3701:1-38-01 Definitions.

(A) As used in this chapter and all other rules promulgated pursuant to Chapter 3748. of the Revised Code:

(1) "A_1" means the maximum activity of special form radioactive material permitted in a type A package. These values are listed in rule 3701:1-50-25 of the Administrative Code, or may be derived in accordance with the procedure prescribed in rule 3701:1-50-25 of the Administrative Code.

(2) "A_2" means the maximum activity of radioactive material, other than special form, low specific activity and surface contaminated object material, permitted in a type A package. These values are listed in rule 3701:1-50-25 of the Administrative Code, or may be derived in accordance with the procedure prescribed in rule 3701:1-50-25 of the Administrative Code.

(3) "Absorbed dose" means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the gray, or Gy, and the rad.

(4) "Accelerator or charged particle accelerator" means any of a class of radiation generating equipment designed to electronically accelerate atomic or sub-atomic particles for subsequent bombardment of targets.

(5) "Accelerator-produced radioactive material" means any material made radioactive by a particle accelerator.

(6) "Activity" means the rate of disintegration or transformation or decay of radioactive material. The units of activity are the becquerel, or Bq, and the curie, or Ci.

(7) "Address of use" means the building or buildings that are identified on the license or registration and where the source of radiation may be received, used, prepared, or stored, except for temporary job sites.

(8) "Administrative controls" means mechanisms used to protect health and minimize damage to life and property through the use of written policies, procedures, instructions, training, observation of work practices, and related compliance audits.

(9) "Administrative monetary penalty" means a monetary penalty assessed by the director under section 3748.05 of the Revised Code and in compliance with rules adopted thereunder, to emphasize the need for lasting remedial action and to deter future violations.

(10) "Adult" means an individual eighteen or more years of age.

(11) "Agreement state" means any state with which the United States nuclear regulatory commission or the atomic energy commission has entered into an effective agreement under subsection 274B of the Atomic Energy Act. Non-agreement state means any other state.

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

(13) "Airborne radioactivity area" means a room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations:

(a) In excess of the derived air concentrations (DACs) specified in appendix C to rule 3701:1-38-12 of the Administrative Code, or

(b) To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 per cent of the annual limit on intake or twelve DAC-hours.

(14) "Air-purifying respirator" means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

(15) "ALARA" or "as low as is reasonably achievable" means every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials and registered activities in the public interest.

(16) "Alert" means events may occur, are in progress, or have occurred that could lead to a release of radioactive material but that the release is not expected to require a response by off-site response organizations to protect persons off-site.

(17) "Annual limit on intake" or "ALI" means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 0.05 sievert (five rem) or a committed dose equivalent of 0.5 sievert (fifty rem) to any individual organ or tissue. ALI values for intake by ingestion and by inhalation of selected radionuclides are given in appendix C to rule 3701:1-38-12 of the Administrative Code.

(18) "Annually" means either

(a) At intervals not to exceed one year; or

(b) Once per year, at about the same time each year, plus or minus one month.

(19) "Area of use" means a portion of an address of use that has been set aside for the purpose of receiving, preparing, using, or storing sources of radiation.

(20) "Assigned protection factor" or "APF" means the expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users. Operationally, the inhaled concentration can be estimated by dividing the ambient airborne concentration by the APF.

(21) "Atmosphere-supplying respirator" means a respirator that supplies the respirator user with breathing air from a source independent of the ambient

atmosphere, and includes supplied air respirators, or SARs, and self-contained breathing apparatus, or SCBA, units.

(22) "Atomic energy commission" or "AEC" means the federal agency created by the Atomic Energy Act of 1954, as amended, and was the predecessor agency to the current United States nuclear regulatory commission created by the Energy Reorganization Act of 1974.

(23) "Background radiation" means radiation from cosmic sources; naturally occurring radioactive materials, including radon, except as a decay product of source or special nuclear material, and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. "Background radiation" does not include radiation from radioactive materials regulated by the department.

(24) "Becquerel" or "Bq" means the SI unit of activity. One becquerel is equal to one disintegration per second.

(25) "Bioassay" or "radiobioassay" means the determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement, in vivo counting, or by analysis and evaluation of materials excreted or removed from the human body.

(26) "Byproduct material" means

(a) 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 materials; or

(b) The tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from solution extraction processes. Underground ore bodies depleted by such solution extraction do not constitute byproduct material within the definition.

(27) "Chelating agent" means a chemical compound or mixture that enhances the removal of radioactive material from the body, water or similar applications. Typical chelating agents include amine polycarboxylic acids such as EDTA or DTPA; hydroxy-carboxylic acids; and polycarboxylic acids such as citric acid, carbolic acid, and gluconic acid.

(28) "Chiropractor" means an individual licensed by the state of Ohio to practice chiropractic medicine pursuant to Chapter 4734. of the Revised Code.

(29) "Class" or "lung class" or "inhalation class" means a classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which applies to a range of clearance half-times: for class D, days, of less than ten days, for class W, weeks, from ten to one hundred days, and for class Y, years, of greater than one hundred days.

(30) "Collective dose" means the sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

(31) "Commencement of construction" means any clearing of land, excavation, or other substantial action that would adversely affect the natural environment of a site but does not include changes desirable for the temporary use of the land for public recreational uses, necessary borings to determine site characteristics or other preconstruction monitoring to establish background information related to the suitability of a site or to the protection of environmental values.

(32) "Committed dose equivalent" or "$H_{T,50}$" means the dose equivalent to organs or tissues of reference, T, that will be received from an intake of radioactive material by an individual during the fifty year period following the intake.

(33) "Committed effective dose equivalent" or "$H_{E,50}$" means the sum of the products of the weighting factors applicable to each of the body organs or tissues, W_T, that are irradiated and the committed dose equivalent to each of these organs or tissues ($H_{E,\ 50} = W_T H_{T,50}$).

(34) "Consortium" means an association of medical use licensees and a PET radionuclide production facility in the same geographical area that jointly own or share in the operation and maintenance cost of the PET radionuclide production facility that produces PET radionuclides for use in producing radioactive drugs within the consortium for noncommercial distributions among its associated members for medical use. The PET radionuclide production facility within the consortium must be located at an educational institution or a medical facility.

(35) "Constraint" or "dose constraint" means a value above which specified licensee actions are required.

(36) "Controlled area" means an area, outside of a restricted area but inside the site boundary, access to which can be limited by the licensee or registrant for any reason.

(37) "Critical group" means the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

(38) "Curie" or "Ci" means a unit of activity. One curie equals 3.7×10^{10} disintegrations per second equals 3.7×10^{10} becquerels equals 2.22×10^{12} disintegrations per minute.

(39) "Cyclotron" means a particle accelerator in which the charged particles travel in an outward spiral or circular path. A cyclotron accelerates charged particles at energies usually in excess of ten megaelectron volts and is commonly used for production of short half-life radionuclides for medical use.

(40) "Declared pregnant woman" means a woman who has voluntarily informed the licensee or registrant, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant woman withdraws the declaration in writing or is no longer pregnant.

(41) "Decommission" means to safely remove any licensed operation from service and reduce residual radioactivity to a level that permits release of the licensee's property for unrestricted use and termination of the license. Termination of a license under conditions other than unrestricted use is not permitted by Chapter 3748. of the Revised Code.

(42) "Dedicated check source" means a radioactive source that is used to assure the consistent performance of a radiation detection or measurement device over several months or years.

(43) "Deep dose equivalent" or "H_d" applies to external whole body exposure, and means the dose equivalent at a tissue depth of one centimeter, one thousand milligram per square centimeter.

(44) "Demand respirator" means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

(45) "Dentist" means an individual licensed by the state of Ohio to practice dentistry under Chapter 4715. of the Revised Code.

(46) "Department" means the Ohio department of health.

(47) "Depleted uranium" means the source material uranium in which the isotope uranium-235 is less than 0.711 weight per cent of the total uranium present. Depleted uranium does not include special nuclear material.

(48) "Derived air concentration" or "DAC" means the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of two thousand hours under conditions of light work, results in an intake of one ALI. The condition of light work is inhaling 1.2 cubic meters of air per hour for two thousand hours in a year. DAC values are given in appendix C to rule 3701:1-38-12 of the Administrative Code.

(49) "Derived air concentration-hour or DAC-hour" means the product of the concentration of radioactive material in air, which is expressed as a fraction or multiple of the derived air concentration for each radionuclide, and the time of exposure to that radionuclide, in hours. A licensee or registrant may take two thousand DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 0.05 Sv (five rem).

(50) "Direct reading dosimeter" means a device that measures radiation dose that does not require another device to read the measured radiation dose. Examples of direct reading dosimeters include pocket dosimeters and electronic dosimeters.

(51) "Director" means the director of health or a designee or authorized representative of the director.

(52) "Discipline" means a branch of knowledge or of teaching.

(53) "Discrete source" means a radionuclide that has been processed so that its concentration within a material has been purposely increased for use for commercial, medical, or research activities.

(54) "Disposable respirator" means a respirator for which maintenance is not intended and that is designed to be discarded after excessive breathing resistance, sorbent exhaustion, physical damage, or end-of service-life renders it unsuitable for use. Examples of this type of respirator are a disposable half-mask respirator or a disposable escape-only self-contained breathing apparatus.

(55) "Dose" or "radiation dose" is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed effective dose equivalent, or total effective dose equivalent as defined in other paragraphs of this rule.

(56) "Dose equivalent" or "H_T" means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert and rem.

(57) "Dose limits" or "limits" means the permissible upper bounds of radiation doses established in accordance with these regulations but excludes background radiation and medical exposure.

(58) "Dosimetry processor" means a person that processes and evaluates individual monitoring devices in order to determine the radiation dose delivered to the monitoring devices.

(59) "Effective dose equivalent" or "H_E" means the sum of the products of the dose equivalent to each organ or tissue, H_T, and the weighting factor, W_T, applicable to each of the body organs or tissues that are irradiated: ($H_E = \Sigma W_T H_T$).

(60) "Embryo" or "fetus" means the developing human organism from conception until time of birth.

(61) "Engineering controls" means mechanisms used to protect health and minimize damage to life and property through engineering specifications, design, and construction of the product or facility including all of the security and safety features. This includes, but is not limited to, auxiliary security and safety features such as additional external shielding, barriers, and operational interlocks with associated processes.

(62) "Entrance" or "access point" means any opening through which an individual or extremity of an individual could gain access to radiation areas or to licensed radioactive materials or registered radiation generating equipment. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.

(63) "Explosive material" means any chemical compound, mixture or device which produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame.

(64) "Exposure" means being exposed to sources of ionizing radiation.

(65) "External dose" means that portion of the dose equivalent received from radiation sources outside the body.

(66) "Extremity" means hand, elbow, arm below the elbow, foot, knee, or leg below the knee.

(67) "Eye dose equivalent" means the same as lens dose equivalent.

(68) "Facility" means all buildings, equipment, structures and other stationary items that, in addition to the meaning defined in division (H) of section 3748.01 of the Revised Code, are:

(a) Located on a single site or on contiguous or adjacent sites and are operated

by the same person and have common corporate or business interests; or

(b) Portions of a building or structure which are operated by the same person and have common corporate or business interests.

(69) "Filtering facepiece" or "dust mask" means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium, not equipped with elastomeric sealing surfaces and adjustable straps.

(70) "Fissile material" means the radionuclides uranium-233, uranium-235, plutonium-239, and plutonium-241, or any combination of these radionuclides. Fissile material means the fissile nuclides themselves, not material containing fissile nuclides. Unirradiated natural uranium and depleted uranium and natural uranium or depleted uranium that has been irradiated in thermal reactors only, are not included in this definition. Certain exclusions from fissile material controls are provided in rule 3701:1-50-13 of the Administrative Code.

(71) "Fit factor" means quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

(72) "Fit test" means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

(73) "Generally applicable environmental radiation standards" means standards issued by the United States environmental protection agency under the authority of the Atomic Energy Act of 1954, as amended, that impose limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment outside the boundaries of locations under the control of persons possessing or using radioactive material.

(74) "Gray" or "Gy" means the SI unit of absorbed dose. One gray is equal to an absorbed dose of one joule per kilogram (one hundred rads).

(75) "Handler" means a facility that handles sources of radiation unless possession is solely for the purpose of transportation.

(76) "Hazardous waste" means those wastes designated as hazardous by rule 3745-51-03 of the Administrative Code.

(77) "Helmet" means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

(78) "High radiation area" means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of one millisievert (0.1 rem) in one hour at thirty centimeters from the radiation source or thirty centimeters from any surface that the radiation penetrates.

(79) "Hood" means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

(80) "Individual" means any human being.

(81) "Individual monitoring" means

(a) The assessment of dose equivalent by the use of devices designed to be worn by an individual;

(b) The assessment of committed effective dose equivalent by bioassay or by determination of the time-weighted air concentrations to which an individual has been exposed, i.e. DAC-hours; or

(c) The assessment of dose equivalent by the use of survey data.

(82) "Individual monitoring devices" means devices designed to be worn by a single individual for the assessment of dose equivalent such as film badges; thermoluminescent dosimeters; optically stimulated luminescent dosimeters; pocket ionization chambers; and personal air sampling devices.

(83) "Industrial radiography" means the examination of the structure of materials by nondestructive methods, utilizing sealed sources of radioactive material or radiation-generating equipment.

(84) "Internal dose" means that portion of the dose equivalent received from radioactive material taken into the body.

(85) "Irradiator" means a facility that uses radioactive sealed sources for the irradiation of objects or materials and in which radiation dose rates exceeding five grays (five hundred rads) per hour exist at one meter from the sealed radioactive source in air or water, as applicable for the irradiator type, but does not include irradiators in which both the sealed source and the area subject to irradiation are contained within a device and are not accessible to personnel.

(86) "Lens dose equivalent" or "eye dose equivalent" means the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeters; i.e. three hundred milligrams per square centimeter.

(87) "License" means a license issued by the nuclear regulatory commission, the director, or another agreement state in accordance with rules adopted by those organizations.

(88) "Licensee" means a person to whom a license is issued.

(89) "Licensed activity" means an activity authorized by a radioactive material license which is essential to achieving the purpose for which the license was issued or amended.

(90) "Licensed material" means radioactive material received, possessed, used, transferred or disposed of under a general or specific license.

(91) "Loose-fitting facepiece" means a respiratory inlet covering that is designed to form a partial seal with the face.

(92) "Lost or missing licensed source of radiation" means a licensed source of radiation whose location is unknown. It includes material that has been shipped but has not reached its destination and whose location cannot be readily traced in the transportation system.

(93) "Low-level radioactive waste" or "LLRW," also "low-level waste," or "LLW" means radioactive waste which is not high-level radioactive waste, spent nuclear fuel, NARM, or byproduct material as defined in section 11 E. (2) of the Atomic Energy Act of 1954, as amended, but is radioactive material that the United States nuclear regulatory commission classifies as low-level radioactive waste.

(94) "Low specific activity material" or "LSA" means radioactive material with limited specific activity which is nonfissile or is excepted under rule 3701:1-50-13 of the Administrative Code, and which satisfies the descriptions and limits set forth below. Shielding materials surrounding the LSA material may not be considered in determining the estimated average specific activity of the package contents. LSA must be in one of three groups:

(a) LSA - I.

(i) Uranium and thorium ores, concentrates of uranium and thorium ores, and other ores containing naturally occurring radioactive radionuclides which are not intended to be processed for the use of these radionuclides;

(ii) Solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures;

(iii) Radioactive material for which the A_2 value is unlimited; or

(iv) Other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed thirty times the value for exempt material activity concentration determined in accordance with rule 3701:1-50-25 of the Administrative Code.

(b) LSA-II.

(i) Water with tritium concentration up to 0.8 terabecquerels per liter (twenty curies per liter); or

(ii) Other material in which the activity is distributed throughout and the average specific activity does not exceed ($0.0001 \times A_2$) per gram for solids and gases, and ($0.00001 \times A_2$) for liquids.

(c) LSA-III. Solids (e.g., consolidated wastes, activated materials), excluding powders, that satisfy the requirements of 10 C.F.R. 71.77 (as published in the January 1, 2006, Code of Federal Regulations), in which:

(i) The radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.);

(ii) The radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that even under loss of packaging, the loss of radioactive material per package by leaching, when placed in water for seven days, would not exceed ($0.1 \times A_2$); and

(iii) The estimated average specific activity of the solid does not exceed ($0.002 \times A_2$) per gram.

(95) "Management" means the chief executive officer or other individual having the authority to manage, direct, or administer the licensee's activities, or those persons' delegate or delegates.

(96) "Medical institution" means an organization in which more than one medical discipline is practiced.

(97) "Medical use" means the intentional internal or external administration of radioactive material or the radiation therefrom to patients or human research subjects under the supervision of an authorized user.

(98) "Member of the public" means any individual except when that individual is receiving an occupational dose.

(99) "Minor" means an individual less than eighteen years of age.

(100) "Monitoring" or "radiation monitoring" or "radiation protection monitoring" means the measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses.

(101) "NARM" or "naturally occurring or accelerator-produced radioactive material" means naturally occurring or accelerator-produced radioactive material, including naturally occurring material that is technologically enhanced, and those nuclides that are generated in a charged particle accelerator, but does not include source material, byproduct material, or special nuclear material.

(102) "NARM 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 and which has been granted final designation by the conference of radiation control program directors, inc.

(103) "Nationally tracked source" means a sealed source containing a quantity equal to or greater than "Category 1" or "Category 2" levels of any radioactive material listed in the appendix to rule 3701:1-38-25 of the Administrative Code. In this context a sealed source is defined as radioactive material that is sealed in a capsule or closely bonded, in a solid form and which is not exempt from regulatory control. It does not mean material encapsulated solely for disposal, or nuclear material contained in any fuel assembly, subassembly, fuel rod, or fuel pellet. "Category 1" nationally tracked sources are those containing radioactive material at a quantity equal to or greater than the "Category 1" threshold. "Category 2" nationally tracked sources are those containing radioactive material at a quantity equal to or greater than the "Category 2" threshold but less than the "Category 1" threshold.

(104) "Negative pressure respirator" or "tight fitting respirator" means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

(105) "Nonstochastic effect" or "deterministic effect" means health effects, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect.

(106) "NORM" or "naturally occurring radioactive material" means any nuclide that is

radioactive in its natural physical state, but does not include source material, byproduct material, or special nuclear material.

(107) "Normal form radioactive material" means radioactive material that has not been demonstrated to qualify as special form radioactive material.

(108) "Nuclear regulatory commission" means the federal agency established by Title II of the Energy Reorganization Act of 1974, as amended, comprising the members of the commission and all offices, employees, and representatives authorized to act in any case or matter related to licensing and related regulatory function previously assigned to the AEC by the Atomic Energy Act of 1954, as amended.

(109) "Occupational dose" means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include doses received from background radiation, from any medical administration the individual has received, from exposures to individuals administered radioactive materials and released in accordance with rule 3701:1-58-30 of the Administrative Code or equivalent United States nuclear regulatory commission or agreement state regulations, from voluntary participation in medical research programs, or as a member of the public.

(110) "Package" means the packaging together with its radioactive contents as presented for transport.

(a) Fissile material package or type AF package, type BF package, type B(U)F package, or type B(M)F package means a fissile material packaging together with its fissile material contents.

(b) Type A package means a type A packaging together with its radioactive contents. A type A package is defined and must comply with the United States department of transportation regulations in 49 C.F.R. 173 (as published in the October 1, 2005, Code of Federal Regulations).

(c) Type B package means a type B packaging together with its radioactive contents. On approval, a type B package design is designated by the United States nuclear regulatory commission as B(U) unless the package has a maximum normal operating pressure of more than seven hundred kilopascals (one hundred pounds per square inch) gauge or a pressure relief device that would allow the release of radioactive material to the environment under the tests specified in 10 C.F.R. 71.73 (hypothetical accident conditions) (as published in the January 1, 2006, Code of Federal Regulations), in which case it will receive a designation B(M). B(U) refers to the need for unilateral approval of international shipments; B(M) refers to the need for multilateral approval of international shipments. There is no distinction made in how packages with these designations may be used in domestic transportation. To determine their distinction for international transportation, see United States department of transportation regulations in 49 C.F.R. 173 (as published in the October 1, 2005 Code of Federal Regulations). A type B package approved before September 6, 1983, was designated only as type B. Limitations on its use are specified in 10 C.F.R. 71.19 (as published in the January 1, 2006, Code of Federal Regulations).

(111) "Packaging" means the assembly of components necessary to ensure compliance with the packaging requirements of rule 49 C.F.R. 173 Subpart I (as published in the October 1, 2005, Code of Federal Regulations). It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie-down system and auxiliary equipment may be designated as part of the packaging.

(112) "Particle accelerator" means any machine capable of accelerating electrons, protons, deuterons, 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 one megaelectron volt. For purposes of this definition, "accelerator" is an equivalent term.

(113) "Person" means any individual, corporation, association, business enterprise, or other legal entity either public or private and any legal successor, representative, agent, or agency of that individual, corporation, association, business enterprise, or other legal entity. Person also includes the United States, states, political subdivisions of states, and any department, agency, or instrumentality of the United States or a state, except the U.S. department of energy or the U.S. nuclear regulatory commission where the state regulation of radioactive material by either of those agencies is prohibited by federal law.

(114) "Personnel dosimeter", means a device that measures radiation dose that is processed and evaluated by an accredited "National Voluntary Laboratory Accreditation Program" (NVLAP) processor. Examples of personnel dosimeters include film badges, thermo-luminescent dosimeters (TLD), and optically stimulated luminescence (OSL) dosimeters.

(115) "Pharmacist" means a person who is licensed by the state of Ohio to practice pharmacy pursuant to Chapter 4731. of the Revised Code.

(116) "Physician" means a person who is licensed pursuant to Chapter 4731. of the Revised Code to practice medicine or surgery or osteopathic medicine or surgery.

(117) "Planned special exposure" means an infrequent exposure to radiation, separate from and in addition to the annual dose limits.

(118) "Podiatrist" means an individual licensed by the state of Ohio to practice podiatry pursuant to Chapter 4731. of the Revised Code.

(119) "Positive pressure respirator" means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

(120) "Positron Emission Tomography (PET) radionuclide production facility" means a facility operating a cyclotron or accelerator for the purpose of producing PET radionuclides.

(121) "Powered air-purifying respirator" or "PAPR" means an air-purifying respirator that uses a blower to force the ambient air through air purifying elements to the inlet covering.

(122) "Pressure demand respirator" means a positive pressure atmosphere

supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

(123) "Public dose" means the dose received by a member of the public from exposure to radiation and/or radioactive material released by the licensee, or to any other source of radiation under the control of a licensee or registrant. Public dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposures to individuals administered radioactive materials and released in accordance with rule 3701:1-58-30 of the Administrative Code or equivalent United States nuclear regulatory commission or agreement state regulations, or from voluntary participation in medical research programs.

(124) "Pyrophoric material" means any liquid that ignites spontaneously in dry or moist air at or below 54.4 degrees celsius (one hundred thirty degrees fahrenheit). A pyrophoric solid is any solid material, other than one classed as an explosive, which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation, handling, or disposal hazard. Included are spontaneously combustible and water-reactive materials.

(125) "Qualitative fit test" or "QLFT" means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

(126) "Quality factor" or "Q" means the modifying factor, as listed in paragraphs (A) and (B) of rule 3701:1-38-11 of the Administrative Code, that is used to derive dose equivalent from absorbed dose.

(127) "Quantitative fit test" or "QNFT" means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

(128) "Quarter" or "quarterly" means a period of time equal to one-fourth of the year observed by the licensee or registrant, approximately thirteen consecutive weeks, providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

(129) "Rad" means the special unit of radiation absorbed dose. One rad is equal to an absorbed dose of one hundred ergs per gram, or 0.01 joule per kilogram, or 0.01 gray.

(130) "Radiation" or "ionizing radiation" means alpha particles, beta particles, gamma rays, x-rays, neutrons, high speed electrons, high speed protons, and other particles capable of producing ions. Radiation does not include nonionizing radiation, such as radio or microwaves, or visible, infrared or ultraviolet light.

(131) "Radiation area" means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 millisievert (0.005 rem) in one hour at thirty centimeters from the source of radiation or from any surface that the radiation penetrates.

(132) "Radiation-generating equipment" or "RGE" means any manufactured product or device, or component of such a product or device, or any machine or system

that during operation can generate or emit radiation, except those that emit radiation only from radioactive material. "Radiation-generating equipment" does not include either of the following:

(a) Diathermy machines;

(b) Microwave ovens, including food service microwave ovens used for commercial and industrial uses, television receivers, electric lamps, and other household appliances and products that generate very low levels of radiation.

(133) "Radiation Safety Officer" or "RSO" means an individual designated by the licensee who has the knowledge and responsibility for the overall radiation safety program at the facility, to include the implementation of the daily radiation safety operations and compliance with the rules.

(134) "Radioactive material" means any solid, liquid or gaseous material that emits ionizing radiation spontaneously. "Radioactive material" includes accelerator-produced and naturally occurring radioactive materials and byproduct, source, and special nuclear material.

(135) "Radioactive waste" means waste containing regulated radioactive material.

(136) "Radioactivity" means the transformation of unstable atoms by the emission of radiation.

(137) "Radiography" means the same as industrial radiography.

(138) "Reference man" means a hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base.

(139) "Registrant" means a person required by Chapter 3748. of the Revised Code to register radiation-generating equipment with the director.

(140) "Rem" means the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rads multiplied by the quality factor (one rem = 0.01 Sv).

(141) "Research and development" means

(a) Theoretical analysis, exploration, or experimentation; or

(b) 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 sources of radiation to human beings.

(142) "Residual radioactivity" means radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the licensee's control. This includes radioactivity from all licensed and unlicensed

sources used by the licensee, but excludes background radiation. It also includes radioactive materials remaining at the site as a result of routine or accidental releases of radioactive material at the site and previous burials at the site, even if those burials were made in accordance with the provisions of 10 C.F.R. 20 (as published in the January 1, 2006, Code of Federal Regulations).

(143) "Respiratory protective equipment or device" means an apparatus, such as a respirator, used to reduce the individual's intake of airborne radioactive materials.

(144) "Restricted area" means an area access to which is limited by the licensee or registrant for the purpose of protecting individuals against undue risks from exposure to sources of radiation. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

(145) "Roentgen" means the amount of gamma or x-rays required to produce ions resulting in a charge of 0.000258 coulombs per kilogram of air under standard conditions.

(146) "Sanitary sewerage" means a system of public sewers for carrying off wastewater and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the licensee.

(147) "Sealed source" means radioactive material that is encased in a manner designed to prevent leakage or escape of the radioactive material.

(148) "Sealed source and device registry" means the national registry that contains all the registration certificates, generated by both the United States nuclear regulatory commission and the agreement states, that summarize the radiation safety information for the sealed sources and devices and describe the licensing and use conditions approved for the product.

(149) "Seismic area" means any area where the probability of a horizontal acceleration in rock of more than 0.3 times the acceleration of gravity in two hundred fifty years is greater than ten per cent, as designated by the United States geological survey.

(150) "Self-contained breathing apparatus" or "SCBA" means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

(151) "Shallow dose equivalent" or "H_S" means the external exposure of the skin of the whole body or the skin of an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter, or seven milligrams per square centimeter.

(152) "Sievert" or "Sv" means the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor. One sievert equals one hundred rem.

(153) "Site area emergency" means events may occur, are in progress, or have occurred that could lead to a significant release of radioactive material and that could require a response by off-site response organizations to protect persons off-site.

(154) "Site boundary" means that line beyond which the land or property is not owned, leased, or otherwise controlled by the licensee or registrant.

(155) "Site closure and stabilization" means those actions that are taken upon completion of operations that prepare a disposal site for custodial care and that assure that the disposal site will remain stable and will not need ongoing active maintenance.

(156) "Source material" means uranium, thorium, or any combination thereof in any physical or chemical form, or any ores that contain by weight at least one-twentieth of one per cent (0.05 per cent) of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

(157) "Sources of radiation" means radioactive material or radiation generating equipment.

(158) "Special form radioactive material" means radioactive material that satisfies the following conditions:

(a) It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule;

(b) The piece or capsule has at least one dimension not less than five millimeters (0.2 inch); and

(c) It satisfies the test requirements specified by the United States nuclear regulatory commission in 10 C.F.R. 71.75 (as published in the January 1, 2006, Code of Federal Regulations). A special form encapsulation designed in accordance with the United States nuclear regulatory commission requirements identified in 10 C.F.R. 71.4, in effect on June 30, 1983, and constructed prior to July 1, 1985, and a special form encapsulation designed in accordance with the requirements of 10 C.F.R. 71.4 in effect on March 31, 1996, and constructed before April 1, 1998, may continue to be used. Any other special form encapsulation must meet the specifications of this definition.

(159) "Special nuclear material" means either of the following:

(a) Plutonium, uranium-233, uranium enriched in the isotope 233, or in the isotope 235, and any other material that the United States nuclear regulatory commission determines to be special nuclear material, but does not include source material pursuant to section 51 of the "Atomic Energy Act of 1954," 68 Stat 919, 42 USCA 2071.

(b) Any material artificially enriched by any of the foregoing but does not include source material.

(160) "Special nuclear material in quantities not sufficient to form a critical mass" means uranium enriched in the isotope uranium-235 in quantities not exceeding three hundred fifty grams of contained uranium-235; uranium-233 in quantities not exceeding two hundred grams; plutonium in quantities not exceeding two hundred 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 unity.

(161) "Stochastic effect" means health effects that occur randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects.

(162) "Supplied-air respirator" or "SAR" or "airline respirator" means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

(163) "Surface contaminated object" or "SCO" means a solid object that is not itself classed as radioactive material, but which has radioactive material distributed on any of its surfaces. SCO must be in one of two groups with surface activity not exceeding the following limits:

(a) SCO-I: a solid object on which:

(i) The non-fixed contamination on the accessible surface averaged over three hundred square centimeters, or the area of the surface if less than three hundred square centimeters, does not exceed four becquerels per square centimeter (10^{-4} microcurie per square centimeter) for beta and gamma and low toxicity alpha emitters, or 0.4 becquerels per square centimeter 10^{-5} microcurie per square centimeter) for all other alpha emitters;

(ii) The fixed contamination on the accessible surface averaged over three hundred square centimeters, or the area of the surface if less than three hundred square centimeters, does not exceed forty thousand becquerels per square centimeter (one microcurie per square centimeter) for beta and gamma and low toxicity alpha emitters, or four thousand becquerels per square centimeter (0.1 microcurie per square centimeter) for all other alpha emitters; and

(iii) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over three hundred square centimeters, or the area of the surface if less than three hundred square centimeters, does not exceed forty thousand becquerels per square centimeter (one microcurie per square centimeter) for beta and gamma and low toxicity alpha emitters, or four thousand becquerels per square centimeter (0.1 microcurie per square centimeter) for all other alpha emitters.

(b) SCO-II: a solid object on which the limits for SCO-I are exceeded and on which:

(i) The non-fixed contamination on the accessible surface averaged over three hundred square centimeters, or the area of the surface if less than three hundred square centimeter, does not exceed four hundred becquerels per square centimeter (10^{-2} microcurie per square centimeter) for beta and gamma and low toxicity alpha emitters, or forty becquerels per square centimeter (10^{-3} microcurie per square centimeter) for all other alpha emitters;

(ii) The fixed contamination on the accessible surface averaged over three hundred square centimeters, or the area of the surface if less than three

hundred square centimeters, does not exceed eight hundred thousand becquerels per square centimeter (twenty microcuries per square centimeter) for beta and gamma and low toxicity alpha emitters, or eighty thousand becquerels per square centimeter (two microcuries per square centimeter) for all other alpha emitters; and

(iii) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over three hundred square centimeters, or the area of the surface if less than three hundred square centimeters, does not exceed eight hundred thousand becquerels per square centimeter (twenty microcuries per square centimeter) for beta and gamma and low toxicity alpha emitters, or eighty thousand becquerels per square centimeter (two microcuries per square centimeter) for all other alpha emitters.

(164) "Survey" means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material, or the sources of radiation and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.

(165) "Tight-fitting facepiece" means a respiratory inlet covering that forms a complete seal with the face.

(166) "Total effective dose equivalent" or "TEDE" means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

(167) "Transport index" means the dimensionless number, rounded up to the next tenth, placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. The transport index is the number determined by multiplying the maximum radiation level in millisievert per hour at one meter (3.3 feet) from the external surface of the package by one hundred, which is equivalent to the maximum radiation level in millirem per hour at one meter (3.3 feet).

(168) "Type A quantity" means a quantity of radioactive material, the aggregate radioactivity of which does not exceed A_1 for special form radioactive material, or A_2 for normal form radioactive material, where A_1 and A_2 are given in rule 3701:1-50-25 of the Administrative Code.

(169) "Type B quantity" means a quantity of radioactive material greater than a type A quantity.

(170) "Type B package" is defined under "Package."

(171) "United States department of energy" means the department of energy established by the Department of Energy Organization Act, PL 95-91, August 4, 1977, 91 Stat. 565, 42 U.S.C. 7101 et seq., to the extent that the department of energy or its duly authorized representatives, 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 (PL 93-438, 88 Stat. 1233 at 1237, 42 U.S.C. 5814) and retransferred to the secretary of energy pursuant to Section 301(a) of the Department of Energy Organization Act (PL 95-91, 91 Stat. 565 at 577-578, 42 U.S.C. 7151).

(172) "Unrestricted area" or "uncontrolled area" means any area, access to which is neither restricted nor controlled by the licensee or registrant.

(173) "User seal check" or "fit check" means an action conducted by the respirator user to determine if the respirator is properly seated to the face. Examples include negative pressure check, positive pressure check, irritant smoke check, or isoamyl acetate check.

(174) "Very high radiation area" means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of five gray (five hundred rad) in one hour at one meter from a source of radiation or from any surface that the radiation penetrates. At very high doses received at high dose rates, units of absorbed dose, gray and rad, are appropriate, rather than units of dose equivalent, sievert and rem.

(175) "Veterinarian" means an individual licensed by the state of Ohio to practice veterinary medicine pursuant to Chapter 4741. of the Revised Code.

(176) "Waste" means those low-level radioactive wastes containing source, special nuclear, or byproduct material that are acceptable for disposal in a land disposal facility. For the purposes of this definition, low-level radioactive waste means radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in paragraph (A)(26)(b) of this rule, or byproduct material as defined in section 11 E. (3) and (4) of the Atomic Energy Act of 1954, as amended.

(177) "Week" means seven consecutive days starting on Sunday.

(178) "Weighting factor - W_T" for an organ or tissue, (T), is the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. For calculating the effective dose equivalent, the values of W_T are:

Organ dose weighting factors	
Organ or tissue	W_T
Gonads	0.25
Breast	0.15
Red bone marrow	0.12
Lung	0.12
Thyroid	0.03
Bone surfaces	0.03
Remainder	0.30 [a]

Whole body	1.00 [b]

[a] 0.30 results from 0.06 for each of five "remainder" organs, excluding the skin and the lens of the eye, that receive the highest doses.

[b] for the purpose of weighting the external whole body dose (for adding it to the internal dose) a single weighting factor, $W_T = 1.0$, has been specified. The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued.

(179) "Whole body" means for purposes of external exposure, head; trunk, including male gonads; arms above the elbow; legs above the knee.

(180) "Worker" means an individual engaged in activities licensed or registered by the department and controlled by a licensee or registrant, but does not include the licensee or registrant.

(181) "Working level" or "WL" means any combination of short-lived radon decay products (for radon-222: polonium-218, lead-214, bismuth-214, and polonium-214; and for radon-220: polonium-216, lead-212, bismuth-212, and polonium-212) in one liter of air that will result in the ultimate emission of 1.3×10^5 million electron volts alpha particle energy.

(182) "Working level month" or "WLM" means a cumulative exposure to one working level for one hundred seventy hours. (Two thousand working hours per year/twelve months per year equals approximately one hundred seventy hours per month.)

(183) "Year" means the period of time beginning in January used to determine compliance with the provisions of this rule. The licensee or registrant may change the starting date of the year used to determine compliance by the licensee or registrant provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

(B) The terms set out in paragraph (A) of this rule may be redefined in other chapters as promulgated pursuant to Chapter 3748. of the Revised Code as used in that chapter only.

Effective: 01/01/2012

R.C. 119.032 review dates: 08/30/2011 and 01/01/2017

CERTIFIED ELECTRONICALLY

Certification

12/05/2011

Date

Promulgated Under:	119.03
Statutory Authority:	3748.04
Rule Amplifies:	3748.01
Prior Effective Dates:	7/22/2011, 6/20/03, 8/15/05, 10/22/06, 10/27/08, 4/5/09, 10/4/10

3701:1-40-13 Gas and aerosol detectors containing radioactive material.

(A) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution gas and aerosol detectors containing radioactive material, a person is exempt from license requirements set forth in this chapter or Chapters 3701:1-38, 3701:1-46, 3701:1-48, 3701:1-49, 3701:1-52, and 3701:1-58 of the Administrative Code 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, and manufactured, processed, produced, or initially transferred in accordance with a specific license for manufacture and distribution issued pursuant to 10 C.F.R. 32.26, as published in the January 1, 2010, Code of Federal Regulations. This exemption also covers gas and aerosol detectors manufactured or distributed before November 30, 2007, in accordance with a specific license issued by a state under comparable provisions to 10 C.F.R. 32.26, as published in the January 1, 2007, Code of Federal Regulations, authorizing distribution to persons exempt from regulatory requirements.

(B) A person who desires to manufacture, process, or produce gas and aerosol detectors containing radioactive material, or to initially transfer such products for use pursuant to paragraph (A) of this rule, shall apply for a license for manufacture and distribution pursuant to 10 C.F.R. 32.26, as published in the January 1, 2010, Code of Federal Regulations.

Effective: 01/01/2012

R.C. 119.032 review dates: 08/30/2011 and 01/01/2017

CERTIFIED ELECTRONICALLY

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Certification

12/05/2011

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Date

Promulgated Under: 119.03
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Rule Amplifies: 3748.04, 3748.06, 3748.07
Prior Effective Dates; 7/22/2001, 8/15/05, 10/4/2010

Appendix A

Exempt Quantities

Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Antimony-122 (Sb-122)	3700	100
Antimony-124 (Sb-124)	370	10
Antimony-125 (Sb-125)	370	10
Arsenic-73 (As-73)	3700	100
Arsenic-74 (As-74)	370	10
Arsenic-76 (As-76)	370	10
Arsenic-77 (As-77)	3700	100
Barium-131 (Ba-131)	370	10
Barium-133 (Ba-133)	370	10
Barium-140 (Ba-140)	370	10
Bismuth-210 (Bi-210)	37	1
Bromine-82 (Br-82)	370	10
Cadmium-109 (Cd-109)	370	10
Cadmium-115m (Cd-115M)	370	10
Cadmium-115 (Cd-115)	3700	100
Calcium-45 (Ca-45)	370	10
Calcium-47 (Ca-47)	370	10
Carbon-14 (C-14)	3700	100
Cerium-141 (Ce-141)	3700	100
Cerium-143 (Ce-143)	3700	100
Cerium-144 (Ce-144)	37	1
Cesium-129 (Cs-129)	3700	100
Cesium-131 (Cs-131)	37000	1,000
Cesium-134m (Cs-134m)	3700	100
Cesium-134 (Cs-134)	37	1

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Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Cesium-135 (Cs-135)	370	10
Cesium-136 (Cs-136)	370	10
Cesium-137 (Cs-137)	370	10
Chlorine-36 (Cl-36)	370	10
Chlorine-38 (Cl-38)	370	10
Chromium-51 (Cr-51)	37000	1,000
Cobalt-57 (Co-57)	3700	100
Cobalt-58m (Co-58m)	370	10
Cobalt-58 (Co-58)	370	10
Cobalt-60 (Co-60)	37	1
Copper-64 (Cu-64)	3700	100
Dysprosium-165 (Dy-165)	370	10
Dysprosium-166 (Dy-166)	3700	100
Erbium-169 (Er-169)	3700	100
Erbium-171 (Er-171)	3700	100
Europium-152 (Eu-152) 9.2 h	3700	100
Europium-152 (Eu-152) 13 yr	37	1
Europium-154 (Eu-154)	37	1
Europium-155 (Eu-155)	370	10
Fluorine-18 (F-18)	37000	1,000
Gadolinium-153 (Gd-153)	370	10
Gadolinium-159 (Gd-159)	3700	100
Gallium-67 (Ga-67)	3700	100
Gallium-72 (Ga-72)	370	10
Germanium-68 (Ge-68)	370	10
Germanium-71 (Ge71)	3700	100

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Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Gold-195 (Au-195)	370	10
Gold-198 (Au-198)	3700	100
Gold-199 (Au-199)	3700	100
Hafnium-181 (Hf-181)	370	10
Holmium-166 (Ho-166)	3700	100
Hydrogen-3 (H-3)	37000	1,000
Indium-111 (In-111)	3700	100
Indium-113M (In-113M)	3700	100
Indium-114M (In-114M)	370	10
Indium-115M (In-115M)	3700	100
Indium-115 (In-115)	370	10
Iodine-123 (I-123)	3700	100
Iodine-125 (I-125)	37	1
Iodine-126 (I-126)	37	1
Iodine-129 (I-129)	3.7	0.1
Iodine-131 (I-131)	37	1
Iodine-132 (I-132)	370	10
Iodine-133 (I-133)	37	1
Iodine-134 (I-134)	370	10
Iodine-135 (I-135)	370	10
Iridium-192 (Ir-192)	370	10
Iridium-194 (Ir-194)	3700	100
Iron-52 (Fe-52)	370	10
Iron-55 (Fe-55)	3700	100
Iron-59 (Fe-59)	370	10
Krypton-85 (Kr-85)	3700	100

Appendix A

Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Krypton-87 (Kr-87)	370	10
Lanthanum-140 (La-140)	370	10
Lutetium-177 (Lu-177)	3700	100
Manganese-52 (Mn-52)	370	10
Manganese-54 (Mn-54)	370	10
Manganese-56 (Mn-56)	370	10
Mercury-197m (Hg-197m)	3700	100
Mercury-197 (Hg-197)	3700	100
Mercury-203 (Hg-203)	370	10
Molybdenum-99 (Mo-99)	3700	100
Neodymium-147 (Nd-147)	3700	100
Neodymium-149 (Nd-149)	3700	100
Nickel-59 (Ni-59)	3700	100
Nickel-63 (Ni-63)	370	10
Nickel-65 (Ni-65)	3700	100
Niobium-93m (Nb-93m)	370	10
Niobium-95 (Nb-95)	370	10
Niobium-97 (Nb-97)	370	10
Osmium-185 (Os-185)	370	10
Osmium-191m (Os-191m)	3700	100
Osmium-191 (Os-191)	3700	100
Osmium-193 (Os-193)	3700	100
Palladium-103 (Pd-103)	3700	100
Palladium-109 (Pd-109)	3700	100
Phosphorus-32 (P-32)	370	10
Platinum-191 (Pt-191)	3700	100

Appendix A

Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Platinum-193m (Pt-193m)	3700	100
Platinum-193 (Pt-193)	3700	100
Platinum-197m (Pt-197m)	3700	100
Platinum-197 (Pt-197)	3700	100
Polonium-210 (Po-210)	3.7	0.1
Potassium-42 (K-42)	370	10
Potassium-43 (K-43)	370	10
Praseodymium-142 (Pr-142)	3700	100
Praseodymium-143 (Pr-143)	3700	100
Promethium-147 (Pm-147)	370	10
Promethium-149 (Pm-149)	370	10
Radium-224, -228 (Ra-224, -228)	3.7	0.1
Rhenium-186 (Re-186)	3700	100
Rhenium-188 (Re-188)	3700	100
Rhodium-103m (Rh-103m)	3700	100
Rhodium-105 (Rh-105)	3700	100
Rubidium-81 (Rb-81)	370	10
Rubidium-86 (Rb-86)	370	10
Rubidium-87 (Rb-87)	370	10
Ruthenium-97 (Ru-97)	3700	100
Ruthenium-103 (Ru-103)	370	10
Ruthenium-105 (Ru-105)	370	10
Ruthenium-106 (Ru-106)	37	1
Samarium-151 (Sm-151)	370	10
Samarium-153 (Sm-153)	3700	100
Scandium-46 (Sc-46)	370	10

Appendix A

Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Scandium-47 (Sc-47)	3700	100
Scandium-48 (Sc-48)	370	10
Selenium-75 (Se-75)	370	10
Silicon-31 (Si-31)	3700	100
Silver-105 (Ag-105)	370	10
Silver-110m (Ag-110m)	37	1
Silver-111 (Ag-111)	3700	100
Sodium-22 (Na-22)	370	10
Sodium-24 (Na-24)	370	10
Strontium-85 (Sr-85)	370	10
Strontium-89 (Sr-89)	37	1
Strontium-90 (Sr-90)	3.7	0.1
Strontium-91 (Sr-91)	370	10
Strontium-92 (Sr-92)	370	10
Sulphur-35 (S-35)	3700	100
Tantalum-182 (Ta-182)	370	10
Technetium-96 (Tc-96)	370	10
Technetium-97m (Tc-97m)	3700	100
Technetium-97 (Tc-97)	3700	100
Technetium-99m (Tc-99m)	3700	100
Technetium-99 (Tc-99)	370	10
Tellurium-125m (Te-125m)	370	10
Tellurium-127m (Te-127m)	370	10
Tellurium-127 (Te-127)	3700	100
Tellurium-129m (Te-129m)	370	10
Tellurium-129 (Te-129)	3700	100

Appendix A

Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Tellurium-131m (Te-131m)	370	10
Tellurium-132 (Te-132)	370	10
Terbium-160 (Tb-160)	370	10
Thallium-200 (Ti-200)	3700	100
Thallium-201 (Tl-201)	3700	100
Thallium-202 (Tl-202)	3700	100
Thallium-204 (Tl-204)	370	10
Thulium-170 (Tm-170)	370	10
Thulium-171 (Tm-171)	370	10
Tin-113 (Sn-113)	370	10
Tin-125 (Sn-125)	370	10
Tungsten-181 (W-181)	370	10
Tungsten-185 (W-185)	370	10
Tungsten-187 (W-187)	3700	100
Vanadium-48 (V-48)	370	10
Xenon-131m (Xe-131m)	37000	1,000
Xenon-133 (Xe-133)	3700	100
Xenon-135 (Xe-135)	3700	100
Ytterbium-175 (Yb-175)	3700	100
Yttrium-87 (Y-87)	370	10
Yttrium-88 (Y-88)	370	10
Yttrium-90 (Y-90)	370	10
Yttrium-91 (Y-91)	370	10
Yttrium-92 (Y-92)	3700	100
Yttrium-93 (Y-93)	3700	100
Zinc-65 (Zn-65)	370	10

Appendix A

Radionuclide	Kilobecquerels (kBq)	Microcuries (μCi)
Zinc-69m (Zn-69m)	3700	100
Zinc-69 (Zn-69)	37000	1,000
Zirconium-93 (Zr-93)	370	10
Zirconium-95 (Zr-95)	370	10
Zirconium-97 (Zr-97)	370	10
Any radioactive material not listed above other than alpha emitting radioactive material.	3.7	0.1

3701:1-58-18 Training for radiation safety officer.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an individual fulfilling the responsibilities of the radiation safety officer as provided in rule 3701:1-58-12 of the Administrative Code to be an individual who:

(A) Is certified by a specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state and who meets the requirements in paragraphs (D) and (E) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov. To have its certification process recognized, a specialty board shall require all candidates for certification to:

(1)

(a) Hold a bachelor's or graduate degree from an accredited college or university in physical science or engineering or biological science with a minimum of twenty college credits in physical science;

(b) Have five or more years of professional experience in health physics, for which graduate training may be substituted for no more than two years of the required experience, with at least three years in applied health physics; and

(c) Pass an examination administered by diplomates of the specialty board, which evaluates knowledge and competence in radiation physics and instrumentation, radiation protection, mathematics pertaining to the use and measurement of radioactivity, radiation biology, and radiation dosimetry; or

(2)

(a) Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university;

(b) Have two years of full-time practical training and/or supervised experience in medical physics:

(i) Under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the director, United States nuclear regulatory commission, or an agreement state; or

(ii) In clinical nuclear medicine facilities providing diagnostic and/or therapeutic services under the direction of physicians who meet the requirements for authorized users in rules 3701:1-58-21, 3701:1-58-36 or rule 3701:1-58-40 of the Administrative Code; and

(c) Pass an examination, administered by diplomates of the specialty board, that assesses knowledge and competence in clinical diagnostic radiological or nuclear medicine physics and in radiation safety; or

(B) Has achieved the following requirements:

(1) Has completed a structured educational program consisting of both:

(a) Two hundred hours of classroom and laboratory training in the following areas:

(i) Radiation physics and instrumentation;

(ii) Radiation protection;

(iii) Mathematics pertaining to the use and measurement of radioactivity;

(iv) Radiation biology; and

(v) Radiation dosimetry; and

(b) One year of full-time radiation safety experience under the supervision of the individual identified as the radiation safety officer on a United States nuclear regulatory commission or agreement state license, or permit issued by a United States nuclear regulatory commission master material licensee, that authorizes similar type(s) of use(s) of radioactive material involving the following:

(i) Shipping, receiving, and performing related radiation surveys;

(ii) Using and performing checks for proper operation of instruments used to determine the activity of dosages, survey meters, and instruments used to measure radionuclides;

(iii) Securing and controlling radioactive material;

(iv) Using administrative controls to avoid mistakes in the administration of radioactive material;

(v) Using procedures to prevent or minimize radioactive contamination and using proper decontamination procedures;

(vi) Using emergency procedures to control radioactive material; and

(vii) Disposing of radioactive material; or

(C)

(1) Is a medical physicist who has been certified by a specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state under paragraph (A) of rule 3701:1-58-19 of the Administrative Code and has experience in radiation safety for similar types of use of radioactive material for which the licensee is seeking the approval of the individual as radiation safety officer and who meets the requirements in paragraphs (D) and (E) of this rule; or

(2) Is an authorized user, authorized medical physicist, or authorized nuclear pharmacist identified on the licensee's license and has experience with the radiation safety aspects of similar types of use of radioactive material for which the individual has radiation safety officer responsibilities; and,

(D) Has obtained written attestation, signed by a preceptor radiation safety officer, that the individual has satisfactorily completed the requirements in paragraph (E) and in paragraphs (A)(1)(a) and (A)(1)(b) or (A)(2)(a) and (A)(2)(b) or (B)(1) or (C)(1) or (C)(2) of this rule, and has achieved a level of radiation safety knowledge sufficient to function independently as a radiation safety officer for a medical use licensee; and

(E) Has training in the radiation safety, regulatory issues, and emergency procedures for the types of use for which a licensee seeks approval. This training requirement may be satisfied by completing training that is supervised by a radiation safety officer, authorized medical physicist, authorized nuclear pharmacist, or authorized user, as appropriate, who is authorized for the type(s) of use for which the licensee is seeking approval.

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3701:1-58-19 Training for an authorized medical physicist.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require the authorized medical physicist to be an individual who:

(A) Is certified by a specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state and who meets the requirements in paragraphs (B)(2) and (C) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov. To have its certification process recognized, a specialty board shall require all candidates for certification to:

(1) Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university;

(2) Have two years of full-time practical training and/or supervised experience in medical physics:

(a) Under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the director, United States nuclear regulatory commission, or an agreement state; or

(b) In clinical radiation facilities providing high-energy, external beam therapy with photons and electrons with energies greater than or equal to one million electron volts and brachytherapy services under the direction of physicians who meet the requirements for authorized users in rules 3701:1-58-21, 3701:1-58-51, or 3701:1-58-71 of the Administrative Code; and

(3) Pass an examination, administered by diplomates of the specialty board, that assesses knowledge and competence in clinical radiation therapy, radiation safety, calibration, quality assurance, and treatment planning for external beam therapy, brachytherapy, and stereotactic radiosurgery; or

(B)

(1) Holds a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; and has completed one year of full-time training in medical physics and an additional year of full-time work experience under the supervision of an individual who meets the requirements for an authorized medical physicist for the type(s) of use for which the individual is seeking authorization. This training and work experience must be conducted in clinical radiation facilities that provide high-energy, external beam therapy with photons and electrons with energies greater than or equal to one million electron volts and brachytherapy services and must include:

(a) Performing sealed source leak tests and inventories;

(b) Performing decay corrections;

(c) Performing full calibration and periodic spot checks of external beam

treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable; and

(d) Conducting radiation surveys around external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable; and

(2) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraph (C) and paragraphs (A)(1) and (A)(2), or (B)(1) and (C) of this rule, and has achieved a level of competency sufficient to function independently as an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. The written attestation must be signed by a preceptor authorized medical physicist who meets the requirements in rule 3701:1-58-19 or 3701:1-58-21 of the Administrative Code or equivalent United States nuclear regulatory commission or agreement state requirements for an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status; and

(C) Has training for the type(s) of use for which authorization is sought that includes hands-on device operation, safety procedures, clinical use, and the operation of a treatment planning system. This training requirement may be satisfied by satisfactorily completing either a training program provided by the vendor or by training supervised by an authorized medical physicist authorized for the type(s) of use for which the individual is seeking authorization.

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3701:1-58-21 Training for experienced radiation safety officer, teletherapy or medical physicist, authorized medical physicist, authorized user, nuclear pharmacist, and authorized nuclear pharmacist.

(A)

(1) An individual identified as a radiation safety officer, a teletherapy or medical physicist, or a nuclear pharmacist on a United States nuclear regulatory commission or agreement state license or a permit issued by a United States nuclear regulatory commission or agreement state broad scope licensee or master material license permit or by a master material license permittee of broad scope before October 24, 2002, need not comply with the training requirements of rule 3701:1-58-18, 3701:1-58-19, or 3701:1-58-20 of the Administrative Code, respectively.

(2) An individual identified as a radiation safety officer, an authorized medical physicist, or an authorized nuclear pharmacist on a United Stated nuclear regulatory commission or agreement state license or a permit issued by a United States nuclear regulatory commission or agreement state broad scope licensee or master material license permit or by a master material license permittee of broad scope between October 24, 2002, and April 29, 2005, need not comply with the training requirements of rule 3701:1-58-18, 3701:1-58-19, or 3701:1-58-20 of the Administrative Code, respectively.

(3) A radiation safety officer, a medical physicist, or a nuclear pharmacist, who used only accelerator-produced radioactive materials, discrete sources of radium-226, or both, for medical uses or in the practice of nuclear pharmacy at a government agency or federally recognized indian tribe before November 30, 2007, or at all other locations of use before August 8, 2009, or an earlier date as noticed by the United States nuclear regulatory commission, need not comply with the training requirements of rule 3701:1-58-18, 3701:1-58-19, or 3701:1-58-20 of the Administrative Code, respectively, when performing the same uses. A nuclear pharmacist, who prepared only radioactive drugs containing accelerator-produced radioactive materials, or a medical physicist, who used only accelerator-produced radioactive materials, at the locations and time period identified in this paragraph, qualifies as an authorized nuclear pharmacist or an authorized medical physicist, respectively, for those materials and uses performed before these dates, for purposes of this chapter.

(B)

(1) Physicians, dentists, or podiatrists identified as authorized users for the medical use of byproduct material on a license issued by the United States nuclear regulatory commission or agreement state, a permit issued by a United States nuclear regulatory commission master material licensee, a permit issued by a United States nuclear regulatory commission or agreement state broad scope licensee, or a permit issued by a United States nuclear regulatory commission master material license broad scope permittee before October 24, 2002, who perform only those medical uses for which they were authorized on that date need not comply with the training requirements of rules 3701:1-58-32 to 3701:1-58-71 of the Administrative Code.

(2) Physicians, dentists, or podiatrists identified as authorized users for the medical

use of byproduct material on a license issued by the United States nuclear regulatory commission or agreement state, a permit issued by a United States nuclear regulatory commission master material licensee, a permit issued by a United States nuclear regulatory commission or agreement state broad scope licensee, or a permit issued by a United States nuclear regulatory commission master material license broad scope permittee who perform only those medical uses for which they were authorized between October 24, 2002, and April 29, 2005, need not comply with the training requirements of rules 3701:1-58-32 to 3701:1-58-71 of the Administrative Code.

(3) Physicians, dentists, or podiatrists who used only accelerator-produced radioactive materials, discrete sources of radium-226, or both, for medical uses performed at a government agency or federally recognized indian tribe before November 30, 2007, or at all other locations of use before August 8, 2009, or an earlier date as noticed by the United States nuclear regulatory commission, need not comply with the training requirements of rules 3701:1-58-32 to 3701:1-58-71 of the Administrative Code, when performing the same medical uses. A physician, dentist, or podiatrist, who used only accelerator-produced radioactive materials, discrete sources of radium-226, or both, for medical uses at the locations and time period identified in this paragraph, qualifies as an authorized user for those materials and uses performed before these dates, for purposes of this chapter.

(C) Individuals who need not comply with training requirements as described in this rule may serve as preceptors for, and supervisors of, applicants seeking authorization on Ohio radioactive material licenses for the same uses for which these individuals are authorized.

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3701:1-58-33 Training for uptake, dilution, and excretion studies.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user of unsealed radioactive material for the uses authorized under rule 3701:1-58-32 of the Administrative Code to be a physician who:

(A) Is certified by a medical specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state and who meets the requirements in paragraph (C)(2) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov. To have its certification process recognized, a specialty board shall require all candidates for certification to:

(1) Complete sixty hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies that includes the topics listed in paragraphs (C)(1)(a) and (C)(1)(b) of this rule; and

(2) Pass an examination, administered by diplomates of the specialty board, that assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or

(B) Is an authorized user under this rule and rule 3701:1-58-36 or 3701:1-58-40 of the Administrative Code or equivalent United States nuclear regulatory commission or agreement state requirements; or

(C) Has achieved the following requirements:

(1) Has completed sixty hours of training and experience, including a minimum of eight hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies. The training and experience must include:

(a) Classroom and laboratory training in the following areas:

(i) Radiation physics and instrumentation;

(ii) Radiation protection;

(iii) Mathematics pertaining to the use and measurement of radioactivity;

(iv) Chemistry of radioactive material for medical use; and

(v) Radiation biology; and

(b) Work experience, under the supervision of an authorized user who meets the requirements in this rule, rule 3701:1-58-21, 3701:1-58-36, or 3701:1-58-40 of the Administrative Code or equivalent United States nuclear regulatory commission or agreement state requirements, involving:

(i) Ordering, receiving, and unpacking radioactive materials safely and

performing the related radiation surveys;

(ii) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;

(iii) Calculating, measuring, and safely preparing patient or human research subject dosages;

(iv) Using administrative controls to prevent a medical event involving the use of unsealed radioactive material;

(v) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and

(vi) Administering dosages of radioactive drugs to patients or human research subjects; and

(2) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in this rule, rule 3701:1-58-21, 3701:1-58-36, or 3701:1-58-40 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements, that the individual has satisfactorily completed the requirements in paragraph (A)(1) or (C)(1) of this rule and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under rule 3701:1-58-32 of the Administrative Code.

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3701:1-58-36 Training for imaging and localization studies.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user of unsealed radioactive material for the uses authorized in rule 3701:1-58-34 of the Administrative Code to be a physician who:

(A) Is certified by a medical specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state and who meets the requirements in paragraph (C)(2) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov. To have its certification process recognized, a specialty board shall require all candidates for certification to:

(1) Complete seven hundred hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for imaging and localization studies that includes the topics listed in paragraphs (C)(1)(a) and (C)(1)(b) of this rule; and

(2) Pass an examination, administered by diplomates of the specialty board, which assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or

(B) Is an authorized user under rule 3701:1-58-40 of the Administrative Code and meets the requirements in paragraph (C)(1)(b)(vii) of rule 3701:1-58-36 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements; or

(C)

(1) Has completed seven hundred hours of training and experience, including a minimum of eighty hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for imaging and localization studies. The training and experience must include, at a minimum:

(a) Classroom and laboratory training in the following areas:

(i) Radiation physics and instrumentation;

(ii) Radiation protection;

(iii) Mathematics pertaining to the use and measurement of radioactivity;

(iv) Chemistry of radioactive material for medical use; and

(v) Radiation biology; and

(b) Work experience, under the supervision of an authorized user, who meets the requirements in this rule, rule 3701:1-58-21, or 3701:1-58-40 of the Administrative Code and paragraph (C)(1)(b)(vii) of this rule, or equivalent United States nuclear regulatory commission or agreement state requirements, involving:

(i) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

(ii) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;

(iii) Calculating, measuring, and safely preparing patient or human research subject dosages;

(iv) Using administrative controls to prevent a medical event involving the use of unsealed radioactive material;

(v) Using procedures to safely contain spilled radioactive material and using proper decontamination procedures;

(vi) Administering dosages of radioactive drugs to patients or human research subjects; and

(vii) Eluting generator systems appropriate for preparation of radioactive drugs for imaging and localization studies, measuring and testing the eluate for radionuclidic purity, and processing the eluate with reagent kits to prepare labeled radioactive drugs; and

(2) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in this rule, rule 3701:1-58-21, or 3701:1-58-40 of the Administrative Code and paragraph (C)(1)(b)(vii) of this rule, or equivalent United States nuclear regulatory commission or agreement state requirements, that the individual has satisfactorily completed the requirements in paragraph (A)(1) or (C)(1) of this rule and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under rules 3701:1-58-32 and 3701:1-58-34 of the Administrative Code.

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3701:1-58-40 Training for use of unsealed radioactive material for which a written directive is required.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user of unsealed radioactive material for the uses authorized under rule 3701:1-58-37 of the Administrative Code to be a physician who:

(A) Is certified by a medical specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state and who meets the requirements in paragraphs (B)(1)(b)(vi) and (B)(2) of this rule. Specialty boards whose certification processes have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov. To be recognized, a specialty board shall require all candidates for certification to:

(1) Successfully complete residency training in a radiation therapy or nuclear medicine training program or a program in a related medical specialty. These residency training programs must include seven hundred hours of training and experience as described in paragraphs (B)(1)(a) to (B)(1)(b)(v) of this rule. Eligible training programs must be approved by the "Residency Review Committee of the Accreditation Council for Graduate Medical Education," the "Royal College of Physicians and Surgeons of Canada," or the "Committee on Post-Graduate Training of the American Osteopathic Association;" and

(2) Pass an examination, administered by diplomates of the specialty board, which tests knowledge and competence in radiation safety, radionuclide handling, quality assurance, and clinical use of unsealed radioactive material for which a written directive is required; or

(B)

(1) Has completed seven hundred hours of training and experience, including a minimum of two hundred hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material requiring a written directive. The training and experience must include:

(a) Classroom and laboratory training in the following areas:

(i) Radiation physics and instrumentation;

(ii) Radiation protection;

(iii) Mathematics pertaining to the use and measurement of radioactivity;

(iv) Chemistry of radioactive material for medical use; and

(v) Radiation biology; and

(b) Work experience, under the supervision of an authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements. A supervising authorized user, who meets the requirements in paragraph (B) of this rule, must also have experience in

administering dosages in the same dosage category or categories, such as paragraph (B)(1)(b)(vi) of this rule, as the individual requesting authorized user status. The work experience must involve:

(i) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

(ii) Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters;

(iii) Calculating, measuring, and safely preparing patient or human research subject dosages;

(iv) Using administrative controls to prevent a medical event involving the use of unsealed radioactive material;

(v) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and

(vi) Administering dosages of radioactive drugs to patients or human research subjects involving a minimum of three cases in each of the following categories for which the individual is requesting authorized user status:

(A) Oral administration of less than or equal to 1.22 gigabecquerels (thirty-three millicuries) of sodium iodide I-131, for which a written directive is required;

(B) Oral administration of greater than 1.22 gigabecquerels, (thirty-three millicuries) of sodium iodide I-131. Experience with at least three cases in this paragraph also satisfies the requirement in paragraph (B)(1)(b)(vi)(a) of this rule;

(C) Parenteral administration of any beta emitter, or a photon- emitting radionuclide with a photon energy less than one hundred fifty keV, for which a written directive is required; and/or

(D) Parenteral administration of any other radionuclide, for which a written directive is required; and

(2) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (A)(1) and (B)(1)(b)(vi), or (B)(1) of this rule, and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under rule 3701:1-58-37 of the Administrative Code. The written attestation must be signed by a preceptor authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements. The preceptor authorized user, who meets the requirements in paragraph (B) of this rule must have experience in administering dosages in the same dosage category or categories, such as paragraph (B)(1)(b)(vi) of this rule, as the individual requesting authorized user status.

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3701:1-58-41 Training for the oral administration of sodium iodide iodine-131 requiring a written directive in quantities less than or equal to 1.22 gigabecquerels (thirty-three millicuries).

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user for the oral administration of sodium iodide iodine-131 requiring a written directive in quantities less than or equal to 1.22 gigabecquerels (thirty-three millicuries) to be a physician who:

(A) Is certified by a medical specialty board whose certification process includes all of the requirements in paragraphs (C)(1) and (C)(2) of this rule and whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state and who meets the requirements in paragraph (C)(3) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov; or

(B) Is an authorized user under rule 3701:1-58-40 of the Administrative Code for uses listed in paragraph (B)(1)(b)(vi)(a) or (B)(1)(b)(vi)(b) of rule 3701:1-58-40 of the Administrative Code, rule 3701:1-58-42 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements; or

(C) Has achieved the following requirements:

(1) Has successfully completed eighty hours of classroom and laboratory training, applicable to the medical use of sodium iodide iodine-131 for procedures requiring a written directive. The training must include:

(a) Radiation physics and instrumentation;

(b) Radiation protection;

(c) Mathematics pertaining to the use and measurement of radioactivity;

(d) Chemistry of radioactive material for medical use; and

(e) Radiation biology;

(2) Has work experience, under the supervision of an authorized user who meets the requirements in rule 3701:1-58-21, 3701:1-58-40, this rule, or rule 3701:1-58-42 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements. A supervising authorized user who meets the requirements in paragraph (B) of rule 3701:1-58-40 of the Administrative Code must have experience in administering dosages as specified in paragraph (B)(1)(b)(vi)(a) or (B)(1)(b)(vi)(a) of rule 3701:1-58-40 of the Administrative Code. The work experience must involve:

(a) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

(b) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey

meters;

(c) Calculating, measuring, and safely preparing patient or human research subject dosages;

(d) Using administrative controls to prevent a medical event involving the use of radioactive material;

(e) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and

(f) Administering dosages to patients or human research subjects, that includes at least three cases involving the oral administration of less than or equal to 1.22 gigabecquerels (thirty-three millicuries) of sodium iodide iodine-131; and

(3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (C)(1) and (C)(2) of this rule, and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under rule 3701:1-58-37 of the Administrative Code. The written attestation must be signed by a preceptor authorized user who meets the requirements in this rule, rule 3701:1-58-21, 3701:1-58-40, or 3701:1-58-42 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements. A preceptor authorized user, who meets the requirement in paragraph (B) of rule 3701:1-58-40 of the Administrative Code, must also have experience in administering dosages as specified in paragraph (B)(1)(b)(vi)(a) or (B)(1)(b)(vi)(b) of rule 3701:1-58-40 of the Administrative Code.

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3701:1-58-42 Training for the oral administration of sodium iodide iodine-131 requiring a written directive in quantities greater than 1.22 gigabecquerels (thirty-three millicuries).

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user for the oral administration of sodium iodide iodine-131 requiring a written directive in quantities greater than 1.22 gigabecquerels (thirty-three millicuries) to be a physician who:

(A) Is certified by a medical specialty board whose certification process includes all of the requirements in paragraphs (C)(1) and (C)(2) of this rule, and whose certification has been recognized by the director, United States nuclear regulatory commission, or an agreement state, and who meets the requirements in paragraph (C)(3) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov.; or

(B) Is an authorized user under rule 3701:1-58-40 of the Administrative Code, for uses listed in paragraph (B)(1)(b)(vi)(b) of rule 3701:1-58-40 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements; or

(C) Has achieved the following requirements:

(1) Has successfully completed eighty hours of classroom and laboratory training, applicable to the medical use of sodium iodide iodine-131 for procedures requiring a written directive. The training must include:

(a) Radiation physics and instrumentation;

(b) Radiation protection;

(c) Mathematics pertaining to the use and measurement of radioactivity;

(d) Chemistry of radioactive material for medical use; and

(e) Radiation biology;

(2) Has work experience, under the supervision of an authorized user who meets the requirements in rule 3701:1-58-21, 3701:1-58-40, or this rule of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements. A supervising authorized user who meets the requirements in paragraph (B) of rule 3701:1-58-40 of the Administrative Code, must have experience in administering dosages as specified in paragraph (B)(1)(b)(vi)(b) of rule 3701:1-58-40 of the Administrative Code. The work experience must involve:

(a) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

(b) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;

(c) Calculating, measuring, and safely preparing patient or human research subject dosages;

(d) Using administrative controls to prevent a medical event involving the use of radioactive material;

(e) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and

(f) Administering dosages to patients or human research subjects, that includes at least three cases involving the oral administration of greater than 1.22 gigabecquerels (thirty-three millicuries) of sodium iodide iodine-131; and

(3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (C)(1) and (C)(2) of this rule, and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under rule 3701:1-58-37 of the Administrative Code. The written attestation must be signed by a preceptor authorized user who meets the requirements in this rule, rule 3701:1-58-21, or 3701:1-58-40 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements. A preceptor authorized user, who meets the requirements in paragraph (B) of rule 3701:1-58-40 of the Administrative Code, must also have experience in administering dosages as specified in paragraph (B)(1)(b)(vi)(b) of rule 3701:1-58-40 of the Administrative Code.

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3701:1-58-51 Training for use of manual brachytherapy sources.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user of a manual brachytherapy source for the uses authorized under rule 3701:1-58-43 of the Administrative Code to be a physician who:

(A) Is certified by a medical specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state, and who meets the requirements in paragraph (B)(3) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov. To have its certification process recognized, a specialty board shall require all candidates for certification to:

(1) Successfully complete a minimum of three years of residency training in a radiation oncology program approved by the "Residency Review Committee of the Accreditation Council for Graduate Medical Education" or the "Royal College of Physicians and Surgeons of Canada" or the "Committee on Post-Graduate Training of the American Osteopathic Association;" and

(2) Pass an examination, administered by diplomates of the specialty board, that tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use of manual brachytherapy; or

(B) Has achieved the following requirements:

(1) Has completed a structured educational program in basic radionuclide handling techniques applicable to the use of manual brachytherapy sources that includes:

(a) Two hundred hours of classroom and laboratory training in the following areas:

(i) Radiation physics and instrumentation;

(ii) Radiation protection;

(iii) Mathematics pertaining to the use and measurement of radioactivity; and

(iv) Radiation biology; and

(b) Five hundred hours of work experience, under the supervision of an authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements at a medical institution, involving:

(i) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

(ii) Checking survey meters for proper operation;

(iii) Preparing, implanting, and removing brachytherapy sources;

(iv) Maintaining running inventories of material on hand;

(v) Using administrative controls to prevent a medical event involving the use of radioactive material; and

(vi) Using emergency procedures to control radioactive material;

(2) Has completed three years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements, as part of a formal training program approved by the "Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education" or the "Royal College of Physicians and Surgeons of Canada" or the "Committee on Postdoctoral Training of the American Osteopathic Association." This experience may be obtained concurrently with the supervised work experience required by paragraph (B)(1)(b) of this rule; and

(3) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements, that the individual has satisfactorily completed the requirements in paragraph (A)(1), or paragraphs (B)(1) and (B)(2) of this rule and has achieved a level of competency sufficient to function independently as an authorized user of manual brachytherapy sources for the medical uses authorized under rule 3701:1-58-43 of the Administrative Code.

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3701:1-58-52 Training for ophthalmic use of strontium-90.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require the authorized user of strontium-90 for ophthalmic radiotherapy to be a physician who:

(A) Is an authorized user under rule 3701:1-58-51 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements; or

(B) Has achieved the following requirements:

(1) Has completed twenty-four hours of classroom and laboratory training applicable to the medical use of strontium-90 for ophthalmic radiotherapy. The training must include:

(a) Radiation physics and instrumentation;

(b) Radiation protection;

(c) Mathematics pertaining to the use and measurement of radioactivity; and

(d) Radiation biology;

(2) Supervised clinical training in ophthalmic radiotherapy under the supervision of an authorized user at a medical institution, clinic, or private practice that includes the use of strontium-90 for the ophthalmic treatment of five individuals. This supervised clinical training must involve:

(a) Examination of each individual to be treated;

(b) Calculation of the dose to be administered;

(c) Administration of the dose; and

(d) Follow up and review of each individual's case history; and

(3) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in this rule, rule 3701:1-58-21, or 3701:1-58-51 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements, that the individual has satisfactorily completed the requirements in paragraphs (A) and (B) of this rule and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use.

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3701:1-58-71 Training for use of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units.

Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user of a sealed source for a use authorized under rule 3701:1-58-55 of the Administrative Code to be a physician who:

(A) Is certified by a medical specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state and who meets the requirements in paragraphs (B)(3) and (C) of this rule. The names of board certifications which have been recognized by the director, United States nuclear regulatory commission, or an agreement state will be posted on the United States nuclear regulatory commission's web page at www.nrc.gov. To have its certification process recognized, a specialty board shall require all candidates for certification to:

(1) Successfully complete a minimum of three years of residency training in a radiation therapy program approved by the "Residency Review Committee of the Accreditation Council for Graduate Medical Education" or the "Royal College of Physicians and Surgeons of Canada" or the "Committee on Post-Graduate Training of the American Osteopathic Association;" and

(2) Pass an examination, administered by diplomates of the specialty board, which tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use of stereotactic radiosurgery, remote afterloaders and external beam therapy; or

(B) Has achieved the following requirements:

(1) Has completed a structured educational program in basic radionuclide techniques applicable to the use of a sealed source in a therapeutic medical unit that includes:

(a) Two hundred hours of classroom and laboratory training in the following areas:

(i) Radiation physics and instrumentation;

(ii) Radiation protection;

(iii) Mathematics pertaining to the use and measurement of radioactivity; and

(iv) Radiation biology; and

(b) Five hundred hours of work experience, under the supervision of an authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements at a medical institution, involving:

(i) Reviewing full calibration measurements and periodic spot-checks;

(ii) Preparing treatment plans and calculating treatment doses and times;

(iii) Using administrative controls to prevent a medical event involving the use of radioactive material;

(iv) Implementing emergency procedures to be followed in the event of the abnormal operation of the medical unit or console;

(v) Checking and using survey meters; and

(vi) Selecting the proper dose and how it is to be administered;

(2) Has completed three years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements, as part of a formal training program approved by the "Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education" or the "Royal College of Physicians and Surgeons of Canada" or the "Committee on Postdoctoral Training of the American Osteopathic Association." This experience may be obtained concurrently with the supervised work experience required by paragraph (B)(1)(b) of this rule; and

(3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (A)(1) or (B)(1) and (B)(2), and (C) of this rule, and has achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation must be signed by a preceptor authorized user who meets the requirements in this rule or rule 3701:1-58-21 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and

(C) Has received training in device operation, safety procedures, and clinical use for the type(s) of use for which authorization is sought. This training requirement may be satisfied by satisfactory completion of a training program provided by the vendor for new users or by receiving training supervised by an authorized user or authorized medical physicist, as appropriate, who is authorized for the type(s) of use for which the individual is seeking authorization.

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3701:1-58-104 Training for the parenteral administration of unsealed radioactive material requiring a written directive.

(A) Except as provided in rule 3701:1-58-21 of the Administrative Code, the licensee shall require an authorized user for the parenteral administration of unsealed radioactive material requiring a written directive, to be a physician who:

(1) Is an authorized user under rule 3701:1-58-40 of the Administrative Code for uses listed in paragraph (B)(1)(b)(vi)(c) or (B)(1)(b)(vi)(d) of rule 3701:1-58-40 of the Administrative Code or equivalent United States nuclear regulatory commission or agreement state requirements;

(2) Is an authorized user under rule 3701:1-58-51 or 3701:1-58-71 of the Administrative code, or equivalent United States nuclear regulatory commission or agreement state requirements and who meets the requirements in paragraph (B) of this rule; or

(3) Is certified by a medical specialty board whose certification process has been recognized by the director, United States nuclear regulatory commission, or an agreement state under rule 3701:1-58-51 or 3701:1-58-71 of the Administrative Code, and who meets the requirements in paragraph (B) of this rule.

(B) An authorized user satisfying paragraph (A)(2) or (A)(3) of this rule, shall be a physician who:

(1) Has successfully completed eighty hours of classroom and laboratory training, applicable to parenteral administrations, for which a written directive is required, of any beta emitter, or any photon-emitting radionuclide with a photon energy less than one hundred fifty keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training must include:

(a) Radiation physics and instrumentation;

(b) Radiation protection;

(c) Mathematics pertaining to the use and measurement of radioactivity;

(d) Chemistry of radioactive material for medical use; and

(e) Radiation biology; and

(2) Has work experience, under the supervision of an authorized user who meets the requirements in this rule, rule 3701:1-58-21, or 3701:1-58-40 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements, in the parenteral administration, for which a written directive is required, of any beta emitter, or any photon-emitting radionuclide with a photon energy less than one hundred fifty keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements in rule 3701:1-58-40 of the Administrative Code must have experience in administering dosages as specified in paragraphs (B)(1)(b)(vi)(c) and/or (B)(1)(b)(vi)(d) of rule 3701:1-58-40 of the Administrative Code. The work experience must

involve:

(a) Ordering, receiving, and unpacking radioactive materials safely, and performing the related radiation surveys;

(b) Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters;

(c) Calculating, measuring, and safely preparing patient or human research subject dosages;

(d) Using administrative controls to prevent a medical event involving the use of unsealed radioactive material;

(e) Using procedures to contain spilled radioactive material safely, and using proper decontamination procedures; and

(f) Administering dosages to patients or human research subjects, that include at least three cases involving the parenteral administration, for which a written directive is required, of any beta emitter, or any photon-emitting radionuclide with a photon energy less than one hundred fifty keV and/or at least three cases involving the parenteral administration of any other radionuclide, for which a written directive is required; and

(3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraph (A)(2) or (A)(3) of this rule, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed radioactive material requiring a written directive. The written attestation must be signed by a preceptor authorized user who meets the requirements in this rule, rule 3701:1-58-21, or 3701:1-58-40 of the Administrative Code, or equivalent United States nuclear regulatory commission or agreement state requirements. A preceptor authorized user, who meets the requirements in rule 3701:1-58-40 of the Administrative Code must have experience in administering dosages as specified in paragraphs (B)(1)(b)(vi)(c) and/or (B)(1)(b)(vi)(d) of rule 3701:1-58-40 of the Administrative Code.

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