

FOR THE STATE DEPARTMENT OF HEALTH

By.....

RHF-14-2

Page.....of.....Pages

STATE OF WASHINGTON

RADIOACTIVE MATERIALS LICENSE

License Number.....

FOR THE STATE DEPARTMENT OF HEALTH

Date..... By.....