

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

PART He-P 4003 DEFINITIONS

He-P 4003.01 Definitions.

(a) “A₁” means the maximum activity of special form radioactive material permitted in a Type A package, as defined in He-P 4037.

(b) “A₂” means the maximum activity of radioactive material, other than special form radioactive material, permitted in a Type A package, as defined in He-P 4037.

(c) “Absorbed dose” means the energy imparted by ionizing radiation per unit mass of irradiated material, expressed in units of the gray (Gy) or the rad.

(d) “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 million electron volts (1MeV). This term includes “particle accelerator.”

(e) “Accelerator-produced radioactive material” means any material made radioactive by a particle accelerator.

(f) “Act” means State of New Hampshire Revised Statutes Annotated (RSA), Chapter 125-F, Sections 1-25, Radiological Health Program.

(g) “Activity” means the rate of disintegration or transformation or decay of radioactive material in units of the Becquerel (Bq) or the curie (Ci).

(h) “Adult” means an individual 18 or more years of age.

(i) “Agreement State” means any state with which the U.S. Nuclear Regulatory Commission or the U.S. Atomic Energy Commission has entered into an effective agreement under subsection 274b. of the Atomic Energy Act of 1954, as amended (73 Stat. 689).

(j) “Airborne radioactive material” means any radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases.

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

(1) That are in excess of the derived air concentrations (DACs) specified in He-P 4090 of these rules; or

(2) 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 percent of the annual limit on intake (ALI) or 12 DAC-hours.

(l) “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.

(m) “Annual limit on intake (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 and 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 Sv (5 rem) or a committed dose equivalent of 0.5 Sv (50 rem) to any individual organ or tissue.

(n) “As low as is reasonably achievable (ALARA)” means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these regulations 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 state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socio-economical considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

(o) “Assigned protection factor (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 trained and fitted users.

(p) “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 (SARs) and self-contained breathing apparatus (SCBA) units.

(q) “Background radiation” means:

(1) Radiation from cosmic sources;

(2) Naturally occurring radioactive materials, which ~~has~~ have not been technologically enhanced, including radon, except as a decay product of source or special nuclear material;

(3) Global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents that contribute to background radiation and are not under the control of the licensee or registrant; and

(4) Not ~~sources of~~ radiation from sources, or byproduct materials regulated by the DHHS/~~BRHRHS~~.

(r) “Becquerel (Bq)” means a unit of activity where one becquerel is equal to one disintegration per second (dps) or transformation per second (tps).

(s) “Bioassay” means the determination of kinds, quantities or concentrations, and 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. This term includes “radiobioassay.”

(t) “Brachytherapy” means a method of radiation therapy in which sealed sources are utilized to deliver a radiation dose at a distance of up to a few centimeters, by surface, intracavitary, or interstitial application.

(u) “Bureau of radiological health (BRH)” means the former name of the radiological health program of the department of health and human services.

(v) “Byproduct material” means:

(1) “Byproduct material” as defined in RSA 125-F:3,II, namely “any radioactive material, except special nuclear material, yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material”; ~~and~~

(2) The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium or thorium solution extraction processes except underground ore bodies depleted by these solution extraction operations-;

(3) Any discrete source of radium-226 that is produced, extracted, or converted after extraction for use for a commercial, medical, or research activity;

(4) Any material that has been made radioactive by use of a particle accelerator and that is produced, extracted, or converted after extraction for use for a commercial, medical, or research activity; and

(5) Any discrete source of naturally occurring radioactive material, other than source material, that:

a. The Governor declares by order to be byproduct material after the United States Nuclear Regulatory Commission, in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, the Secretary of Homeland Security, and the head of any other appropriate Federal agency, determines would pose a threat similar to the threat posed by a discrete source of radium-226 to the public health and safety or the common defense and security; and

b. Is extracted or converted after extraction for use in a commercial, medical, or research activity.

(w) “Calibration” means the determination of:

(1) The response or reading of an instrument relative to a series of known radiation values over the range of the instrument, or

(2) The strength of a source of radiation relative to a standard.

(x) “Chelating agent” means amine polycarboxylic acids, hydroxycarboxylic acids, gluconic acid, and polycarboxylic acids.

(y) “Class” means a classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. This term includes “inhalation class” or “lung class.”

(z) “Class D” means a class having a range of clearance half-times of less than 10 days.

(aa) “Class W” means a class having a range of clearance half-times of 10 to 100 days.

(ab) “Class Y” means a class having a range of clearance half-times of greater than 100 days.

(ac) “Clearance half time” means the time required for activity in the pulmonary region of the lung to be reduced by radioactive decay and biological processes to one half its value.

(ad) “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.

(ae) “Commissioner” means ~~“commissioner” as defined in RSA 125:F:3, VI, namely~~ “the commissioner of the New Hampshire department of health and human services”, or his or her designee.

(af) “Committed dose equivalent ($H_{T,50}$)” 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 50-year period following the intake.

(ag) “Committed effective dose equivalent ($H_{E,50}$)” is the sum of the products of the weighting factors (w_T) applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent ($H_{T,50}$) to each of these organs or tissues ($H_{E,50} = \sum S w_T H_{T,50}$).

(ah) “Condition of light work” means an inhalation rate of 1.2 cubic meters of air per hour for 2,000 hours in a year.

(ai) “Consortium” means an association of medical use licensees and a Positron Emission Tomography (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 Federal facility or a medical facility.

~~(aj)~~ “Constraint” means a value above which specified license actions are required. This term includes “dose constraint.”

(ak) “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.

~~(ajal)~~ “Critical group” means the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

~~(akam)~~ “Curie” means a unit of quantity of radioactivity in which one curie (Ci) is that quantity of radioactive material that decays at the rate of $3.7E+10$ transformations per second (tps).

(an) “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 10 megaelectron volts and is commonly used for production of short half-life radionuclides for medical use.

~~(alao)~~ “Declared pregnant woman” means a woman who has voluntarily informed her employer, 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.

~~(amap)~~ “Decommission” means to remove a facility or site safely from service and reduce residual radioactivity to a level that permits:

- (1) Release of the property for unrestricted use and termination of the license; or
- (2) Release of the property under restricted conditions and termination of the license.

(~~aaq~~) “Decommissioning plan” means a written document that includes the licensee’s planned procedures and activities for decommissioning of the facility or site.

(~~aear~~) “Deep dose equivalent (H_d),” applicable to external whole-body exposure, means the dose equivalent at a tissue depth of one centimeter (1000 mg/cm²).

(~~apas~~) “Demand respirator” means an atmosphere-supplying respirator that admits breathing air to the face-piece only when a negative pressure is created inside the facepiece by inhalation.

(~~aqat~~) “Depleted uranium” means the source material uranium in which the isotope uranium-235 is less than 0.711 weight percent of the total uranium present exclusive of special nuclear material.

(~~afau~~) “Derived air concentration (DAC)” means the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2,000 hours under conditions of light work, results in an intake of one ALI.

(~~asav~~) “Derived air concentration-hour” (DAC-hour) means the product of the concentration of radioactive material in air, expressed as a fraction or multiple of the derived air concentration for each radionuclide, and the time of exposure to that radionuclide, in hours.

(aw) “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.

(~~atax~~) “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 (SCBA).

(~~auay~~) “Distinguishable from background” means that the detectable concentration of a radionuclide is statistically different from the background concentration of that radionuclide in the vicinity of the site or, in the case of structures, in similar materials using adequate measurement technology, survey, and statistical techniques.

(~~avaz~~) “Dose” means a generic term that includes absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, ~~total organ dose equivalent~~, or total effective dose equivalent. This term includes “radiation dose.”

(~~awba~~) “Dose equivalent (H_T)” means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the body location of interest in units of the sievert (Sv) or rem.

(~~axbb~~) “Dose limits” means the permissible upper bounds of radiation doses established in accordance with these rules. ~~This term includes “limits.”~~

(~~aybc~~) “Dosimetry processor” means an individual or an organization that processes and evaluates individual monitoring devices in order to determine the radiation dose delivered to the monitoring devices.

(~~az~~bd) “Effective dose equivalent ($H_{E,E}$)” 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.

(~~babe~~) “Embryo/fetus” means the developing human organism from conception until the time of birth.

(~~bbbf~~) “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 which include entry or exit portals of sufficient size to permit human entry.

(~~bebg~~) “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.

(~~bdbh~~) “Exposure” means being exposed to ionizing radiation or to radioactive material.

(~~be~~) “Exposure” means the quotient of dQ by dm where “ dQ ” is the absolute value of the total charge of the ions of one sign produced in air when all the electrons, both negatrons and positrons, liberated by photons in a volume element of air having mass “ dm ” are completely stopped in air, the SI unit being the coulomb per kilogram (C/kg).

(~~bfbj~~) “Exposure rate” means the exposure per unit of time.

(~~bgbj~~) “External dose” means that portion of the dose equivalent received from any source of radiation outside the body.

(~~bhbk~~) “Extremity” means hand, elbow, and arm below the elbow, foot, knee, and leg below the knee.

(~~bibl~~) “Facility” means the location within one building, vehicle, or under one roof and under the same administrative control at which:

- (1) ~~t~~The possession, use, processing or storage of radioactive material is or was authorized; or
- (2) ~~e~~One or more radiation-producing machines or radioactivity-inducing machines are installed or located.

(~~bjbm~~) “Filtering facepiece” 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. This term includes “dust mask.”

(~~bkbj~~) “Fit factor” means a 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.

(~~bhbo~~) “Fit test” means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

(~~bmbp~~) “Final radiation survey” means the survey of the facility or site after decommissioning activities have been completed during which the determination is made by the licensee that the facility or site meets the DHHS/~~BRH's~~ RHS's release criteria.

(~~b~~(b)(4)) “Former U.S. Atomic Energy Commission (AEC) or U.S. Nuclear Regulatory Commission (NRC) licensed facilities” means nuclear reactors, nuclear fuel reprocessing plants, uranium enrichment plants, or critical mass experimental facilities where AEC or NRC licenses have been terminated.

(~~b~~(b)(1)) “Generally applicable environmental radiation standards” means standards issued by the U.S. Environmental Protection Agency (EPA) 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.

(~~b~~(b)(5)) “Gray (Gy)” means the SI unit of absorbed dose where one gray is equal to an absorbed dose of one joule per kilogram that is equal to 100 rad.

(~~b~~(b)(1)) “Hazardous waste” means those waste designated as hazardous by U.S. Environmental Protection Agency regulations in 40 CFR 261.

(~~b~~(b)(4)) “Healing arts” means the diagnosis and treatment of ailments for humans.

(~~b~~(b)(4)) “Helmet” means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

(~~b~~(b)(4)) “High radiation area” means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of one millisievert (mSv) or “0.1 rem” in one hour at 30 centimeters from any source of radiation or from any surface that the radiation penetrates.

(~~b~~(b)(4)) “Hood” means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

(~~b~~(b)(4)) “Human use” means the internal or external administration of radiation or radioactive material to human beings.

(~~b~~(b)(4)) “Individual” means any human being.

(~~b~~(b)(4)) “Individual monitoring” means the assessment of:

- (1) Dose equivalent by the use of individual monitoring devices or by the use of survey data; or
- (2) Committed effective dose equivalent by bioassay or by determination of the time-weighted air concentrations to which an individual has been exposed, that is, DAC-hours.

(~~b~~(b)(4)) “Individual monitoring devices” means devices designed to be worn by a single individual for the assessment of dose equivalent, and includes film badges, thermoluminescent dosimeters (TLDs), pocket ionization chambers, optically stimulated luminescence (OSL) dosimeters, and personal air sampling equipment. This term includes “personnel monitoring equipment.”

(~~b~~(b)(4)) “Inspection” means an official examination or observation to determine compliance with rules and orders of the DHHS/BRHRHS.

(~~e~~(a)(4)) “Instrument traceability” means the ability to show for ionizing radiation measurements that an instrument has been calibrated at specified time intervals using a national standard or a transfer standard

which was calibrated at a laboratory accredited by a program which requires continuing participation in measurement quality assurance with the National Institute of Standards and Technology, or other equivalent national or international program.

(~~ebce~~) “Interlock” means a device arranged or connected such that the occurrence of an event or condition is required before a second event or condition can occur or continue to occur.

(~~eeef~~) “Internal dose” means that portion of the dose equivalent received from radioactive material taken into the body.

(~~eedg~~) “Lens dose equivalent (LDE)” means the external exposure to the lens of the eye as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg/cm²).

(~~eech~~) “License” means a “license” as defined in RSA 125-F:3 IX, namely, “general or specific: (a) “General license” means a license pursuant to rules adopted by the program without the filing of an application with the program, or the issuance of licensing documents to particular persons to transfer, acquire, own, possess or use quantities of, or devices or equipment utilizing, radioactive material. (b) “Specific license” means a license issued to a name person upon application filed pursuant to the rules adopted under this chapter, to use, manufacture, produce, transfer, receive, acquire, own or possess quantities of, or devices or equipment utilizing, radioactive material.”

(~~efci~~) “Licensed material” means ~~radioactive source~~ material, ~~special nuclear material, or byproduct material~~ received, possessed, used, transferred, or disposed of under a license issued by the DHHS/~~BRHRHS~~.

(~~egcj~~) “Licensee” means:

(1) Any person who is licensed by the DHHS/~~BRHRHS~~ in accordance with the Act and He-P 4000; or

(2) Any person who is responsible for decommissioning by being registered with the DHHS/~~BRHRHS~~, being subject to a record of possession of a radiation source or device under general license, or being otherwise legally obligated to conduct decommissioning activities in accordance with these regulations and the Act.

(~~ehck~~) “Licensing State” means any state with regulations or rules equivalent to the Suggested State Rules for Control of Radiation relating to, and having 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.

(~~cl~~) “Limits” means ~~the permissible upper bounds of radiation doses.~~

(~~eicm~~) “Loose-fitting facepiece” means a respiratory inlet covering that is designed to form a partial seal with the face.

(~~ejcn~~) “Lost or missing sources of radiation” means licensed or registered sources of radiation whose location is unknown or that have been shipped but has not reached its planned destination and whose location cannot be readily traced.

(~~ekco~~) “Major processor” means a user processing, handling, or manufacturing radioactive material exceeding Type A quantities as defined in ~~He P-4037.03(q)~~ 10 CFR Part 71.4 as unsealed sources or

material, or exceeding 4 times Type B quantities as defined in ~~He-P 4037.03(r)~~ 10 CFR Part 71.4 as sealed sources, exclusive of nuclear medicine programs, universities, or industrial ~~radiographers~~ radiography.

(~~etcp~~) “Member of the public” means any individual, except an individual who is performing assigned duties for a licensee or registrant involving exposure to sources of radiation.

(~~emcq~~) “Minor” means an individual less than 18 years of age.

(~~enr~~) “Monitoring” means the measurement of radiation levels, radioactive material concentrations, surface area activity or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses.

(~~eees~~) “NARM” means any naturally occurring or accelerator-produced radioactive material other than byproduct, source, or special nuclear material.

(ct) “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 He-P 4097. 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.

(~~epcu~~) “Natural radioactivity” means radioactivity of naturally occurring nuclides.

(~~eqcv~~) “Negative pressure respirator (tight fitting)” 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. This term includes “tight fitting negative pressure respirator.”

(~~efcw~~) “Nonstochastic effect” means a health effect, the severity of which varies with the dose and for which a threshold is believed to exist.

(~~escx~~) “NORM” means any naturally occurring radioactive material, and excludes byproduct, source, or special nuclear material.

(~~etcy~~) “Nuclear facility” means any facility that uses radioactive material.

(~~enr~~) “Nuclear Regulatory Commission (NRC)” means the U.S. Nuclear Regulatory Commission or its duly authorized representatives.

(~~evda~~) “Occupational dose” means the dose received by an individual in the course of employment in which the individual's assigned duties for the licensee or registrant involve exposure to sources of radiation, or to radioactive material from licensed and unlicensed sources of radiation, whether or not the sources of radiation are in the possession of the licensee, registrant or other person, exclusive of dose received:

- (1) From background radiation;
- (2) As a patient from medical practices;

(3) From exposure to individuals administered radioactive material and released under He-P 4035.25;

~~(34)~~ From voluntary participation in medical research programs; or

~~(45)~~ As a member of the public.

~~(ewdb)~~ “Package” means packaging plus its radioactive contents as presented for transport.

(dc) “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.

~~(exdd)~~ “Person” means “person” as defined in RSA 125-F:3, XII, namely “any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency of this state other than the program, political subdivision of this state, any other state or political subdivision or agency, and any legal successor, representative, or agent of the foregoing, other than federal government agencies”.

~~(eyde)~~ “Pharmacist” means “licensed pharmacist or pharmacist” as defined in RSA 318:1, VII, namely, “when not otherwise limited, means a person holding a license under RSA 318:18 and who is, therefore, legally authorized to practice the profession of pharmacy in this state.”

~~(ezdf)~~ “Physician” means an individual licensed in this state to practice medicine.

~~(dadg)~~ “Planned special exposure” means an infrequent exposure to radiation, separate from and in addition to the annual occupational dose limits.

~~(dbdh)~~ “Positive pressure respirator” means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

~~(dedi)~~ “Powered air-purifying respirator (PAPR)” means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

~~(dddj)~~ “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.

~~(dedk)~~ “Principal activity” means an activity authorized by the license which is essential to achieving the purpose(s) for which the license was issued or amended, and excludes storage during which no licensed material is accessed for use or disposal and activity incidental to decontamination or decommissioning.

~~(dfdl)~~ “Protective apron” means an apron made of radiation-attenuating materials used to reduce exposure to radiation.

~~(dgdM)~~ “Public dose” means the dose received by a member of the public from exposure to sources of radiation or to radioactive material released from by licensed licensee or registered operators or to any other source of radiation under the control of a licensee or registrant. ~~but Public dose~~ does not include occupational dose, dose received from background radiation, dose received as a patient from medical

~~practices~~administration, from exposure to individuals administered radioactive material and released under He-P 4035.25, or dose from voluntary participation in medical research programs.

~~(d)dn~~ “Pyrophoric liquid” means any liquid that ignites spontaneously in dry or moist air at or below 130° F (54.4° C).

~~(d)do~~ “Pyrophoric solid” means any solid material, or spontaneously combustible and water-reactive 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.

~~(d)dp~~ “Qualified expert” means an individual having the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs, for example, individuals certified in the appropriate field by the American Board of Radiology, or the American Board of Health Physics, or the American Board of Medical Physics, or those having equivalent qualifications. With reference to the calibration of radiation therapy equipment, this term includes an individual having, in addition to the above qualifications, training and experience in the clinical applications of radiation physics to radiation therapy, for example, individuals certified in ~~Therapeutic Radiological Physics or X-Ray and Radium Physics~~radiation oncology by the American Board of Radiology, or those having equivalent qualifications.

~~(d)dq~~ “Qualitative fit test (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.

~~(d)dr~~ “Quality factor (Q)” means the modifying factor, listed in Tables 4001.1 and 4001.2 of He-P 4001.0809, that is used to derive dose equivalent from absorbed dose.

~~(d)ds~~ “Quantitative fit test (QNFT)” means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

~~(d)dt~~ “Quarter” means not less than 12 consecutive weeks nor more than 14 consecutive weeks arranged so that the first calendar quarter begins in January and that in subsequent calendar quarters no day is included in more than one calendar quarter and no day in any one year is omitted from inclusion within a calendar quarter. This term includes “calendar quarter.”

~~(d)du~~ “Rad” means the special unit of absorbed dose where one rad is equal to an absorbed dose of 100 ergs per gram or 0.01 joule per kilogram.

~~(d)dv~~ “Radiation” means “radiation” as defined in RSA 125-F:3, XIV, namely, “ionizing radiation and nonionizing radiation: (a) ‘Ionizing radiation’ means gamma rays and x-rays, alpha and beta particles, high speed electrons, neutrons, protons, and other nuclear particles, but not sound or radio waves or visible, infrared or ultraviolet light; (b) ‘Nonionizing radiation’ means: (1) Any electromagnetic radiation other than ionizing radiation which the program determines by rule to present a biological hazard to the occupational or public health and safety; and (2) Any sonic, ultrasonic, or infrasonic wave which the program determines by rule to present a biological hazard to the occupational or public health or safety.”

~~(d)dw~~ “Radiation area” means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 mSv or 0.005 rem in one hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

~~(d)dx~~ “Radiation ~~machine~~equipment” means “radiation ~~equipment~~machine” as defined in RSA 125-F:3, XV, namely, “any manufactured product or device, the component part of such product or device, or any machine or system which during operation is able to generate or emit radiation, except those which emit radiation only from radioactive material.”

~~(d)dy~~ “Radiation safety officer” means an individual who:

(1) ~~has~~Has the knowledge and responsibility to apply appropriate radiation protection rules and has been assigned such responsibility by the licensee or registrant;

(2) ~~Meets the requirements in both He-P 4035.08 and He-P 4035.61, or meets the requirements in He-P 4035.62; or~~

~~(3) Is identified as a Radiation Safety Officer on an Agency license, a Nuclear Regulatory Commission license, or Agreement State license or other equivalent permit or license recognized by the Agency for similar types and uses of byproduct material.~~

~~(d)dz~~ “Radioactive material” means “radioactive material” as defined in RSA 125-F:3, XVI, namely, “any material, whether solid, liquid, or gas, which emits radiation spontaneously. It includes artificially produced, byproduct, naturally occurring, source, and special nuclear materials.” The term includes byproduct material.

~~(d)ea~~ “Radioactivity” means the transformation of unstable atomic nuclei by the emission of radiation.

~~(e)b~~ “Radiological health section (RHS)” means the radiological health section of the division of public health service of the NH department of health and human services.

~~(d)ec~~ “Reference man” means a hypothetical aggregation of human physical and physiological characteristics determined by international consensus, ~~and described in the International Commission on Radiological Protection report, ICRP Publication 23, “Report of the Task Group on Reference Man”~~ 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.

~~(d)ed~~ “Registrant” means any person who is registered with the DHHS/~~BRH-RHS~~ and is legally obligated to register with the DHHS/~~BRH-RHS~~ pursuant to these rules and the Act.

~~(d)ee~~ “Registration” means “registration” as defined in RSA 125-F:3, XVIII, namely, “registration in accordance with rules adopted pursuant to this chapter.”

~~(d)ef~~ “Regulations of the U.S. Department of Transportation” means the regulations in 49 CFR 100-189.

~~(d)eg~~ “Rem” means the special unit of any of the quantities expressed as dose equivalent equal to the absorbed dose in rad multiplied by the quality factor.

~~(e)eh~~ “Research and development” means:

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

(2) The extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes but does not include the internal or external administration of radiation or radioactive material to human beings.

(~~e~~~~b~~~~e~~~~j~~) “Residual radioactivity” means radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the licensee’s control, but not background radiation, and includes:

(1) Radioactivity from all licensed and unlicensed sources used by the licensee; and

(2) Radioactive materials remaining at the site as a result of routine or accidental releases of radioactive materials at the site and previous burials at the site, even if those burials were made in accordance with the provisions of these regulations.

(~~e~~~~e~~~~e~~~~j~~) “Respiratory protective device” means an apparatus, such as a respirator, used to reduce an individual's intake of airborne radioactive materials.

(~~e~~~~e~~~~k~~) “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 and radioactive materials exclusive of areas used as residential quarters, other than separate rooms in a residential building which may be set apart as a restricted area.

(~~e~~~~e~~~~l~~) “Restricted use” means that a limit or control has been placed on future use of the facility and the facility is no longer under the control of the licensee, registrant, or holder of the record of possession.

(~~e~~~~f~~~~e~~~~m~~) “Roentgen” means the special unit of exposure where one roentgen (R) equals $2.58E-4$ coulombs per kilogram of air.

(~~e~~~~g~~~~e~~~~n~~) “Sanitary sewerage” means a system of public sewers for carrying off waste water and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the licensee or registrant.

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

(~~e~~~~i~~~~e~~~~p~~) “Sealed source and device registry (SSD)” means the national registry that contains the registration certificates, maintained by the Nuclear Regulatory Commission (NRC), that summarize the radiation safety information for sealed sources and devices, and describe the licensing and use conditions approved for the product.

(~~e~~~~j~~~~e~~~~q~~) “Self-contained breathing apparatus (SCBA)” means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

(~~e~~~~k~~~~e~~~~r~~) “Shallow dose equivalent (Hs)” means the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm^2) applicable to the external exposure of the skin of the whole body or the skin of an extremity.

(~~es~~) “Short-lived radon daughters for radon-222” means polonium-218, lead-214, bismuth-214, and polonium-214.

(~~emet~~) “Short-lived radon daughters for radon-220” means polonium-216, lead-212, bismuth-212, and polonium-212.

(~~eu~~) “SI” means the measurement is in the International-international System-system of units.

(~~eev~~) “Sievert” means the SI unit of any of the quantities expressed as dose equivalent which in sieverts is equal to the absorbed dose in grays multiplied by the quality factor.

(~~epew~~) “Site” means the area contained within the boundary of a location under the control of persons generating or storing radioactive materials.

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

(~~erey~~) “Source material” means “source material” as defined in RSA 125-F:3, XIX, namely, “(a) uranium, thorium, or any other material which the governor declares by order to be source material after the United States Nuclear Regulatory Commission or its successor has determined the material to be source material; or (b) ores containing one or more of the foregoing materials in such concentration as the governor declares by order to be source material after the United States Nuclear Regulatory Commission or its successor has determined the material in such concentration to be source material.”

(~~esez~~) “Source material milling” means any activity that results in the production of radioactive material as defined in He-P 4003.01(~~etdz~~).

(~~etfa~~) “Source of radiation” means “source of radiation” as defined in RSA 125-F:3, XX, namely, “collectively, radioactive material and radiation equipment.”

(~~ewfb~~) “Source traceability” means the ability to show that a radioactive source has been calibrated either by the national standards laboratory of the National Institute of Standards and Technology, or by a laboratory which participates in a continuing measurement quality assurance program with the National Institute of Standards and Technology or an equivalent national or international program.

(~~evfc~~) “Special form radioactive material” means radioactive material that satisfies the following conditions:

- (1) It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule;
- (2) The piece or capsule has at least one dimension not less than 5 millimeters or “0.2 inch”; and
- (3) It satisfies the test requirements specified by the U.S. Nuclear Regulatory Commission.

(~~ewfd~~) “Special nuclear material” means “special nuclear material” as defined in RSA 125-F:3, XXI, namely, “(a) plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the governor declares by order to be special nuclear material after the United States Nuclear Regulatory Commission or its successor has determined the material to be special nuclear material,

but does not include source material; or (b) any material artificially enriched by any of the foregoing, but does not include source material.”

(~~ex~~fe) “Special nuclear material in quantities not sufficient to form a critical mass” means:

- (1) Uranium enriched in the isotope U-235 in quantities not exceeding 350 grams of contained U-235;
- (2) Uranium-233 in quantities not exceeding 200 grams;
- (3) Plutonium in quantities not exceeding 200 grams; or
- (4) Any combination of them so that the ratio between the quantity of the special nuclear material on hand and the quantity specified above for the same kind of special nuclear material, summed for all of the kinds of special nuclear material in combination does not exceed one.

(~~ey~~ff) “Stochastic effect” means a health effect that occurs 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, such as hereditary effects and cancer incidence.

(~~ez~~fg) “Storage” means a condition in which a device or source is not being used for an extended period of time, and has been made inoperable.

(~~fa~~fh) “Supplied-air respirator (SAR)” means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user. This term includes “airline respirator.”

(~~fb~~fi) “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 and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.

(~~fe~~fi) “Test” means the process of verifying compliance with an applicable rule.

(~~fd~~fk) “Tight-fitting facepiece” means a respiratory inlet covering that forms a complete seal with the face.

(~~fe~~fl) “Total effective dose equivalent (TEDE)” means the sum of the ~~deep-effective~~ dose equivalent for external exposures and the committed effective dose equivalent for internal exposures.

(~~ff~~fm) “Total organ dose equivalent (TODE)” means the sum of the deep dose equivalent and the committed dose equivalent to the organ receiving the highest dose as described in He-P 4003.01(~~ae~~ar) and He-P 4003.01(af) respectively.

(~~fg~~fn) “Traceable to a national standard” means:

- (1) The ability to show for ionizing radiation measurements that an instrument has been calibrated at specified time intervals using a national standard or a transfer standard which was calibrated at a laboratory accredited by a program which requires continuing participation in

measurement quality assurance with the National Institute of Standards and Technology (NIST), or other equivalent national or international program; or

(2) The ability to show that a radioactive source has been calibrated either by the national standards laboratory of the NIST, or by a laboratory which participates in a continuing measurement quality assurance program with NIST or an equivalent national or international program.

(~~h~~fo) “U.S. Department of Energy” means the Department of Energy established by Public Law 95-91, August 4, 1977, 91 Stat. 565, 42 U.S.C. 7101, to the extent that the Department exercises functions formerly vested in the U.S. Atomic Energy Commission, its chairman, members, officers and components and transferred to the U.S. 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 established by Public Law 93-438, October 11, 1974, 88 Stat. 1233 at 1237, 42 U.S.C. 5814, effective January 19, 1975 and retransferred to the Secretary of Energy pursuant to section 301(a) of the Department of Energy Organization Act established by Public Law 95-91, August 4, 1977, 91 Stat. 565 at 577-578, 42 U.S.C. 7151, effective October 1, 1977.

(~~f~~fp) “Unrefined and unprocessed ore” means ore in its natural form prior to any processing.

(~~f~~fj) “Unrestricted area” means an area access to which is neither limited nor controlled by the licensee or registrant.

(~~f~~fr) “Unrestricted use” means that the facility or area may be used by individuals for any purpose without limits or controls, and is no longer under the control of the licensee, registrant, or holder of the record of possession.

(~~f~~fs) “User seal check (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.

(~~f~~mft) “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 5 Gy (500 rad) in one hour at one meter from a source of radiation or one meter from any surface that the radiation penetrates.

(~~f~~fu) “Waste” means “low-level radioactive waste” as defined in RSA 125-F:3, X, namely, “radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in paragraph II.” This term includes radioactive waste not classified as byproduct material as defined in (v) above; and includes radioactive wastes that are acceptable for disposal in a land disposal facility.

(~~f~~fv) “Waste handling licensees” mean persons licensed to receive and store radioactive wastes prior to disposal and/or persons licensed to dispose of radioactive waste.

(~~f~~fw) “Week” means 7 consecutive days starting on Sunday.

(~~f~~qfx) “Weighting factor (~~w~~FW_T) for an organ or tissue (T)” means 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.

(~~f~~fy) “Whole body” means external exposure of head, trunk including male gonads, arms above the elbow, or legs above the knee.

(~~f~~sfz) “Worker” means an individual engaged in activities under a license or registration issued by the DHHS/~~BRH~~RHS and controlled by a licensee or registrant, but does not include the licensee or registrant.

(~~f~~ga) “Working level (WL)” means any combination of short-lived radon daughters in one liter of air that will result in the ultimate emission of $1.3E+5$ MeV of potential alpha particle energy.

(~~f~~gb) “Working level month (WLM)” means an exposure to one working level for 170 hours and calculated as 2,000 working hours per year divided by 12 months per year and is approximately equal to 170 hours per month.

(~~f~~gc) “Year” means the period of time beginning in January used to determine compliance with the provisions of these rules.

PART He-P 4019 NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS;
INSPECTIONS

He-P 4019.01 Purpose. This part shall establish requirements for notices, instructions, and reports by licensees or registrants to individuals engaged in activities under a license or registration and options available to such individuals in connection with the department of health and human services/bureau of radiological health (DHHS/~~BRHRHS~~) inspections of licensees or registrants to ascertain compliance with the provisions of the Act and rules, orders, and licenses issued thereunder regarding radiological working conditions.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.02 Scope. The rules in this part shall apply to all persons who receive, possess, use, own, or transfer sources of radiation registered with or licensed by the DHHS/~~BRHRHS~~.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.03 Posting of Notices to Workers.

(a) Each licensee shall post, at each facility licensed, current copies of the following documents:

- (1) The rules in He-P 4019 through 4023;
- (2) The license, and conditions or documents incorporated into the license by reference and amendments thereto;
- (3) The operating procedures applicable to activities under the license; and
- (4) Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued by the commissioner pursuant to the Act, and any response from the licensee.

(b) Each registrant shall post, at each facility registered, current copies of the following documents:

- (1) The rules in He-P 4019 through 4022;
- (2) The certificate of registration;
- (3) The operating procedures applicable to activities under the registration; and
- (4) Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued by the commissioner pursuant to the Act, and any response from the registrant.

(c) If posting of a document specified in He-P 4019.03(a) or (b) is not practicable, the licensee or registrant shall post a notice which describes the document and states where it may be examined.

(d) The DHHS/~~BRH-RHS~~ Form ~~Bureau of~~ Radiological Health Section-5 “Notice to Employees” shall be posted by each licensee or registrant.

(e) The DHHS/~~BRH-RHS~~ documents posted pursuant to He-P 4019.03(a)(4) or (b)(4) shall be posted within 2 working days after receipt of the documents from the DHHS/~~BRH-RHS~~.

(f) The licensee’s or registrant’s response pursuant to He-P 4019.03(a)(4) or (b)(4), if any, shall be posted within 2 working days after dispatch from the licensee or registrant and shall remain posted for a minimum of 5 working days or until action correcting the violation has been completed, whichever is later.

(g) Documents, notices, or forms posted pursuant to He-P 4019.03 shall:

- (1) Appear in a sufficient number of places to permit individuals engaged in work under the license or registration to observe them on the way to or from any particular work location to which the document applies;
- (2) Be conspicuous; and
- (3) Be replaced if defaced or altered.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.04 Instructions to Workers.

(a) All individuals who in the course of employment are likely to receive in a year an occupational dose in excess of 1 millisievert (100 mrem) shall:

- (1) Be kept informed of the storage, transfer, or use of sources of radiation in the licensee’s or registrant’s workplace;
- (2) Be instructed in:
 - a. The health protection problems associated with exposure to radiation or radioactive material to the individual and potential offspring;
 - b. Precautions or procedures to minimize exposure; and
 - c. The purposes and functions of protective devices employed;
- (3) Be instructed in, and be required to observe, to the extent within the worker’s control, the applicable provisions of these rules and licenses for the protection of personnel from exposures to radiation or radioactive material;
- (4) Be instructed of their responsibility to report promptly to the licensee or registrant any condition which may constitute, lead to, or cause a violation of the Act, these rules, and license conditions or unnecessary exposure to radiation or radioactive material;
- (5) Be instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material; and

(6) Be advised as to the radiation exposure reports which workers shall be furnished pursuant to He-P 4019.05.

(b) The licensee shall consider assigned activities during normal and abnormal situations involving exposure to radiation or radioactive material which can reasonably be expected to occur during the life of the licensed facility in determining those individuals subject to the requirements of He-P 4019.04(a).

(c) The extent of these instructions shall be commensurate with potential radiological health protection problems present in the workplace.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.05 Notifications and Reports to Individuals.

(a) Radiation exposure data for an individual and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual shall be reported to the individual as specified in He-P 4019.05(b)-(k).

(b) The information reported shall include data and results obtained pursuant to these rules, orders, or license conditions, as shown in records maintained by the licensee or registrant pursuant to He-P 4021.07.

(c) Each notification and report shall:

- (1) Be in writing;
- (2) Include appropriate identifying data such as:
 - a. The name of the licensee or registrant;
 - b. The name of the individual; and
 - c. The individual's identification number;
- (3) Include the individual's exposure information; and
- (4) Contain the following statement:

"This report is furnished to you under the provisions of He-P 4019. You should preserve this report for further reference."

(d) Each licensee or registrant shall make dose information available to workers as shown in records maintained by the licensee under the provisions of He-P 4021.07. Each licensee or registrant shall furnish to each worker annually a written report of the worker's dose as shown in records maintained by the licensee or registrant pursuant to He-P ~~4021.07~~4022.02; if:

~~(e) Each licensee or registrant shall furnish a written report of the worker's exposure to sources of radiation at the request of a worker formerly engaged in activities controlled by the licensee or registrant. The report shall include the dose record for each year the worker was required to be monitored pursuant to He P 4022.02.~~

(1) The individual's occupational dose exceeds 1 mSv (100 mrem) TEDE or 1 mSv (100 mrem) to any individual organ or tissue; or

(2) The individual requests his or her annual dose report.

(e)(1) At the request of a worker formerly engaged in licensed activities controlled by the licensee or registrant, each licensee or registrant shall furnish to the worker a report of the worker's exposure to radiation and/or to radioactive material:

a. As shown in records maintained by the licensee or registrant to He-P 4021.07 for each year the worker was required to be monitored under the provisions of He-P 4022.02; and

b. For each year the worker was required to be monitored under the requirements in effect prior to January 1, 1994.

(f) Such report, pursuant to He-P 4019.05(e), shall be furnished within 30 days from the date of the request, or within 30 days after the dose of the individual has been determined by the licensee or registrant, whichever is later.

(g) The report, pursuant to He-P 4019.05(e), shall cover the period of time that the worker's activities involved exposure to sources of radiation and shall include the dates and locations of work under the license or registration in which the worker participated during this period.

(h) When a licensee or registrant is required pursuant to He-P 4021.14 to report to the DHHS/~~BRH-RHS~~, any exposure of an individual to sources of radiation, the licensee or the registrant shall also provide the individual a written report on the exposure data included therein.

(i) Reports, pursuant to He-P 4019.05(e), shall be transmitted to the individual at a time not later than the transmittal to the DHHS/~~BRH-RHS~~.

(j) Each licensee or registrant shall, at the request of a worker who is terminating employment and whose work involved exposure to radiation or radioactive material during the current year, provide at termination to each such worker, or to the worker's designee, a written report regarding the radiation dose received by that worker from operations of the licensee or registrant during the current year or fraction thereof.

(k) If the most recent individual monitoring results are not available pursuant to He-P 4019.05(j), a written estimate of the dose shall be provided together with a clear indication that this is an estimate.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.06 Presence of Representatives of Licensees or Registrants and Workers During Inspections.

(a) Each licensee or registrant shall afford to the DHHS/~~BRH-RHS~~ at any time the opportunity to inspect:

(1) Materials;

- (2) Machines;
- (3) Activities;
- (4) Facilities;
- (5) Premises; and
- (6) Records created and maintained pursuant to these rules.

(b) During an inspection, the DHHS/~~BRH-RHS~~ inspectors may consult privately with workers, either on their own volition or at the request of any of the workers, as specified in He-P 4019.07.

(c) The licensee or registrant may accompany the DHHS/~~BRH-RHS~~ inspectors during an inspection at times other than the private consultation with workers.

(d) If, at the time of inspection, an individual has been authorized by the workers to represent them during the DHHS/~~BRH-RHS~~ inspections, the licensee or registrant shall notify the inspectors of such authorization and shall give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions.

(e) Each workers' representative shall be routinely engaged in work under control of the licensee or registrant and shall have received instructions as specified in He-P 4019.05.

(f) Different representatives of licensees or registrants and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one workers' representative at a time may accompany the inspectors.

(g) With the approval of the licensee or registrant and the workers' representative, an individual who is not routinely engaged in work under control of the licensee or registrant, for example, a consultant to the licensee or registrant or to the workers' representative, shall be afforded the opportunity to accompany the DHHS/~~BRH-RHS~~ inspectors during the inspection of physical working conditions.

(h) Notwithstanding the other provisions of He-P 4019.06, the DHHS/~~BRH-RHS~~ inspectors shall refuse to permit accompaniment by any individual who deliberately interferes with a fair and orderly inspection.

(i) With regard to areas containing information classified by an agency of the U.S. Government in the interest of national security, an individual who accompanies an inspector may have access to such information only if authorized by the licensee to do so.

(j) With regard to any area containing proprietary information, the workers' representative for that area shall be an individual previously authorized by the licensee or registrant to enter that area.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.07 Consultation with Workers During Inspections.

(a) The DHHS/~~BRH~~-RHS inspectors may consult privately with workers or former workers, either on their own volition or at the request of any of the workers or former workers, concerning matters of occupational radiation protection and other matters related to applicable provisions of these rules and licenses for the conduct of an effective and thorough inspection.

(b) During the course of an inspection, any worker or former worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which the worker or former worker has reason to believe may have contributed to or caused any violation of the Act, these rules, or license condition, or any unnecessary exposure of an individual to sources of radiation under the licensee's or registrant's control.

(c) Any such notice in writing shall comply with the requirements of He-P 4019.08(b).

(d) The provisions of He-P 4019.07(b) shall not be interpreted as authorization to disregard instructions pursuant to He-P 4019.04.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.08 Requests by Workers for Inspections.

(a) Any worker or representative of workers believing that a violation of the Act, these rules, or license conditions exists or has occurred in work under a license or registration with regard to radiological working conditions in which the worker is engaged may request an inspection by giving notice of the alleged violation to the DHHS/~~BRH~~-RHS.

(b) Any such notice shall:

- (1) Be in writing;
- (2) Set forth the specific grounds for the notice; and
- (3) Be signed by the worker or representative of the workers.

(c) A copy of the notice shall be provided to the licensee or registrant by the DHHS/~~BRH~~-RHS no later than at the time of inspection except that, upon the request of the worker giving such notice, such worker's name and the name of individuals referred to therein shall not appear in such copy or on any record published, released, or made available by the DHHS/~~BRH~~-RHS, except for good cause shown.

(d) If the complaint meets the requirements set forth in He-P 4019.08(a) through (c), and there are reasonable grounds to believe that the alleged violation exists or has occurred, an inspection shall be made as soon as practicable to determine if such alleged violation exists or has occurred.

(e) Inspections pursuant to He-P 4019.08 may not be limited to matters referred to in the complaint.

(f) No licensee, registrant, contractor, or subcontractor of a licensee or registrant shall discharge or in any manner discriminate against any worker because such worker has:

- (1) Filed any complaint or instituted or caused to be instituted any proceeding under these rules;

(2) Testified or is about to testify in any such proceeding; or

(3) Because of the exercise by such worker on behalf of himself or others of any option afforded by He-P 4019.

(g) If the DHHS/~~BRH-RHS~~ determines that an inspection is not warranted because the requirements of He-P 4019.08 have not been met, the complainant shall be notified in writing of such determination and shall be without prejudice to the filing of a new complaint meeting the requirements of He-P 4019.08.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4019.09 Inspections not Warranted; Informal Review.

(a) If the DHHS/~~BRH-RHS~~ determines, with respect to a complaint under He-P 4019.08 that an inspection is not warranted because there are no reasonable grounds to believe that a violation exists or has occurred, the ~~BRH-DHHS/RHS~~ shall notify the complainant in writing of such determination.

(b) The complainant may obtain review of such determination by submitting a written position statement with the commissioner, department of health and human services.

(c) The commissioner shall provide the licensee or registrant with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant.

(d) The licensee or registrant may submit an opposing written statement of position with the commissioner.

(e) The commissioner shall provide the complainant with a copy of such statement by certified mail.

(f) Upon the request of the complainant, the commissioner shall hold an informal conference in which the complainant and the licensee or registrant shall orally present their views.

(g) An informal conference may also be held at the request of the licensee or registrant, but disclosure of the identity of the complainant shall be made only following receipt of written authorization from the complainant.

(h) After considering all written and oral views presented, the commissioner shall affirm, modify, or reverse the determination of the DHHS/~~BRH-RHS~~ and furnish the complainant and the licensee or registrant a written notification of the decision and the reason therefor.

(i) If the DHHS/~~BRH-RHS~~ determines, with respect to a complaint under He-P 4019.08, that an inspection is not warranted because the requirements of He-P 4019.08(a) have not been met, the complainant shall be notified in writing of such determination.

(j) A determination made pursuant to He-P 4019.09(i) shall be without prejudice to the filing of a new complaint meeting the requirements of He-P 4019.08(a).

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

PART He-P 4022 SURVEYS AND MONITORING

He-P 4022.01 General.

(a) Each licensee or registrant shall make, or cause to be made, surveys of areas, including the subsurface that:

(1) Are necessary for the licensee or registrant to comply with He-P 4020 through He-P 4023; and

(2) Are necessary to evaluate:

a. The magnitude and extent of radiation levels;

b. Concentrations or quantities of ~~radioactive material~~residual radioactivity; and

c. The potential radiological hazards ~~that could be present~~of the radiation levels and residual radioactivity detected.

(b) Notwithstanding He-P 4021.03(a) of this part, records from surveys describing the locations and amount of subsurface residual radioactivity identified at the site must be kept with records important for decommissioning, and such records must be retained in accordance with He-P 4030.09(r).

~~(c)~~ The licensee or registrant shall ensure that instruments and equipment used for quantitative radiation measurements are calibrated at intervals not to exceed 12 months for the radiation measured, except when a more frequent interval is specified in another applicable part of this chapter or in a license condition.

~~(d)~~ All personnel dosimeters, except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees and registrants to comply with He-P 4020.05, with other applicable provisions of this chapter, or with conditions specified in a license or registration, shall be processed and evaluated by a dosimetry processor:

(1) Holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and

(2) Approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

(d) The licensee or registrant shall ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.02 Conditions Requiring Individual Monitoring of External and Internal Occupational Dose.

(a) Each licensee or registrant shall monitor occupational exposures from licensed and unlicensed sources of radiation at levels sufficient to demonstrate compliance with the occupational dose limits of He-P 4020 through He-P 4023.

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(b) As a minimum, each licensee or registrant shall monitor occupational exposure to radiation from licensed and unlicensed radiation sources under its control and shall supply and require the use of individual monitoring devices by:

- (1) Adults likely to receive, in one year from sources external to the body, a dose in excess of 10 percent of the limits in He-P 4020.05(a);
- (2) Minors likely to receive, in one year from sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem), a lens dose equivalent in excess of 1.5 mSv (0.15 rem), or a shallow dose equivalent to the skin or to the extremities in excess of 5 mSv (0.5 rem);
- (3) Declared pregnant women likely to receive during the entire pregnancy, from radiation sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem);
- (4) Individuals entering a high or very high radiation area; and
- (5) Individuals working with medical fluoroscopic equipment.

(c) To determine compliance with He-P 4020.08, each licensee or registrant shall monitor the occupational intake of radioactive material by, and assess the committed effective dose equivalent to:

- (1) Adults likely to receive, in one year, an intake in excess of 10 percent of the applicable ALI in Table 4090.1, Table I, Columns 1 and 2, of He-P 4090;
- (2) Minors likely to receive, in one year, a committed effective dose equivalent in excess of 1 mSv (0.1 rem); and
- (3) Declared pregnant women likely to receive, during the entire pregnancy, a committed dose equivalent in excess of 1 mSv (0.1 rem).

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.03 Location of Individual Monitoring Devices.

(a) Each licensee or registrant shall ensure that individuals who are required to monitor occupational doses in accordance with He-P 4022.02(a) wear monitoring devices.

(b) Individual monitoring devices shall be worn as follows:

- (1) An individual monitoring device used for monitoring the dose to the whole body shall be worn at the unshielded location of the whole body likely to receive the highest exposure;
- (2) When a protective apron is worn, the location of the individual monitoring device shall be at the neck;
- (3) An individual monitoring device used for monitoring the dose to an embryo/fetus of a declared pregnant woman, pursuant to He-P 4020.12(a), shall be located under the protective apron at the waist;
- (4) An individual monitoring device used for monitoring the lens dose equivalent, in accordance with He-P 4020.05(a)(2)a., shall be located:
 - a. At the neck and outside the protective apron if being worn by the monitored individual;or

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b. At an unshielded location close to the eye;

(5) An individual monitoring device used for monitoring the dose to the extremities, in accordance with He-P 4020.05(a)(2)b., shall be worn on the extremity likely to receive the highest exposure;

(6) Each individual monitoring device used in accordance with He-P 4022.03(b)(5) shall be oriented to measure the highest dose to the extremity being monitored;

(7) One individual monitoring device used to determine the effective dose equivalent for external radiation pursuant to He-P 4020.05(e) and He-P 4022.02(b)(5), shall be located at the neck outside the protective apron;

(8) If two individual monitoring devices are used to determine the effective dose equivalent for external radiation pursuant to He-P 4020.05(e) and He-P 4022.02(b)(5), they shall be located:

(a) One at the neck outside the protective apron; and

(b) One under the protective apron at the waist; and

(9) Two individual monitoring devices shall be used and worn in accordance with He-P 4022.03(b)(8) by declared pregnant woman.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.04 Control of Access to High Radiation Areas.

(a) The licensee or registrant shall ensure that each entrance or access point to a high radiation area has one or more of the following features:

(1) A control device that, upon entry into the area, causes the level of radiation to be reduced below that level at which an individual might receive a deep dose equivalent of one mSv (0.1 rem) in one hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates;

(2) A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry; or

(3) Entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.

(b) In place of the controls required by He-P 4022.04(a) for a high radiation area, the licensee or registrant may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

(c) The licensee or registrant may apply to the DHHS/~~BRH~~-RHS in writing for approval of alternative methods for controlling access to high radiation areas.

(d) The licensee or registrant shall establish the controls required by He-P 4022.04(a) and (c) in a way that does not prevent individuals from leaving a high radiation area.

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(e) The licensee or registrant shall not be required to control each access point to an area that is a high radiation area solely because of the presence of radioactive materials prepared for transport, packaged and labeled in accordance with He-P 4037 provided that:

- (1) The packages do not remain in the area longer than 3 days; and
- (2) The dose rate at one meter from the external surface of any package does not exceed 0.1 mSv (0.01 rem) per hour.

(f) The licensee or registrant shall not be required to control entrance or access to rooms or other areas in hospitals solely because of the presence of patients containing radioactive material, provided that:

- (1) There are personnel in attendance who are taking the necessary precautions to prevent the exposure of individuals to radiation or radioactive material in excess of the established limits in He-P 4020 through He-P 4023; and
- (2) The licensee's or registrant's radiation protection program operates within the provisions of ALARA.

(g) The registrant shall not be required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a high radiation area as described in He-P 4022.04 if the registrant has met all the specific requirements for access and control specified in other applicable parts of these rules.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.05 Control of Access to Very High Radiation Areas.

(a) In addition to the requirements in He-P 4022.04, the licensee or registrant shall institute measures to ensure that an individual is not able to gain unauthorized or inadvertent access to areas in which radiation levels could be encountered at 5 Gy (500 rad) or more in one hour at one meter from a source of radiation or any surface through which the radiation penetrates.

(b) He-P 4022.05(a) does not apply to rooms or areas in which diagnostic x-ray systems are the only source of radiation, or to non-self-shielded irradiators.

(c) The registrant shall not be required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a very high radiation area as described in He-P 4022.05(a) if the registrant has met all the specific requirements for access and control specified in:

- (1) He-P 4034 and 4042 for industrial radiography;
- (2) He-P 4040 and 4041 for x-rays in the healing arts; and
- (3) He-P 4044 for particle accelerators.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.06 Control of Access to Very High Radiation Areas; Irradiators.

(a) This section shall apply to licensees or registrants with sources of radiation in non-self-shielded irradiators.

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(b) This section shall not apply to sources of radiation that are used:

- (1) In teletherapy;
- (2) In industrial radiography; or
- (3) In completely self-shielded irradiators in which the source of radiation is both stored and operated within the same shielding radiation barrier and, in the designed configuration of the irradiator, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual.

(c) Each area in which there may exist radiation levels in excess of 5 Gy (500 rad) in one hour at one meter from a source of radiation that is used to irradiate materials shall meet the following requirements:

- (1) Each entrance or access point shall be equipped with entry control devices which shall:
 - a. Function automatically to prevent any individual from inadvertently entering a very high radiation area;
 - b. Permit deliberate entry into the area only after a control device is actuated that causes the radiation level within the area, from the source of radiation, to be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour; and
 - c. Prevent operation of the source of radiation if it would produce radiation levels in the area that could result in a deep dose equivalent to an individual in excess of one mSv (0.1 rem) in one hour;
- (2) Upon failure of the entry control devices to function as required by He-P 4022.06(c)(1), additional control devices shall be provided so that:
 - a. The radiation level within the area, from the source of radiation, shall be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour; and
 - b. Conspicuous visible and audible alarm signals shall be generated to make:
 1. An individual attempting to enter the area aware of the hazard; and
 2. At least one other authorized individual, who is physically present, familiar with the activity, and prepared to render or summon assistance, aware of the failure of the entry control devices;
- (3) Upon failure or removal of physical radiation barriers other than a sealed source's shielded storage container, the licensee or registrant shall provide control devices so that:
 - a. The radiation level from the source of radiation shall be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour; and
 - b. Conspicuous visible and audible alarm signals shall be generated to make:
 1. Potentially affected individuals aware of the hazard; and

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2. The licensee or registrant or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of the failure or removal of the physical barrier;

(4) When a shield for stored sealed sources is a liquid, the licensee or registrant shall provide means to monitor the integrity of the shield and to signal, automatically, loss of adequate shielding;

(5) Physical radiation barriers that comprise permanent structural components, such as walls, that have no credible probability of failure or removal in ordinary circumstances shall not need to meet the requirements of He-P 4022.06(c)(3) and (4);

(6) Each area shall be equipped with devices that automatically generate conspicuous visible and audible alarm signals to:

- a. Alert personnel in the area before the source of radiation can be put into operation; and
- b. Allow time for any individual in the area to operate a clearly identified control device, which:
 1. Shall be installed in the area; and
 2. Shall prevent the source of radiation from being put into operation when the control device is actuated;

(7) Each area shall be controlled by use of such administrative procedures and such devices as are necessary to ensure that the area is cleared of personnel prior to each use of the source of radiation;

(8) Each area shall be checked by a radiation measurement prior to the first individual's entry into the area and after any use of the source of radiation to ensure that the radiation level from the source of radiation in the area is below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour;

(9) The entry control devices required in He-P 4022.05(c)(1) shall be tested for proper functioning:

- a. Prior to initial operation with the source of radiation on any day, unless operations were continued uninterrupted from the previous day; and
- b. Prior to resumption of operation of the source of radiation after any unintentional interruption;

(10) The licensee or registrant shall submit to the DHHS/~~BRH~~ RHS and adhere to a schedule for periodic tests of the entry control and warning systems;

(11) The licensee or registrant shall not conduct operations, other than those necessary to place the source of radiation in safe condition or to effect repairs on controls, unless control devices are functioning properly;

(12) Entry and exit portals that are used in transporting materials to and from the irradiation area, and that are not intended for use by individuals, shall be controlled by such devices and administrative procedures as are necessary to physically protect and warn against inadvertent entry by any individual through these portals; and

(13) Exit portals for irradiated materials shall be equipped to detect and automatically signal the presence of any loose radioactive material that is carried toward such an exit to prevent loose radioactive material from being carried out of the area.

(d) Licensees, registrants, or applicants for licenses or registrations for sources of radiation within the purview of He-P 4022.06(c) which will be used in a variety of positions or in locations that make it impracticable to comply with certain requirements of He-P 4022.06(c) may apply to the DHHS/~~BRH~~RHS for approval of alternative safety measures.

(e) Alternative safety measures shall:

(1) Provide personnel protection at least equivalent to those specified in He-P 4022.06(c); and

(2) Have at least one of the alternative measures to include an entry-preventing interlock control based on a measurement of the radiation that ensures the absence of high radiation levels before an individual can gain access to the area where such sources of radiation are used.

(f) The entry control devices required by He-P 4022.06(c) and (d) shall not prevent an individual from leaving the area.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.07 Control of Radioactive Material in the Air.

(a) The licensee or registrant shall use, to the extent practicable, process or other engineering controls, such as containment, decontamination, or ventilation, to control the concentrations of radioactive material in air.

(b) When it is not practicable to apply process or other engineering controls to control the concentrations of radioactive material in air to values below those that define an airborne radioactivity area, the licensee or registrant shall, consistent with maintaining the total effective dose equivalent ALARA, increase monitoring and limit intakes by one or more of the following means:

(1) Control of access;

(2) Limitation of exposure times;

(3) Use of respiratory protection equipment; or

(4) Other controls.

(c) If the licensee or registrant performs an ALARA analysis to determine whether or not respirators should be used, the licensee or registrant may also consider the impact of respirator use of workers' industrial health and safety.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.08 Use of Individual Respiratory Protection Equipment.

(a) If the licensee or registrant assigns or permits the use of respiratory protection equipment to limit intakes pursuant to He-P 4022.07, the licensee or registrant shall:

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- (1) Except as provided in He-P 4022.08(a)(2), use only respiratory protection equipment that is tested and certified or had certification extended by the National Institute for Occupational Safety and Health (NIOSH);
- (2) Submit an application to the DHHS/~~BRH~~-RHS for authorized use of equipment which:
 - a. Has not been tested and certified by NIOSH; or
 - b. Has no schedule for testing or certification;
- (3) Include in the application specified in He-P 4022.08(a)(2) above a demonstration by testing, or a demonstration on the basis of reliable test information, that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use;
- (4) Implement and maintain a respiratory protection program that includes:
 - a. Air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate doses;
 - b. Surveys and bioassays, as appropriate, to evaluate actual intakes;
 - c. Testing of respirators for operability, including user seal check for face sealing devices and functional checks for other devices, immediately prior to each use;
 - d. Written procedures regarding:
 1. Supervision and training of respirator users;
 2. Monitoring, including air sampling and bioassays;
 3. Fit testing;
 4. Respirator selection;
 5. Breathing air quality;
 6. Inventory and control;
 7. Storage, issuance, maintenance, repair, testing, and quality assurance of respiratory protection equipment;
 8. Record-keeping; and
 9. Limitations on periods of respiratory use and relief from respirator use;
 - e. A determination by a physician that the individual user is medically fit to use the respiratory protection equipment prior to:
 1. The initial fitting of a face-sealing respirator;
 2. The first field use of non-face-sealing respirators; and
 3. Either every 12 months thereafter, or periodically at a frequency determined by a physician; and

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f. Fit testing, performed with the facepiece operating in the negative pressure mode, with a fit factor greater than 10 times the assigned protection factor (APF) for negative pressure devices, and a fit factor greater than 500 times the APF for any positive pressure, continuous flow, and pressure-demand devices, before the first field use of tight fitting, face sealing respirators, and periodically thereafter at a frequency not to exceed one year;

(5) Issue a written policy statement on respirator usage covering:

- a. The use of process or other engineering controls, instead of respirators;
- b. The routine, non-routine, and emergency use of respirators; and
- c. The length of periods of respirator use and relief from respirator use;

(6) Advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of:

- a. Equipment malfunction;
- b. Physical or psychological distress;
- c. Procedural or communication failure;
- d. Significant deterioration of operating conditions; or
- e. Any other conditions that might require such relief;

(7) Use respiratory protection equipment within the equipment manufacturer's expressed limitations for type and mode of use and shall provide vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or radiological protection equipment;

(8) Use safety, radiological protection or other equipment in such a way as not to interfere with the proper operation of the respirator;

(9) Provide standby rescue personnel whenever one-piece atmosphere-supplying suits, or any combination of supplied air respiratory protection device and personnel protective equipment are used from which an unaided individual would have difficulty extricating himself or herself, with the following:

- a. Respiratory protection devices or other apparatus appropriate for the potential hazards;
- b. Continuous communication with the workers, by one or more of the following methods:
 1. By sight;
 2. By voice;
 3. By signal line;
 4. By telephone;
 5. By radio; and
 6. By other suitable means;

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- c. Immediate availability to assist the workers in case of a failure of the air supply or for any other reason that requires relief from distress; and
- d. Sufficient numbers and immediate availability to assist all users of this type of equipment and to provide effective emergency rescue, if needed;

(10) Supply atmosphere-supplying respirators with respirable air of grade D quality or better, as defined by the Compressed Gas Association in Publication G-7.1, "Commodity Specification for Air," 1997, and included in the regulations of the Occupational Safety and Health Administration (29 CFR 1910.134(i)(1)(ii)(A) through (E)), which contains:

- a. Oxygen content (v/v) of 19.5 – 23.3%;
- b. Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
- c. Carbon monoxide (CO) content of 10 ppm or less;
- d. Carbon dioxide content of 1,000 ppm or less; and
- e. Lack of noticeable odor; and

(11) Ensure that no objects, materials or substances, such as facial hair, or any conditions that interfere with the face to facepiece seal or valve function, and that are under the control of the wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator facepiece.

(b) In estimating the dose to individuals from intake of airborne radioactive materials, the concentration of radioactive material in the air that is inhaled when respirators are worn shall be initially assumed to be the ambient concentration in air without the respiratory protection, divided by the APF.

(c) If the dose to individuals from intake of airborne radioactive materials is subsequently found to be greater than the estimated dose, the corrected value shall be used.

(d) If the dose to individuals from intake of airborne radioactive materials is subsequently found to be less than the estimated dose, the corrected value may be used.

(e) The DHHS/~~BRH-RHS~~ shall impose restrictions in addition to the provisions of He-P 4022.07, 4022.08, and 4095, in order to:

(1) Ensure that the respiratory protection program of the licensee or registrant is adequate to limit doses to individuals from intakes of radioactive materials consistent with maintaining total effective dose equivalent ALARA; and

(2) Limit the extent to which a licensee or registrant may use respiratory protection equipment instead of process or other engineering controls.

(f) The licensee or registrant shall seek and obtain authorization from the DHHS/~~BRH-RHS~~ before using assigned protection factors in excess of those specified in He-P 4095.

(g) The DHHS/~~BRH-RHS~~ shall authorize a licensee or registrant to use higher protection factors only upon receipt and approval of an application that:

(1) Describes the situation for which a need exists for higher protection factors; and

(2) Demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.09 Security of Stored Sources of Radiation. The licensee or registrant shall secure from unauthorized removal or access licensed or registered sources of radiation that are stored in unrestricted areas.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.10 Control of Sources of Radiation not in Storage.

(a) The licensee shall control and maintain constant surveillance of licensed radioactive material that is in an unrestricted area and that is not in storage.

(b) The registrant shall maintain control of radiation machines that are in an unrestricted area and that are not in storage.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

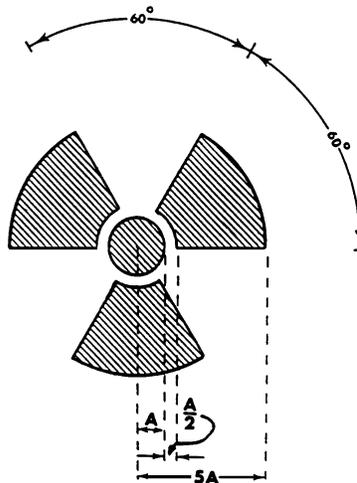
He-P 4022.11 Caution Signs.

(a) Unless otherwise authorized by the DHHS/~~BRHRHS~~, the symbol illustrated in Figure 4022.1 shall be the standard radiation symbol.

(b) The colors used for the cross-hatched area shall be magenta, or purple, or black, and the background shall be yellow.

(c) The symbol prescribed shall be the three-bladed design as follows:

Figure 4022.1 Radiation Symbol



(d) Notwithstanding the requirements of He-P 4022.11, licensees or registrants are authorized to label sources, source holders, or device components containing sources of radiation that are subjected to high temperatures, with conspicuously etched or stamped radiation caution symbols and without a color requirement.

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(e) In addition to the contents of signs and labels prescribed in He-P 4022, the licensee or registrant may provide, on or near the required signs and labels, any additional information to make individuals aware of potential radiation exposures and to minimize the exposures.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.12 Posting Requirements.

(a) The licensee or registrant shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, RADIATION AREA”.

(b) The licensee or registrant shall post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, HIGH RADIATION AREA”

or

“DANGER, HIGH RADIATION AREA”.

(c) The licensee or registrant shall post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words:

“GRAVE DANGER, VERY HIGH RADIATION AREA”.

(d) The licensee shall post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, AIRBORNE RADIOACTIVITY AREA”

or

“DANGER, AIRBORNE RADIOACTIVITY AREA”.

(e) The licensee shall post each area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in He-P 4092 with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, RADIOACTIVE MATERIAL(S)”

or

“DANGER, RADIOACTIVE MATERIAL(S)”.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.13 Exceptions to Posting Requirements.

(a) A licensee or registrant shall not be required to post caution signs in areas or rooms containing sources of radiation for periods of less than 8 hours, if each of the following conditions is met:

(1) The sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in He-P 4020; and

(2) The area or room is subject to the licensee's or registrant's control.

(b) Rooms or other areas in hospitals that are occupied by patients shall not be required to be posted with caution signs pursuant to He-P 4022.12 provided that the patient could be released from ~~confinement~~ licensee control pursuant to the requirements of He-P 4035.2542.

(c) Rooms or other areas in hospitals that are occupied by patients shall not be required to be posted with caution signs, provided that:

(1) A patient being treated with a permanent implant could be released from confinement pursuant to He-P 4035.2542(b); or

(2) A patient being treated with a therapeutic radiopharmaceutical could be released from confinement pursuant to He-P 4035.2542(a).

(d) A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level at 30 centimeters from the surface of the sealed source container or housing does not exceed 0.05 mSv (0.005 rem) per hour.

(e) A room or area is not required to be posted with a caution sign because of the presence of radiation machines used solely for diagnosis in the healing arts.

(f) Rooms in hospitals or clinics that are used for teletherapy are exempt from the requirement to post caution signs under He-P 4022.12 if:

(1) Access to the room is controlled pursuant to He-P 4035.5176; and

(2) Personnel in attendance take necessary precautions to prevent the inadvertent exposure of workers, other patients, and members of the public to radiation in excess of the limits established in this part.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.14 Labeling Containers and Radiation Machines.

(a) The licensee shall ensure that each container of radioactive material bears a durable, clearly visible label bearing the radiation symbol and the words:

“CAUTION, RADIOACTIVE MATERIAL”

or

“DANGER, RADIOACTIVE MATERIAL”.

(b) The licensee shall also provide information to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures, such as:

(1) The radionuclides present;

(2) An estimate of the quantity of radioactivity;

(3) The date for which the activity is estimated;

- (4) Radiation levels;
- (5) Kinds of materials; and
- (6) Mass enrichment.

(c) Each licensee shall, prior to removal or disposal of empty uncontaminated containers to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

(d) Each registrant shall ensure that each radiation machine is labeled in a conspicuous manner which cautions individuals that radiation is produced when it is energized.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.15 Exemptions to Labeling Requirements.

(a) A licensee shall not be required to label:

- (1) Containers holding radioactive material in quantities less than the quantities listed in He-P 4092;
- (2) Containers holding radioactive material in concentrations less than those specified in Table 4090.1, Table III of He-P 4090;
- (3) Containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by He-P 4020;
- (4) Containers when they are in transport and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation;
- (5) Containers that are accessible only to individuals authorized to handle or use them, or to work in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record; or
- (6) Installed manufacturing or process equipment, such as piping and tanks.

(b) The record specified in He-P 4022.15(a)(5) shall be retained as long as the containers are in use for the purpose indicated on the record.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.16 Procedures for Receiving and Opening Packages.

(a) Each licensee who expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, as defined in He-P 4037.03 and He-P 4037.22, shall make arrangements to receive:

- (1) The package when the carrier offers it for delivery; or

(2) The notification of the arrival of the package at the carrier's terminal and to take possession of the package expeditiously.

(b) Each licensee shall:

(1) Monitor the external surfaces of a package labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U.S. Department of Transportation regulations 49 CFR 172.403 and 172.436-440 for radioactive contamination unless the package contains only radioactive material in the form of gas or in special form as defined in He-P 4003;

(2) Monitor the external surfaces of a package labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U. S. Department of Transportation regulations 49 CFR 172.403 and 172.436-440 for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity, as defined in He-P 4037.03 and He-P 4037.22; and

(3) Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet, or damaged.

(c) The licensee shall perform the monitoring required by He-P 4022.16(b) as soon as practicable after receipt of the package, but not later than 3 hours after the package is received at the licensee's facility if it is received during the licensee's normal working hours, or not later than 3 hours from the beginning of the next working day if it is received after working hours.

(d) The licensee shall immediately notify the final delivery carrier and the DHHS/~~BRH~~RHS when:

(1) Removable radioactive surface contamination exceeds the limits of He-P 4037.16(b)(8) through (b)(11); or

(2) External radiation levels exceed the limits of He-P 4037.16(b)(12) and (b)(13).

(e) Notification required by He-P 4022.16(d) shall occur by telephone, telegram, mail, or facsimile.

(f) Each licensee shall:

(1) Establish, maintain, and retain written procedures for safely opening packages in which radioactive material is received; and

(2) Ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.

(g) Licensees transferring special form sources in vehicles owned or operated by the licensee to and from a work site are exempt from the contamination monitoring requirements of He-P 4022.16(b), but shall not be exempt from the monitoring requirement in He-P 4022.16(b) for measuring radiation levels that ensures that the source is still properly lodged in its shield.

Source. #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

PART He-P 4021 RECORDS, REPORTS, AND ADDITIONAL REQUIREMENTS

He-P 4021.01 Units and Quantities For Records

(a) Each licensee or registrant shall use the SI units becquerel, gray, sievert and coulomb per kilogram, or the special units curie, rad, rem and roentgen, including multiples and subdivisions, and shall clearly indicate the units of all quantities on records required by He-P 4020 through 4023.

(b) Notwithstanding the requirements of He-P 4021.01(a), when recording information on shipment manifests, as required in He-P 4023.06, information ~~must~~shall be recorded in SI units or in SI units and special units as specified He-P 4021.01(a).

(c) The licensee or registrant shall make a clear distinction among the quantities entered on the records required by He-P 4020 through 4023, such as:

- (1) Total effective dose equivalent;
- (2) Shallow dose equivalent;
- (3) Lens dose equivalent;
- (4) Deep dose equivalent; or
- (5) Committed effective dose equivalent.

He-P 4021.02 Records of Radiation Protection Programs.

(a) Each licensee or registrant shall maintain records of the radiation protection program.

(b) Radiation protection program records shall include:

- (1) The provisions of the program; and
- (2) Audits and other reviews of program content and implementation.

(c) The licensee or registrant shall retain the records required by He-P 4021.02(b)(1) until such time as each pertinent license or registration requiring the record is terminated in accordance with this chapter.

(d) The licensee or registrant shall retain the records required by He-P 4021.02(b)(2) for 3 years after the record is made.

He-P 4021.03 Records of Surveys.

(a) Each licensee or registrant shall maintain records showing the results of surveys and calibrations required by He-P 4022.01 and He-P 4022.~~4516~~(b).

(b) The licensee or registrant shall retain these records for 3 years after the record is made.

(c) Until each pertinent license or registration requiring the record is terminated in accordance with this chapter, the licensee or registrant shall retain each of the following records:

- (1) Records of the results of surveys to determine the dose from external sources of radiation used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents; ~~and~~
- (2) Records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose;
- (3) Records showing the results of air sampling, surveys, and bioassays required pursuant to He-P 4022.07(d)(1)08(a)(4)a. and ~~(2) (a)(4)b.~~; and
- (4) Records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

He-P 4021.04 Records of Tests for Leakage or Contamination of Sealed Sources. Records of tests for leakage or contamination of sealed sources shall be kept in units of becquerel or microcurie and maintained for inspection by the DHHS/~~BRH-RHS~~ for 5 years after the records are made.

He-P 4021.05 Records of Prior Occupational Dose.

(a) The licensee or registrant shall retain the records of prior occupational dose and exposure history as specified in He-P 4020.09 on DHHS/~~BRH-RHS~~ Form Y or equivalent until such time as each pertinent license or registration requiring this record is terminated in accordance with this chapter.

(b) The licensee or registrant shall retain records used in preparing DHHS/~~BRH-RHS~~ Form Y or equivalent as specified in He-P 4020.09(c)(2) for 3 years after the record is made.

(c) Upon termination of the license or registration, the licensee or registrant shall permanently store records on DHHS/~~BRH-RHS~~ Form Y or equivalent as specified in He-P 4020.09(c)(2), or shall make provisions with the DHHS/~~BRH-RHS~~ for transfer to the DHHS/~~BRHRHS~~.

He-P 4021.06 Records of Planned Special Exposures.

(a) For each use of the provisions of He-P 4020.10 for planned special exposures, the licensee or registrant shall maintain records that describe:

- (1) The exceptional circumstances requiring the use of a planned special exposure;
- (2) The name of the management official who authorized the planned special exposure and a copy of the signed authorization;
- (3) What actions were necessary;
- (4) Why the actions were necessary;
- (5) What precautions were taken to assure that doses were maintained ALARA;
- (6) What individual and collective doses were expected to result; and

(7) The doses actually received in the planned special exposure.

(b) The licensee or registrant shall retain the records until such time as each pertinent license or registration requiring these records is terminated in accordance with this chapter.

He-P 4021.07 Records of Individual Monitoring Results.

(a) Each licensee or registrant shall maintain records of doses received by all individuals for whom monitoring was required pursuant to He-P 4022.02, and records of doses received during planned special exposures, accidents, and emergency conditions.

(b) Assessments of dose equivalent and records made using units in effect before August 6, 1998, need not be changed.

(c) The records specified in He-P 4021.07(a) shall include, when applicable:

(1) The deep dose equivalent to the whole body, lens dose equivalent, shallow dose equivalent to the skin, and shallow dose equivalent to the extremities;

(2) The estimated intake of radionuclides;

(3) The committed effective dose equivalent assigned to the intake of radionuclides;

(4) The specific information used to calculate the committed effective dose equivalent pursuant to He-P 4020.08(a) and (c), and when required by He-P 4022.02;

(5) The total effective dose equivalent when required by He-P 4020.06; and

(6) The total of the deep dose equivalent and the committed dose to the organ receiving the highest total dose.

(d) The licensee or registrant shall make entries of the records specified in He-P 4021.07(a) at intervals not to exceed one year.

(e) The licensee or registrant shall maintain the records specified in He-P 4021.07(a) on DHHS/[BRH](#) [RHS](#) Form Z, or equivalent containing the following:

(1) The full name of the individual monitored for occupational radiation dose;

(2) The monitored individual's identification number;

(3) The sex of the monitored individual;

(4) The date of birth of the monitored individual in the format MM/DD/YYYY;

(5) The monitoring period for the which the report is filed, in the format MM/DD/YYYY – MM/DD/YYYY;

(6) The name of the licensee or registrant;

(7) The license or registration number or numbers;

(8) For the monitoring period reported, an indication as to whether the dose data listed represents:

- a. A dose record, if the dose data listed is a final determination of the dose received to the best of the licensee's knowledge;
- b. A dose estimate, if the listed dose data are preliminary and will be superseded by a final determination resulting in a subsequent report;
- c. A routine exposure, if the data represents the results of monitoring for routine exposures; and
- d. A planned special exposure, if the data represents the results of monitoring of planned special exposures;

(9) The symbol for each radionuclide that resulted in an internal exposure recorded for the individual;

(10) The lung clearance class for all intakes by inhalation;

(11) The mode of intake, including inhalation, absorption through the skin, oral ingestion, or injection;

(12) The intake quantity of each radionuclide in curies;

(13) For the monitoring period, the following dose data:

- a. The deep dose equivalent (~~DDE~~) to the whole body;
- b. The eye dose equivalent (~~LDE~~) recorded for the lens of the eye;
- c. The shallow dose equivalent recorded for the skin of the whole body (~~SDE, WB~~);
- d. The shallow dose equivalent recorded for the skin of the extremity receiving the maximum dose (~~SDE, ME~~);
- e. The committed effective dose equivalent (~~CEDE~~) recorded for the maximally exposed organ;
- f. The total effective dose equivalent (~~TEDE~~); and
- g. The total organ dose equivalent (~~TODE~~) for the maximally exposed organ;

(14) Additional comments, as necessary, to demonstrate compliance with the dose limits; and

(15) The date and signature of the person designated to represent the licensee or registrant, certifying that the information contained on the form is complete and correct to the best of his or her knowledge.

(f) The licensee or registrant shall maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman.

(g) The declaration of pregnancy, including the estimated date of conception, shall also be kept on file, but may be maintained separately from the dose records.

(h) The licensee or registrant shall retain each required form or record until such time as each pertinent license or registration requiring the record is terminated in accordance with this chapter.

(i) The records required under this section shall be protected from public disclosure, under the authority of RSA 91-A:5, and the Privacy Act of 1974, Public Law 93-579, 5 U.S.C. 552a, because of their personal privacy nature.

He-P 4021.08 Records of Dose to Individual Members of the Public.

(a) Each licensee or registrant shall maintain records to demonstrate compliance with the dose limit for individual members of the public.

(b) The licensee or registrant shall retain the records required by He-P 4021.08(a) until such time as each pertinent license or registration requiring the record is terminated in accordance with this chapter.

He-P 4021.09 Records of Waste Disposal.

(a) Each licensee shall maintain records of the disposal of licensed materials made pursuant to He P 4023.02, He-P 4023.03, He-P 4023.04, He-P 4023.05, and He-P 4062.

(b) The records of disposal required by ~~He-P-4021.09~~(a) above shall include as a minimum:

- (1) Type of radioactive material;
- (2) Activity at time of disposal;
- (3) Date of disposal; and
- (4) Method of disposal.

(c) The licensee shall retain the records required by ~~He-P-4021.09~~(a) above until such time as each pertinent license requiring the record is terminated in accordance with this chapter.

He-P 4021.10 Records of Testing Entry Control Devices for Very High Radiation Areas: Irradiators.

(a) Each licensee or registrant shall maintain records of tests made pursuant to He-P 4022.~~0506~~(c)(9) on entry control devices for very high radiation areas.

(b) These records shall include the date, time, and results of each such test of function.

(c) The licensee or registrant shall retain the records required by He-P 4021.10(a) above for 3 years after the record is made.

He-P 4021.11 Form of Records.

(a) Each record required by He-P 4020 - 4023 shall be legible throughout the specified retention period.

(b) The record shall be the original or a reproduced copy or a microform, provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period.

(c) The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period.

(d) Records, such as letters, drawings, and specifications, shall include all pertinent information, such as stamps, initials, and signatures.

(e) The licensee shall maintain safeguards against tampering with and loss of records.

He-P 4021.12 Reports of Stolen, Lost, or Missing Licensed or Registered Sources of Radiation.

(a) Each licensee or registrant shall report stolen, lost, or missing licensed or registered sources of radiation to the DHHS/~~BRH~~RHS by telephone.

(b) Reports shall be made as follows:

(1) Immediately if an aggregate quantity is equal to or greater than 1,000 times the quantity specified in He-P 4092, or if a radiation machine, and under such circumstances that it appears to the licensee or registrant that an exposure could result to individuals in unrestricted areas; or

(2) Within 30 days if an aggregate quantity is greater than 10 times the quantity specified in He-P 4092, or if a radiation machine, and is still missing.

(c) Each licensee or registrant required to make a report pursuant to He-P 4021.12 shall, within 30 days after making the telephone report, make a written report to the DHHS/~~BRH~~RHS.

(d) Reports shall contain:

(1) A description of the licensed or registered source of radiation involved, including:

(a) For radioactive material, the kind, quantity, and chemical and physical form; and

(b) For radiation machines, the manufacturer, model and serial number, type and maximum energy of radiation emitted;

(2) A description of the circumstances under which the loss or theft occurred;

(3) A statement of disposition, or probable disposition, of the licensed or registered source of radiation involved;

(4) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas;

(5) Actions that have been taken, or will be taken, to recover the source of radiation; and

(6) Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed or registered sources of radiation.

(e) Subsequent to filing the written report, the licensee or registrant shall also report additional information on the loss or theft within 30 days after the licensee or registrant learns of such information.

(f) The licensee or registrant shall prepare any report filed with the DHHS/~~BRH~~RHS pursuant to He-P 4021.12 so that names of individuals who may have received exposure to radiation are stated in a separate and detachable portion of the report.

He-P 4021.13 Notification of Incidents.

(a) Notwithstanding other requirements for notification, each licensee or registrant shall immediately report each event involving a source of radiation possessed by the licensee or registrant that may have caused or threatens to cause any of the following:

(1) An individual to receive:

a. A total effective dose equivalent of 0.25 Sv or “25 rem_s” or more;

b. A lens dose equivalent of 0.75 Sv or “75 rem_s” or more; or

c. A shallow dose equivalent to the skin or extremities or a total organ dose equivalent of 2.5 Gy or “250 rad_s” or more; or

(2) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake ~~five~~5 times the occupational ALI.

(b) The provision in He-P 4021.13(a)(2) shall not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

(c) Each licensee or registrant shall, within 24 hours of discovery of the event, report to the DHHS/~~BRH~~RHS each event involving loss of control of a licensed or registered source of radiation possessed by the licensee or registrant that may have caused, or threatens to cause, any of the following:

(1) An individual to receive, in a period of 24 hours:

a. A total effective dose equivalent exceeding 0.05 Sv or “5 rem_s”;

b. A lens dose equivalent exceeding 0.15 Sv or “15 rem_s”; or

c. A shallow dose equivalent to the skin or extremities or a total organ dose equivalent exceeding 0.5 Sv or “50 rem_s”; or

(2) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational ALI.

(d) The provision in ~~He-P 4021.13~~(c)(2) above shall not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

(e) The licensee or registrant shall prepare each report filed with the DHHS/~~BRH~~RHS pursuant to He-P 4021.13 so that names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.

(f) Licensees or registrants shall make the reports required by ~~He-P 4021.13~~(a) and (b) above to the DHHS/~~BRH~~RHS by telephone, telegram, mail, or facsimile.

(g) The provisions of He-P 4021.13 ~~do shall~~ not apply to doses that result from planned special exposures, provided such doses are within the limits for planned special exposures and are reported pursuant to He-P 4021.15.

He-P 4021.14 Reports of Exposures, Radiation Levels, and Concentrations of Radioactive Material Exceeding the Limits.

(a) In addition to the notification required by He-P 4021.13, each licensee or registrant shall submit a written report within 30 days after learning of any of the following occurrences:

(1) Incidents for which notification is required by He-P 4021.13;

(2) Doses in excess of any of the following:

a. The occupational dose limits for adults in He-P 4020.05;

b. The occupational dose limits for a minor in He-P 4020.11;

c. The limits for an embryo/fetus of a declared pregnant woman in He-P 4020.12;

d. The limits for an individual member of the public in He-P 4020.13;

e. Any applicable limit in the license or registration; or

f. The ALARA constraints for air emissions established under He-P 4020.04(d);

(3) Levels of radiation or concentrations of radioactive material in:

a. A restricted area in excess of applicable limits in the license or registration; or

b. An unrestricted area in excess of 10 times the applicable limit set forth in ~~Part~~ He-P 4020 or in the license or registration, whether or not involving exposure of any individual in excess of the limits in He-P 4020.~~14~~13; or

(4) For licensees subject to the provisions of U.S. Environmental Protection Agency's generally applicable environmental radiation standards in 40 CFR 190, levels of radiation or releases of radioactive material in excess of those standards, or of license conditions related to those standards.

(b) Contents of Reports.

(1) Each report required by ~~He-P 4021.14~~(a) above shall describe the extent of exposure of individuals to radiation and radioactive material, including:

- a. Estimates of each individual's dose;
- b. The levels of radiation and concentrations of radioactive material involved;
- c. The cause of the elevated exposures, dose rates, or concentrations; and
- d. Corrective steps taken or planned to ensure against a recurrence, including the schedule for achieving conformance with applicable limits, ALARA constraints, generally applicable environmental standards, and associated license or registration conditions;:-

(2) Each report filed pursuant to ~~He-P 4021.14~~(a) above shall be protected from public disclosure under the authority of RSA 91-A:5 and the Privacy Act of 1974, Public Law 93-579, 52 U.S.C. 552a, and shall include for each individual exposed:

- a. The name;
- b. Social security number, as authorized by 10 CFR 20.2203(b)(2); and
- c. Date of birth;:-

(3) With respect to the limit for the embryo/fetus in He-P 4020.12, the identifiers shall be those of the declared pregnant woman;:-

(4) The report shall be prepared so that this information is stated in a separate and detachable portion of the report;:- and

(5) The report shall be clearly labeled "Confidential Information: Not for Public Disclosure" and shall be protected from public disclosure under the authority of RSA 91-A:5 and the Privacy Act of 1974, Public Law 93-579, 52 U.S.C. 552a.

(c) All licensees or registrants who make reports pursuant to ~~He-P 4021.14~~(a) above shall submit the report in writing to the DHHS/BRHRHS.

He-P 4021.15 Reports of Planned Special Exposures. The licensee or registrant shall submit a written report to the DHHS/BRH-RHS within 30 days following any planned special exposure conducted in accordance with He-P 4020.10, informing the DHHS/BRH-RHS that a planned special exposure was conducted and indicating the date the planned special exposure occurred and the information required by He-P 4021.06.

He-P 4021.16 Report to Individuals of Exceeding Dose Limits. When a licensee or registrant is required pursuant to He-P 4021.14, ~~or He-P 4021.15, or He-P 4021.17~~, to report to the DHHS/BRH-RHS any exposure of an identified occupationally exposed individual, or an identified member of the public, to radiation or radioactive material, the licensee or registrant shall also provide a copy of the report submitted to the DHHS/BRH-RHS to the individual, and such report shall be transmitted at a time no later than the transmittal to the DHHS/BRHRHS.

He-P 4021.17 Reports of Individual Monitoring.

(a) This section applies to each person licensed or registered by the DHHS/BRH-RHS to:

(1) Possess or use sources of radiation for purposes of industrial radiography pursuant to He-P 4030 and He-P 4034; or

(2) Possess or use at any time, for processing or manufacturing for distribution pursuant to He-P 4030, He-P 4032, or He-P 4034, radioactive material in quantities exceeding any one of the quantities indicated in Table 4021.1:

Table 4021.1

Radionuclide	Activity	
	Ci	GBq
Cesium-137	1	37
Cobalt-60	1	37
Gold-198	100	3,700
Iodine-131	1	37
Iridium-192	10	370
Krypton-85	1,000	37,000
Promethium-147	10	370
Technetium-99m	1,000	37,000

(b) Each licensee or registrant in a category listed in [He-P 4021.17\(a\)](#) [above](#) shall submit an annual report of the results of individual monitoring carried out by the licensee or registrant for each individual for whom monitoring was required by He-P 4022.02 during that year, and that may include additional data for individuals for whom monitoring was provided but not required.

(c) The licensee or registrant shall use DHHS/[BRH-RHS](#) Form Z or equivalent as specified in He-P 4021.07(e) containing all the information required by DHHS/[BRH-RHS](#) Form Z for filing the annual report described in [He-P 4021.17\(b\)](#) [above](#).

(d) The licensee or registrant shall file the report required by [He-P 4021.17\(b\)](#) [above](#), covering the preceding year, on or before April 30 of each year, and the licensee or registrant shall submit the report to the DHHS/[BRH-RHS](#).

He-P 4021.18 Notifications and Reports to Individuals.

(a) Requirements for notification and reports to individuals of exposure to radiation or radioactive material shall be as specified in He-P 4019.05.

(b) When a licensee or registrant is required pursuant to He-P 4021.14 to report to the DHHS/[BRH-RHS](#) any exposure of an individual to radiation or radioactive material, the licensee or registrant shall also notify the individual.

(c) Such notice shall be transmitted at a time not later than the transmittal to the DHHS/[BRH-RHS](#) and shall comply with the provisions of He-P 4019.05.

He-P 4021.19 Reports of Leaking or Contaminated Sealed Sources.

(a) The licensee or registrant shall file a report within 5 days with the DHHS/[BRH-RHS](#) if the test for leakage or contamination required by He-P 4001.05 indicates a sealed source is leaking or contaminated.

- (b) The report shall include:
- (1) The equipment involved;
 - (2) The test results; and
 - (3) The corrective action taken.

He-P 4021.20 Additional Requirements.

(a) Each specific licensee shall, no less than 30 days before vacating or relinquishing possession or control of premises which may have been contaminated with radioactive material as a result of licensee's activities, notify the DHHS/~~BRH~~RHS in writing of intent to vacate.

(b) If in the course of a survey as required by He-P 4022.01, a licensee should find a surface contaminated to levels in excess of the values specified in Table 4021.2, Column 1, the licensee shall immediately institute measures to reduce the contamination to the levels specified.

(c) No licensee shall allow surfaces or surfaces of objects contaminated to levels in excess of the values specified in Table 4021.2, to be released to unrestricted areas.

(d) Where surface contamination by both alpha and beta-gamma emitting isotopes exists, the limits established for alpha and beta-gamma emitting isotopes shall apply independently.

(e) The radioactivity on the interior surfaces of pipes, drain lines or ductwork shall be determined by making measurements at all traps and other appropriate access points to the interior of the pipes, drain lines or ductwork.

(f) Surfaces of premises, equipment or scrap that may be contaminated and that are of such size, construction or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the levels.

(g) The amount of removable radioactive material per 100 square centimeters (cm²) of surface area shall be determined by wiping that area, with dry filter or soft absorbent paper and with the application of moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency.

(h) For objects of lesser than 100 cm² surface area, the entire surface shall be wiped and the above levels reduced in direct proportion to the area of the object.

(i) Measurements of fixed contaminant shall not be averaged over more than 1.0 square meter.

(j) For objects of lesser than 1.0 square meter area, the average shall be derived from measurements made on each of the surfaces of the object.

(k) Disintegrations per minute (dpm) shall be determined by correcting the counts per minute observed by an appropriate detector and count rate meter, for background, efficiency, and geometric factors associated with the instrumentation.

(l) Fixed beta-gamma contamination levels shall be measured through not more than 7 milligrams per square centimeter of total absorber.

He-P 4021.21 Permissible Levels of Surface Contamination. Levels of surface contamination shall be in compliance with the restrictions set forth in Table 4021.2 below:

Table 4021.2 Permissible Levels of Surface Contamination

Nuclide	Fixed	Removable	
	Average	Maximum	
U-natural, U-235, U-238 and associated decay products	$\frac{5,000 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{15,000 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{1,000 \text{ dpm}}{100 \text{ cm}^2}$
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	$\frac{100 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{300 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{20 \text{ dpm}}{100 \text{ cm}^2}$
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	$\frac{1,000 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{3,000 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{200 \text{ dpm}}{100 \text{ cm}^2}$
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission except Sr-90 and others noted above).	$\frac{5,000 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{15,000 \text{ dpm}}{100 \text{ cm}^2}$	$\frac{1,000 \text{ dpm}}{100 \text{ cm}^2}$

He-P 4021.22 Reports of Transactions Involving Nationally Tracked Sources. Each licensee who manufactures, transfers, receives, disassembles, or disposes of a nationally tracked source shall complete and submit a National Source Tracking Transaction Report as specified in He-P 4021.22(a) through (e) for each type of transaction.

(a) Each licensee who manufactures a nationally tracked source shall complete and submit a National Source Tracking Transaction Report, to include the following information:

- (1) The name, address, and license number of the reporting licensee;
- (2) The name of the individual preparing the report;
- (3) The manufacturer, model, and serial number of the source;
- (4) The radioactive material in the source;
- (5) The initial source strength in becquerels (curies) at the time of manufacture; and
- (6) The manufacture date of the source.

(b) Each licensee that transfers a nationally tracked source to another person shall complete and submit a National Source Tracking Transaction Report, to include the following information:

- (1) The name, address, and license number of the reporting licensee;
- (2) The name of the individual preparing the report;
- (3) The name and license number of the recipient facility and the shipping address;

(4) The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;

(5) The radioactive material in the source;

(6) The initial or current source strength in becquerels (curies);

(7) The date for which the source strength is reported;

(8) The shipping date;

(9) The estimated arrival date; and

(10) For nationally tracked sources transferred as waste under a Uniform Low-Level Radioactive Waste Manifest, the waste manifest number and the container identification of the container with the nationally tracked source.

(c) Each licensee that receives a nationally tracked source shall complete and submit a National Source Tracking Transaction Report, to include the following information:

(1) The name, address, and license number of the reporting licensee;

(2) The name of the individual preparing the report;

(3) The name, address, and license number of the person that provided the source;

(4) The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;

(5) The radioactive material in the source;

(6) The initial or current source strength in becquerels (curies);

(7) The date for which the source strength is reported;

(8) The date of receipt; and

(9) For material received under a Uniform Low-Level Radioactive Waste Manifest, the waste manifest number and the container identification with the nationally tracked source.

(d) Each licensee that disassembles a nationally tracked source shall complete and submit a National Source Tracking Transaction Report, to include the following information:

(1) The name, address, and license number of the reporting licensee;

(2) The name of the individual preparing the report;

(3) The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;

(4) The radioactive material in the source;

(5) The initial or current source strength in becquerels (curies);

(6) The date for which the source strength is reported; and

(7) The disassemble date of the source.

(e) Each licensee who disposes of a nationally tracked source shall complete and submit a National Source Tracking Transaction Report, to include the following information:

(1) The name, address, and license number of the reporting licensee;

(2) The name of the individual preparing the report;

(3) The waste manifest number;

(4) The container identification with the nationally tracked source.

(5) The date of disposal; and

(6) The method of disposal.

(f) The reports in (a) through (e) above:

(1) Shall Be submitted by the close of the next business day after the transaction;

(2) May be submitted in a single report for multiple sources and transactions; and

(3) Shall be submitted to the National Source Tracking System by using:

a. The on-line National Source Tracking System;

b. Electronically using a computer-readable format;

c. By facsimile;

d. By mail to the address on the National Source Tracking Transaction Report Form (NRC Form 748); or

e. By telephone with follow-up by facsimile or mail.

(g) Each licensee shall correct any error in previously filed reports or file a new report for any missed transaction within 5 business days of the discovery of the error or missed transaction. Such errors may be detected by a variety of methods such as administrative reviews or by physical inventories required by regulation. In addition:

(1) Each licensee shall reconcile the inventory of nationally tracked sources possessed by the licensee against that licensee's data in the National Source Tracking System;

(2) The reconciliation shall be conducted during the month of January in each year; and

(3) The reconciliation process shall include resolving any discrepancies between the National Source Tracking System and the actual inventory by filing the reports identified by He-P 4021.22(a) through (e). By January 31 of each year, each licensee shall submit to the National Source Tracking System confirmation that the data in the National Source Tracking System is correct.

(h) Each licensee that possesses Category 1 or Category 2 nationally tracked sources shall report its initial inventory of Category 1 or Category 2 nationally tracked sources to the National Source Tracking System by January 31 each year.

(i) The information in (h) above may be submitted by using any of the methods identified by He-P 4021.22(f)(3).

(j) The initial inventory report shall include the following information:

(1) The name, address, and license number of the reporting licensee;

(2) The name of the individual preparing the report;

(3) The manufacturer, model, and serial number of each nationally tracked source or, if not available, other information to uniquely identify the source;

(4) The radioactive material in the sealed source;

(5) The initial or current source strength in becquerels (curies); and

(6) The date for which the source strength is reported.

PART He-P 4022 SURVEYS AND MONITORING

He-P 4022.01 General.

(a) Each licensee or registrant shall make, or cause to be made, surveys of areas, including the subsurface that:

(1) Are necessary for the licensee or registrant to comply with He-P 4020 through He-P 4023; and

(2) Are necessary to evaluate:

a. The magnitude and extent of radiation levels;

b. Concentrations or quantities of ~~radioactive material~~residual radioactivity; and

c. The potential radiological hazards ~~that could be present~~of the radiation levels and residual radioactivity detected.

(b) Notwithstanding He-P 4021.03(a) of this part, records from surveys describing the locations and amount of subsurface residual radioactivity identified at the site must be kept with records important for decommissioning, and such records must be retained in accordance with He-P 4030.09(r).

~~(c)~~ The licensee or registrant shall ensure that instruments and equipment used for quantitative radiation measurements are calibrated at intervals not to exceed 12 months for the radiation measured, except when a more frequent interval is specified in another applicable part of this chapter or in a license condition.

~~(d)~~ All personnel dosimeters, except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees and registrants to comply with He-P 4020.05, with other applicable provisions of this chapter, or with conditions specified in a license or registration, shall be processed and evaluated by a dosimetry processor:

(1) Holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and

(2) Approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

(d) The licensee or registrant shall ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.02 Conditions Requiring Individual Monitoring of External and Internal Occupational Dose.

(a) Each licensee or registrant shall monitor occupational exposures from licensed and unlicensed sources of radiation at levels sufficient to demonstrate compliance with the occupational dose limits of He-P 4020 through He-P 4023.

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(b) As a minimum, each licensee or registrant shall monitor occupational exposure to radiation from licensed and unlicensed radiation sources under its control and shall supply and require the use of individual monitoring devices by:

- (1) Adults likely to receive, in one year from sources external to the body, a dose in excess of 10 percent of the limits in He-P 4020.05(a);
- (2) Minors likely to receive, in one year from sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem), a lens dose equivalent in excess of 1.5 mSv (0.15 rem), or a shallow dose equivalent to the skin or to the extremities in excess of 5 mSv (0.5 rem);
- (3) Declared pregnant women likely to receive during the entire pregnancy, from radiation sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem);
- (4) Individuals entering a high or very high radiation area; and
- (5) Individuals working with medical fluoroscopic equipment.

(c) To determine compliance with He-P 4020.08, each licensee or registrant shall monitor the occupational intake of radioactive material by, and assess the committed effective dose equivalent to:

- (1) Adults likely to receive, in one year, an intake in excess of 10 percent of the applicable ALI in Table 4090.1, Table I, Columns 1 and 2, of He-P 4090;
- (2) Minors likely to receive, in one year, a committed effective dose equivalent in excess of 1 mSv (0.1 rem); and
- (3) Declared pregnant women likely to receive, during the entire pregnancy, a committed dose equivalent in excess of 1 mSv (0.1 rem).

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.03 Location of Individual Monitoring Devices.

(a) Each licensee or registrant shall ensure that individuals who are required to monitor occupational doses in accordance with He-P 4022.02(a) wear monitoring devices.

(b) Individual monitoring devices shall be worn as follows:

- (1) An individual monitoring device used for monitoring the dose to the whole body shall be worn at the unshielded location of the whole body likely to receive the highest exposure;
- (2) When a protective apron is worn, the location of the individual monitoring device shall be at the neck;
- (3) An individual monitoring device used for monitoring the dose to an embryo/fetus of a declared pregnant woman, pursuant to He-P 4020.12(a), shall be located under the protective apron at the waist;
- (4) An individual monitoring device used for monitoring the lens dose equivalent, in accordance with He-P 4020.05(a)(2)a., shall be located:
 - a. At the neck and outside the protective apron if being worn by the monitored individual;or

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b. At an unshielded location close to the eye;

(5) An individual monitoring device used for monitoring the dose to the extremities, in accordance with He-P 4020.05(a)(2)b., shall be worn on the extremity likely to receive the highest exposure;

(6) Each individual monitoring device used in accordance with He-P 4022.03(b)(5) shall be oriented to measure the highest dose to the extremity being monitored;

(7) One individual monitoring device used to determine the effective dose equivalent for external radiation pursuant to He-P 4020.05(e) and He-P 4022.02(b)(5), shall be located at the neck outside the protective apron;

(8) If two individual monitoring devices are used to determine the effective dose equivalent for external radiation pursuant to He-P 4020.05(e) and He-P 4022.02(b)(5), they shall be located:

(a) One at the neck outside the protective apron; and

(b) One under the protective apron at the waist; and

(9) Two individual monitoring devices shall be used and worn in accordance with He-P 4022.03(b)(8) by declared pregnant woman.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.04 Control of Access to High Radiation Areas.

(a) The licensee or registrant shall ensure that each entrance or access point to a high radiation area has one or more of the following features:

(1) A control device that, upon entry into the area, causes the level of radiation to be reduced below that level at which an individual might receive a deep dose equivalent of one mSv (0.1 rem) in one hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates;

(2) A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry; or

(3) Entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.

(b) In place of the controls required by He-P 4022.04(a) for a high radiation area, the licensee or registrant may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

(c) The licensee or registrant may apply to the DHHS/~~BRH~~-RHS in writing for approval of alternative methods for controlling access to high radiation areas.

(d) The licensee or registrant shall establish the controls required by He-P 4022.04(a) and (c) in a way that does not prevent individuals from leaving a high radiation area.

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(e) The licensee or registrant shall not be required to control each access point to an area that is a high radiation area solely because of the presence of radioactive materials prepared for transport, packaged and labeled in accordance with He-P 4037 provided that:

- (1) The packages do not remain in the area longer than 3 days; and
- (2) The dose rate at one meter from the external surface of any package does not exceed 0.1 mSv (0.01 rem) per hour.

(f) The licensee or registrant shall not be required to control entrance or access to rooms or other areas in hospitals solely because of the presence of patients containing radioactive material, provided that:

- (1) There are personnel in attendance who are taking the necessary precautions to prevent the exposure of individuals to radiation or radioactive material in excess of the established limits in He-P 4020 through He-P 4023; and
- (2) The licensee's or registrant's radiation protection program operates within the provisions of ALARA.

(g) The registrant shall not be required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a high radiation area as described in He-P 4022.04 if the registrant has met all the specific requirements for access and control specified in other applicable parts of these rules.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.05 Control of Access to Very High Radiation Areas.

(a) In addition to the requirements in He-P 4022.04, the licensee or registrant shall institute measures to ensure that an individual is not able to gain unauthorized or inadvertent access to areas in which radiation levels could be encountered at 5 Gy (500 rad) or more in one hour at one meter from a source of radiation or any surface through which the radiation penetrates.

(b) He-P 4022.05(a) does not apply to rooms or areas in which diagnostic x-ray systems are the only source of radiation, or to non-self-shielded irradiators.

(c) The registrant shall not be required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a very high radiation area as described in He-P 4022.05(a) if the registrant has met all the specific requirements for access and control specified in:

- (1) He-P 4034 and 4042 for industrial radiography;
- (2) He-P 4040 and 4041 for x-rays in the healing arts; and
- (3) He-P 4044 for particle accelerators.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.06 Control of Access to Very High Radiation Areas; Irradiators.

(a) This section shall apply to licensees or registrants with sources of radiation in non-self-shielded irradiators.

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(b) This section shall not apply to sources of radiation that are used:

- (1) In teletherapy;
- (2) In industrial radiography; or
- (3) In completely self-shielded irradiators in which the source of radiation is both stored and operated within the same shielding radiation barrier and, in the designed configuration of the irradiator, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual.

(c) Each area in which there may exist radiation levels in excess of 5 Gy (500 rad) in one hour at one meter from a source of radiation that is used to irradiate materials shall meet the following requirements:

- (1) Each entrance or access point shall be equipped with entry control devices which shall:
 - a. Function automatically to prevent any individual from inadvertently entering a very high radiation area;
 - b. Permit deliberate entry into the area only after a control device is actuated that causes the radiation level within the area, from the source of radiation, to be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour; and
 - c. Prevent operation of the source of radiation if it would produce radiation levels in the area that could result in a deep dose equivalent to an individual in excess of one mSv (0.1 rem) in one hour;
- (2) Upon failure of the entry control devices to function as required by He-P 4022.06(c)(1), additional control devices shall be provided so that:
 - a. The radiation level within the area, from the source of radiation, shall be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour; and
 - b. Conspicuous visible and audible alarm signals shall be generated to make:
 1. An individual attempting to enter the area aware of the hazard; and
 2. At least one other authorized individual, who is physically present, familiar with the activity, and prepared to render or summon assistance, aware of the failure of the entry control devices;
- (3) Upon failure or removal of physical radiation barriers other than a sealed source's shielded storage container, the licensee or registrant shall provide control devices so that:
 - a. The radiation level from the source of radiation shall be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour; and
 - b. Conspicuous visible and audible alarm signals shall be generated to make:
 1. Potentially affected individuals aware of the hazard; and

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2. The licensee or registrant or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of the failure or removal of the physical barrier;

(4) When a shield for stored sealed sources is a liquid, the licensee or registrant shall provide means to monitor the integrity of the shield and to signal, automatically, loss of adequate shielding;

(5) Physical radiation barriers that comprise permanent structural components, such as walls, that have no credible probability of failure or removal in ordinary circumstances shall not need to meet the requirements of He-P 4022.06(c)(3) and (4);

(6) Each area shall be equipped with devices that automatically generate conspicuous visible and audible alarm signals to:

- a. Alert personnel in the area before the source of radiation can be put into operation; and
- b. Allow time for any individual in the area to operate a clearly identified control device, which:
 1. Shall be installed in the area; and
 2. Shall prevent the source of radiation from being put into operation when the control device is actuated;

(7) Each area shall be controlled by use of such administrative procedures and such devices as are necessary to ensure that the area is cleared of personnel prior to each use of the source of radiation;

(8) Each area shall be checked by a radiation measurement prior to the first individual's entry into the area and after any use of the source of radiation to ensure that the radiation level from the source of radiation in the area is below that at which it would be possible for an individual to receive a deep dose equivalent in excess of one mSv (0.1 rem) in one hour;

(9) The entry control devices required in He-P 4022.05(c)(1) shall be tested for proper functioning:

- a. Prior to initial operation with the source of radiation on any day, unless operations were continued uninterrupted from the previous day; and
- b. Prior to resumption of operation of the source of radiation after any unintentional interruption;

(10) The licensee or registrant shall submit to the DHHS/~~BRH~~ RHS and adhere to a schedule for periodic tests of the entry control and warning systems;

(11) The licensee or registrant shall not conduct operations, other than those necessary to place the source of radiation in safe condition or to effect repairs on controls, unless control devices are functioning properly;

(12) Entry and exit portals that are used in transporting materials to and from the irradiation area, and that are not intended for use by individuals, shall be controlled by such devices and administrative procedures as are necessary to physically protect and warn against inadvertent entry by any individual through these portals; and

(13) Exit portals for irradiated materials shall be equipped to detect and automatically signal the presence of any loose radioactive material that is carried toward such an exit to prevent loose radioactive material from being carried out of the area.

(d) Licensees, registrants, or applicants for licenses or registrations for sources of radiation within the purview of He-P 4022.06(c) which will be used in a variety of positions or in locations that make it impracticable to comply with certain requirements of He-P 4022.06(c) may apply to the DHHS/~~BRH~~RHS for approval of alternative safety measures.

(e) Alternative safety measures shall:

(1) Provide personnel protection at least equivalent to those specified in He-P 4022.06(c); and

(2) Have at least one of the alternative measures to include an entry-preventing interlock control based on a measurement of the radiation that ensures the absence of high radiation levels before an individual can gain access to the area where such sources of radiation are used.

(f) The entry control devices required by He-P 4022.06(c) and (d) shall not prevent an individual from leaving the area.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.07 Control of Radioactive Material in the Air.

(a) The licensee or registrant shall use, to the extent practicable, process or other engineering controls, such as containment, decontamination, or ventilation, to control the concentrations of radioactive material in air.

(b) When it is not practicable to apply process or other engineering controls to control the concentrations of radioactive material in air to values below those that define an airborne radioactivity area, the licensee or registrant shall, consistent with maintaining the total effective dose equivalent ALARA, increase monitoring and limit intakes by one or more of the following means:

(1) Control of access;

(2) Limitation of exposure times;

(3) Use of respiratory protection equipment; or

(4) Other controls.

(c) If the licensee or registrant performs an ALARA analysis to determine whether or not respirators should be used, the licensee or registrant may also consider the impact of respirator use of workers' industrial health and safety.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.08 Use of Individual Respiratory Protection Equipment.

(a) If the licensee or registrant assigns or permits the use of respiratory protection equipment to limit intakes pursuant to He-P 4022.07, the licensee or registrant shall:

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- (1) Except as provided in He-P 4022.08(a)(2), use only respiratory protection equipment that is tested and certified or had certification extended by the National Institute for Occupational Safety and Health (NIOSH);
- (2) Submit an application to the DHHS/~~BRH~~-RHS for authorized use of equipment which:
 - a. Has not been tested and certified by NIOSH; or
 - b. Has no schedule for testing or certification;
- (3) Include in the application specified in He-P 4022.08(a)(2) above a demonstration by testing, or a demonstration on the basis of reliable test information, that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use;
- (4) Implement and maintain a respiratory protection program that includes:
 - a. Air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate doses;
 - b. Surveys and bioassays, as appropriate, to evaluate actual intakes;
 - c. Testing of respirators for operability, including user seal check for face sealing devices and functional checks for other devices, immediately prior to each use;
 - d. Written procedures regarding:
 1. Supervision and training of respirator users;
 2. Monitoring, including air sampling and bioassays;
 3. Fit testing;
 4. Respirator selection;
 5. Breathing air quality;
 6. Inventory and control;
 7. Storage, issuance, maintenance, repair, testing, and quality assurance of respiratory protection equipment;
 8. Record-keeping; and
 9. Limitations on periods of respiratory use and relief from respirator use;
 - e. A determination by a physician that the individual user is medically fit to use the respiratory protection equipment prior to:
 1. The initial fitting of a face-sealing respirator;
 2. The first field use of non-face-sealing respirators; and
 3. Either every 12 months thereafter, or periodically at a frequency determined by a physician; and

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f. Fit testing, performed with the facepiece operating in the negative pressure mode, with a fit factor greater than 10 times the assigned protection factor (APF) for negative pressure devices, and a fit factor greater than 500 times the APF for any positive pressure, continuous flow, and pressure-demand devices, before the first field use of tight fitting, face sealing respirators, and periodically thereafter at a frequency not to exceed one year;

(5) Issue a written policy statement on respirator usage covering:

- a. The use of process or other engineering controls, instead of respirators;
- b. The routine, non-routine, and emergency use of respirators; and
- c. The length of periods of respirator use and relief from respirator use;

(6) Advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of:

- a. Equipment malfunction;
- b. Physical or psychological distress;
- c. Procedural or communication failure;
- d. Significant deterioration of operating conditions; or
- e. Any other conditions that might require such relief;

(7) Use respiratory protection equipment within the equipment manufacturer's expressed limitations for type and mode of use and shall provide vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or radiological protection equipment;

(8) Use safety, radiological protection or other equipment in such a way as not to interfere with the proper operation of the respirator;

(9) Provide standby rescue personnel whenever one-piece atmosphere-supplying suits, or any combination of supplied air respiratory protection device and personnel protective equipment are used from which an unaided individual would have difficulty extricating himself or herself, with the following:

- a. Respiratory protection devices or other apparatus appropriate for the potential hazards;
- b. Continuous communication with the workers, by one or more of the following methods:
 1. By sight;
 2. By voice;
 3. By signal line;
 4. By telephone;
 5. By radio; and
 6. By other suitable means;

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- c. Immediate availability to assist the workers in case of a failure of the air supply or for any other reason that requires relief from distress; and
- d. Sufficient numbers and immediate availability to assist all users of this type of equipment and to provide effective emergency rescue, if needed;

(10) Supply atmosphere-supplying respirators with respirable air of grade D quality or better, as defined by the Compressed Gas Association in Publication G-7.1, "Commodity Specification for Air," 1997, and included in the regulations of the Occupational Safety and Health Administration (29 CFR 1910.134(i)(1)(ii)(A) through (E)), which contains:

- a. Oxygen content (v/v) of 19.5 – 23.3%;
- b. Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
- c. Carbon monoxide (CO) content of 10 ppm or less;
- d. Carbon dioxide content of 1,000 ppm or less; and
- e. Lack of noticeable odor; and

(11) Ensure that no objects, materials or substances, such as facial hair, or any conditions that interfere with the face to facepiece seal or valve function, and that are under the control of the wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator facepiece.

(b) In estimating the dose to individuals from intake of airborne radioactive materials, the concentration of radioactive material in the air that is inhaled when respirators are worn shall be initially assumed to be the ambient concentration in air without the respiratory protection, divided by the APF.

(c) If the dose to individuals from intake of airborne radioactive materials is subsequently found to be greater than the estimated dose, the corrected value shall be used.

(d) If the dose to individuals from intake of airborne radioactive materials is subsequently found to be less than the estimated dose, the corrected value may be used.

(e) The DHHS/~~BRH-RHS~~ shall impose restrictions in addition to the provisions of He-P 4022.07, 4022.08, and 4095, in order to:

(1) Ensure that the respiratory protection program of the licensee or registrant is adequate to limit doses to individuals from intakes of radioactive materials consistent with maintaining total effective dose equivalent ALARA; and

(2) Limit the extent to which a licensee or registrant may use respiratory protection equipment instead of process or other engineering controls.

(f) The licensee or registrant shall seek and obtain authorization from the DHHS/~~BRH-RHS~~ before using assigned protection factors in excess of those specified in He-P 4095.

(g) The DHHS/~~BRH-RHS~~ shall authorize a licensee or registrant to use higher protection factors only upon receipt and approval of an application that:

(1) Describes the situation for which a need exists for higher protection factors; and

(2) Demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.09 Security of Stored Sources of Radiation. The licensee or registrant shall secure from unauthorized removal or access licensed or registered sources of radiation that are stored in unrestricted areas.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.10 Control of Sources of Radiation not in Storage.

(a) The licensee shall control and maintain constant surveillance of licensed radioactive material that is in an unrestricted area and that is not in storage.

(b) The registrant shall maintain control of radiation machines that are in an unrestricted area and that are not in storage.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

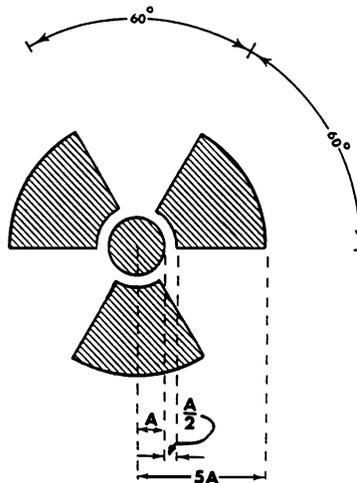
He-P 4022.11 Caution Signs.

(a) Unless otherwise authorized by the DHHS/~~BRHRHS~~, the symbol illustrated in Figure 4022.1 shall be the standard radiation symbol.

(b) The colors used for the cross-hatched area shall be magenta, or purple, or black, and the background shall be yellow.

(c) The symbol prescribed shall be the three-bladed design as follows:

Figure 4022.1 Radiation Symbol



(d) Notwithstanding the requirements of He-P 4022.11, licensees or registrants are authorized to label sources, source holders, or device components containing sources of radiation that are subjected to high temperatures, with conspicuously etched or stamped radiation caution symbols and without a color requirement.

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(e) In addition to the contents of signs and labels prescribed in He-P 4022, the licensee or registrant may provide, on or near the required signs and labels, any additional information to make individuals aware of potential radiation exposures and to minimize the exposures.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.12 Posting Requirements.

(a) The licensee or registrant shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, RADIATION AREA”.

(b) The licensee or registrant shall post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, HIGH RADIATION AREA”

or

“DANGER, HIGH RADIATION AREA”.

(c) The licensee or registrant shall post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words:

“GRAVE DANGER, VERY HIGH RADIATION AREA”.

(d) The licensee shall post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, AIRBORNE RADIOACTIVITY AREA”

or

“DANGER, AIRBORNE RADIOACTIVITY AREA”.

(e) The licensee shall post each area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in He-P 4092 with a conspicuous sign or signs bearing the radiation symbol and the words:

“CAUTION, RADIOACTIVE MATERIAL(S)”

or

“DANGER, RADIOACTIVE MATERIAL(S)”.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.13 Exceptions to Posting Requirements.

(a) A licensee or registrant shall not be required to post caution signs in areas or rooms containing sources of radiation for periods of less than 8 hours, if each of the following conditions is met:

(1) The sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in He-P 4020; and

(2) The area or room is subject to the licensee's or registrant's control.

(b) Rooms or other areas in hospitals that are occupied by patients shall not be required to be posted with caution signs pursuant to He-P 4022.12 provided that the patient could be released from ~~confinement~~ licensee control pursuant to the requirements of He-P 4035.2542.

(c) Rooms or other areas in hospitals that are occupied by patients shall not be required to be posted with caution signs, provided that:

(1) A patient being treated with a permanent implant could be released from confinement pursuant to He-P 4035.2542(b); or

(2) A patient being treated with a therapeutic radiopharmaceutical could be released from confinement pursuant to He-P 4035.2542(a).

(d) A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level at 30 centimeters from the surface of the sealed source container or housing does not exceed 0.05 mSv (0.005 rem) per hour.

(e) A room or area is not required to be posted with a caution sign because of the presence of radiation machines used solely for diagnosis in the healing arts.

(f) Rooms in hospitals or clinics that are used for teletherapy are exempt from the requirement to post caution signs under He-P 4022.12 if:

(1) Access to the room is controlled pursuant to He-P 4035.5176; and

(2) Personnel in attendance take necessary precautions to prevent the inadvertent exposure of workers, other patients, and members of the public to radiation in excess of the limits established in this part.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8488, eff 11-18-05; ss by #8808, eff 1-24-07

He-P 4022.14 Labeling Containers and Radiation Machines.

(a) The licensee shall ensure that each container of radioactive material bears a durable, clearly visible label bearing the radiation symbol and the words:

“CAUTION, RADIOACTIVE MATERIAL”

or

“DANGER, RADIOACTIVE MATERIAL”.

(b) The licensee shall also provide information to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures, such as:

(1) The radionuclides present;

(2) An estimate of the quantity of radioactivity;

(3) The date for which the activity is estimated;

- (4) Radiation levels;
- (5) Kinds of materials; and
- (6) Mass enrichment.

(c) Each licensee shall, prior to removal or disposal of empty uncontaminated containers to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

(d) Each registrant shall ensure that each radiation machine is labeled in a conspicuous manner which cautions individuals that radiation is produced when it is energized.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.15 Exemptions to Labeling Requirements.

(a) A licensee shall not be required to label:

- (1) Containers holding radioactive material in quantities less than the quantities listed in He-P 4092;
- (2) Containers holding radioactive material in concentrations less than those specified in Table 4090.1, Table III of He-P 4090;
- (3) Containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by He-P 4020;
- (4) Containers when they are in transport and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation;
- (5) Containers that are accessible only to individuals authorized to handle or use them, or to work in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record; or
- (6) Installed manufacturing or process equipment, such as piping and tanks.

(b) The record specified in He-P 4022.15(a)(5) shall be retained as long as the containers are in use for the purpose indicated on the record.

Source. #5903, eff 2-1-95; ss by #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

He-P 4022.16 Procedures for Receiving and Opening Packages.

(a) Each licensee who expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, as defined in He-P 4037.03 and He-P 4037.22, shall make arrangements to receive:

- (1) The package when the carrier offers it for delivery; or

(2) The notification of the arrival of the package at the carrier's terminal and to take possession of the package expeditiously.

(b) Each licensee shall:

(1) Monitor the external surfaces of a package labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U.S. Department of Transportation regulations 49 CFR 172.403 and 172.436-440 for radioactive contamination unless the package contains only radioactive material in the form of gas or in special form as defined in He-P 4003;

(2) Monitor the external surfaces of a package labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U. S. Department of Transportation regulations 49 CFR 172.403 and 172.436-440 for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity, as defined in He-P 4037.03 and He-P 4037.22; and

(3) Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet, or damaged.

(c) The licensee shall perform the monitoring required by He-P 4022.16(b) as soon as practicable after receipt of the package, but not later than 3 hours after the package is received at the licensee's facility if it is received during the licensee's normal working hours, or not later than 3 hours from the beginning of the next working day if it is received after working hours.

(d) The licensee shall immediately notify the final delivery carrier and the DHHS/~~BRH~~RHS when:

(1) Removable radioactive surface contamination exceeds the limits of He-P 4037.16(b)(8) through (b)(11); or

(2) External radiation levels exceed the limits of He-P 4037.16(b)(12) and (b)(13).

(e) Notification required by He-P 4022.16(d) shall occur by telephone, telegram, mail, or facsimile.

(f) Each licensee shall:

(1) Establish, maintain, and retain written procedures for safely opening packages in which radioactive material is received; and

(2) Ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.

(g) Licensees transferring special form sources in vehicles owned or operated by the licensee to and from a work site are exempt from the contamination monitoring requirements of He-P 4022.16(b), but shall not be exempt from the monitoring requirement in He-P 4022.16(b) for measuring radiation levels that ensures that the source is still properly lodged in its shield.

Source. #6827, eff 8-6-98; ss by #8692, INTERIM, eff 7-27-06, EXPIRES: 2-2-07; ss by #8808, eff 1-24-07

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

PART He-P 4023 WASTE DISPOSAL

He-P 4023.01 Disposal Requirements.

(a) A licensee shall dispose of radioactive material only:

(1) By transfer to an authorized recipient as provided in He-P 4023.06 or in He-P 4030 or to the U.S. Department of Energy;

(2) By decay in storage;

(3) By release in effluents within the limits in He-P 4020.14; or

(4) As authorized pursuant to He-P 4023.02, He-P 4023.03, He-P 4023.04 ~~or~~, He-P 4023.05, or He-P 4023.08.

(b) A person shall have a specific license to receive waste containing radioactive-licensed material from other persons for:

(1) Treatment prior to disposal;

(2) Treatment or disposal by incineration;

(3) Decay in storage; ~~or~~

(4) Disposal at a land disposal facility licensed pursuant to He-P 4062; or

(5) Storage until transferred to a storage or disposal facility authorized to receive the waste.

He-P 4023.02 Method for Obtaining Approval of Proposed Disposal Procedures.

(a) A licensee or applicant for a license may apply to the DHHS/~~BRH~~ RHS in accordance with He-P 4030 for approval of proposed procedures to dispose of radioactive-licensed material generated in the licensee's operations.

(b) Each application shall include:

(1) A description of the waste containing licensed material to be disposed of, including the physical and chemical properties that have an impact on risk evaluation, and the proposed manner and conditions of waste disposal;

(2) An analysis and evaluation of pertinent information on the nature of the environment;

(3) The nature and location of other potentially affected licensed and unlicensed facilities; and

(4) Analyses and procedures to ensure that doses are maintained ALARA and within the dose limits in He-P 4020.

He-P 4023.03 Disposal by Release into Sanitary Sewerage.

(a) A licensee may discharge licensed material into sanitary sewerage if each of the following conditions is satisfied:

(1) The material is readily soluble, or is readily dispersible biological material, in water;

(2) The quantity of licensed or other radioactive material that the licensee releases into the sewer in one month divided by the average monthly volume of water released into the sewer by the licensee does not exceed the concentration listed in Table 4090.1, Table III of He-P 4090;

(3) If more than one radionuclide is released:

a. The licensee shall determine the fraction of the limit in Table 4090.1, Table III of He-P 4090 represented by discharges into sanitary sewerage by dividing the actual monthly average concentration of each radionuclide released by the licensee into the sewer by the concentration of that radionuclide listed in Table 4090.1, Table III of He-P 4090; and

b. The sum of the fractions for each radionuclide required by He-P 4023.03(a)(3)a. shall not exceed unity; and

(4) The total quantity of licensed and other radioactive material that the licensee releases into the sanitary sewerage in a year does not exceed 185 GBq (5 Ci) of hydrogen-3, 37 GBq (1 Ci) of carbon-14, and 37 GBq (1 Ci) of all other radioactive materials combined.

(b) Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are shall not be subject to the limitations contained in He-P 4023.03(a).

He-P 4023.04 Treatment or Disposal by Incineration. A licensee may treat or dispose of licensed material by incineration only in the form and concentration specified in He-P 4023.05 or as specifically approved by the DHHS/~~BRH~~RHS pursuant to He-P 4023.02.

He-P 4023.05 Disposal of Specific Wastes.

(a) A licensee shall dispose of the following licensed material as if it were not radioactive:

(1) 1.85 kBq (0.05 μ Ci), or less, of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting; and

(2) 1.85 kBq (0.05 μ Ci), or less, of hydrogen-3 or carbon-14 per gram of animal tissue, averaged over the weight of the entire animal.

(b) A licensee shall not dispose of tissue having been treated with radioactive material pursuant to He-P 4023.05(a)(2) in a manner that would permit its use either as food for humans or as animal feed.

(c) The licensee shall maintain records in accordance with He-P 4021.09.

He-P 4023.06 Transfer for Disposal and Manifests.

(a) This section shall:

- (1) Control transfers of low-level radioactive waste by any waste generator, waste collector, or waste processor licensee who ships low-level waste either directly, or indirectly through a waste collector or waste processor, to a licensed low-level waste land disposal facility as defined in He-P 4003;
- (2) Establish a manifest tracking system; and
- (3) Supplement existing requirements concerning transfers and recordkeeping for those wastes.

(b) Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility shall document the information required on NRC's Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee in accordance with Appendix G to 10 CFR 20.

(c) Each shipment manifest shall include a certification by the waste generator as specified in Appendix G to 10 CFR 20, as appropriate.

(d) Each person involved in the transfer of waste for disposal or in the disposal of waste, including the waste generator, waste collector, waste processor, and disposal facility operator, shall comply with the requirements specified in Appendix G to 10 CFR 20, as appropriate.

(e) Any licensee shipping byproduct material, as defined in He-P 4003.01(v)(3), (4), and (5), intended for ultimate disposal at a land disposal facility under 10 CFR 61 shall document the information required on the NRC's Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee in accordance with He-P 4022.04, He-P 4022.05, and He-P 4022.06, as appropriate.

He-P 4023.07 Compliance with Environmental and Health Protection Regulations.
Nothing in He-P 4023.01, He-P 4023.02, He-P 4023.03, He-P 4023.04, He-P 4023.05-~~or~~, He-P 4023.06 or He-P 4023.08 shall relieve the licensee from complying with other applicable federal, state and local regulations or rules governing any other toxic or hazardous properties of materials that may be disposed of under He-P 4023.01, He-P 4023.02, He-P 4023.03, He-P 4023.04, He-P 4023.05-~~or~~, He-P 4023.06 or He-P 4023.08.

He-P 4023.08 Disposal of Certain Byproduct Material.

(a) Licensed material, as defined in He-P 4003.01(v)(3), (4), and (5), may be disposed of in accordance with 10 CFR 61, even though it is not defined as low-level radioactive waste. Therefore, any licensed byproduct material being disposed of at a facility, or transferred for

ultimate disposal at a facility licensed under 10 CFR 61, shall meet the requirements of He-P 4023.06.

(b) A licensee may dispose of byproduct material, as defined in He-P 4003.01(v)(3), (4) and (5), at a disposal facility authorized to dispose of such material in accordance with any applicable federal, state or local regulations or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005.

Readopt with amendment He-P 4024, effective 7-23-05 (Document #8393), cited and to read as follows:

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

PART He-P 4024 DECOMMISSIONING

Statutory Authority RSA 125-F:5,V

He-P 4024.01 Purpose.

(a) This part provides for removing safely from service a facility or site having radioactive material, a radiation-producing or radioactivity-inducing machine pursuant to He-P 4030 through 4036, 4039, 4040, 4044, and 4047.

(b) The purpose of this part is to conform with 10 CFR 20.1401 – 20.1406, 30.35, 30.36, 40.36, 40.42, 70.25, and 70.38.

He-P 4024.02 Scope. This part shall apply to any person licensed to receive, possess, own, acquire, use, process, transfer or dispose of radioactive material, and to any person responsible for decommissioning a facility or site.

He-P 4024.03 Exemptions. The following licensees shall be exempt from this part:

(a) Low-level waste disposal facility licensees under this chapter including ancillary facilities that support radioactive waste management and disposal activities; and

(b) Uranium and thorium recovery facility licensees under this chapter, or uranium solution extraction facilities.

He-P 4024.04 Minimization of Contamination. Applicants for licenses, other than renewals, shall describe in the application how facility design and procedures for operation shall:

(a) Minimize, to the extent practicable, contamination of the facility and the environment;

(b) Facilitate eventual decommissioning;

(c) Minimize, to the extent practicable, the generation of radioactive waste; and

(d) Conduct, to the extent practical, operations to minimize the introduction of residual radioactivity into the site, including the subsurface, in accordance with the existing radiation protection requirements in He-P 4020.04 and radiological criteria for license termination in He-P 4024.04, He-P 4024.09, He-P 4024.10, He-P 4024.11, and He-P 4024.13.

He-P 4024.05 Continuation of Licenses Beyond Expiration Date.

(a) In accord with He-P 4030, each existing license shall not expire until final action is taken by the DHHS/RHS.

(b) With respect to possession of radioactive material and residual radioactive contamination, each specific license continues in effect beyond the expiration date until the DHHS/RHS notifies the licensee in writing that the license is terminated, even if:

- (1) The licensee decides not to renew the license;
- (2) No application for license renewal is submitted;
- (3) An application for renewal is denied; or
- (4) The DHHS/RHS modifies or suspends the license.

(c) After the expiration date specified in the license, each licensee to which He-P 4024.05(b) applies and who possesses radioactive material, including residual radioactive material, shall:

- (1) Limit actions involving radioactive material to those related to decommissioning; and
- (2) Continue to control entry to restricted areas until they are suitable for release in accordance with DHHS/RHS requirements.

He-P 4024.06 Decommissioning Timeliness.

(a) Each licensee or person in possession of a non-exempt source of radiation who decides to terminate all activities involving that source of radiation shall notify the DHHS/RHS immediately, in writing.

(b) Each licensee or person responsible for a facility or site which includes a non-exempt source of radiation or which may be contaminated by residual radioactivity shall, no less than 30 days before vacating or relinquishing possession or control of the facility or site, notify the DHHS/RHS, in writing, of the intent to vacate.

(c) The licensee shall notify the DHHS/RHS in writing within 60 days of the occurrence of any of the following:

- (1) The licensee has decided to permanently cease principal activities at the entire site or in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with these regulations;
- (2) No principal activities under the license have been conducted for a period of 24 months; or
- (3) No principal activities have been conducted for a period of 24 months in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with these regulations.

(d) From the date of notification of the DHHS/RHS required in (a) or (b) above, the licensee shall either:

- (1) Begin decommissioning activities; or

(2) Within 12 months of notification, submit a decommissioning plan, if required by He-P 4024.07, and begin decommissioning upon DHHS/RHS approval of that plan.

(e) Coincident with the notification of the DHHS/RHS required in (a) and (b) above, the licensee shall maintain in effect all decommissioning financial assurances established by the licensee pursuant to He-P 4030.09 in conjunction with a license issuance or renewal or as required by this part.

(f) The amount of the financial assurance required by paragraph (e) of He-P 4024.06 shall be increased, or may be decreased, as appropriate, to cover the detailed cost estimate for decommissioning established pursuant to He-P 4024.07(c)5.

(g) The DHHS/RHS shall approve an alternate schedule for the submission of plans and for the completion of decommissioning as required pursuant to (a) and (b) above only if the DHHS/RHS determines that the alternate schedule:

- (1) Is necessary to effectively conduct decommissioning;
- (2) Presents no undue risks to public health and safety; and
- (3) Is otherwise in the public interest.

(h) Any such request as described in He-P 4024.06(g) shall be submitted no later than 30 days before notification pursuant to He-P 4030.11(b).

(i) The schedule for decommissioning shall not commence until the DHHS/RHS has made a determination on the request.

He-P 4024.07 Decommissioning Plan.

(a) A licensee shall submit a decommissioning plan if:

- (1) The licensee intends to terminate the license using radiological criteria specified in He-P 4024.10 and He-P 4024.11;
- (2) Otherwise required by these rules;
- (3) Required by license condition; or
- (4) The procedures and activities necessary to carry out decommissioning of the site or separate building or outdoor area have not been previously approved by the DHHS/RHS and the procedures could increase potential health and safety impacts to workers or to the public, including but not limited to the following cases:
 - a. Procedures involving techniques not applied routinely during cleanup or maintenance operations;
 - b. Workers entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during the operation for which the license was issued;

c. Procedures that could result in significantly greater airborne concentrations of radioactive materials than are present during operation; or

d. Procedures that could result in significantly greater releases of radioactive material to the environment than those associated with the operation for which the license was issued.

(b) Procedures with potential health and safety impacts shall not be carried out prior to approval of the decommissioning plan.

(c) The proposed decommissioning plan for the facility or site, or separate building or outdoor area, shall include:

(1) A description of the conditions of the facility or site sufficient to evaluate the acceptability of the plan;

(2) A description of planned decommissioning activities;

(3) A description of methods used to ensure protection of workers and the environment against radiation hazards during decommissioning;

(4) A description of the radiation survey planned to demonstrate compliance with He-P 4024.08(d) and He-P 4024.09(a), or if applicable, He-P 4024.09 or He-P 4024.11; and

(5) An updated, detailed cost estimate for decommissioning, comparison of that estimate with present funds set aside for decommissioning, and a plan for assuring the availability of adequate funds for completion of decommissioning.

(d) For decommissioning plans calling for completion of decommissioning later than 24 months after plan approval, the plan shall include a justification for the delay.

(e) The proposed decommissioning plan shall be approved by the DHHS/RHS only if the information therein demonstrates that the decommissioning will be completed as soon as practicable and that the health and safety of workers and the public will be adequately protected.

He-P 4024.08 Completion of Decommissioning.

(a) The licensee shall complete decommissioning of the facility or site as soon as practicable but no later than 24 months following the initiation of decommissioning, unless an alternate schedule addressing the factors in He-P 4024.08(c) is requested with written justification and approved by the DHHS/RHS.

(b) When decommissioning involves the entire site, the licensee shall request license termination upon completion of decommissioning activities.

(c) For decommissioning plans calling for completion of decommissioning later than 24 months after plan approval, the plan shall include a justification for the decommissioning schedule warranted by consideration of the following:

- (1) Whether it is technically feasible to complete decommissioning within the allotted 24-month period;
 - (2) Whether sufficient waste disposal capacity is available to allow completion of decommissioning within the allotted 24-month period;
 - (3) Whether a significant volume reduction in wastes requiring disposal will be achieved by allowing short-lived radionuclides to decay;
 - (4) Whether a significant reduction in radiation exposure to workers can be achieved by allowing short-lived radionuclides to decay; and
 - (5) Other site-specific factors which the DHHS/RHS considers appropriate on a case-by-case basis, including but not limited to:
 - a. The regulatory requirements of other government agencies, lawsuits, groundwater treatment activities, monitored natural ground-water restoration, actions that could result in more environmental harm than deferred cleanup; and
 - b. Other factors beyond the control of the licensee.
- (d) As the final step in decommissioning, the licensee shall:
- (1) Conduct a radiation survey of the premises where the licensed activities were carried out, and:
 - a. Submit a report of the results of this survey in (1) above, unless the licensee demonstrates that the premises are suitable for release in some other manner;
 - b. As appropriate:
 1. Report levels of gamma radiation in units of millisieverts, or microroentgens, per hour at one meter from surfaces; and
 2. Report levels of radioactivity, including alpha and beta:
 - (i) In units of megabecquerels, or disintegrations per minute or microcuries, per 100 square centimeters, removable and fixed, for surfaces;
 - (ii) In units of megabecquerels, or microcuries, per milliliter for water; and
 - (iii) In units of becquerels, or picocuries, per gram for solids such as soils or concrete; and
 - c. Specify the survey instrument(s) used and certify that each instrument is properly calibrated and tested;
 - (2) Certify the disposition of all licensed material including accumulated wastes, by submitting a completed Form RHP-10 containing the following:

- a. Name of licensee;
- b. Address of licensee;
- c. Department(s) of licensee, as applicable;
- d. License number of licensee;
- e. Individual isotope user(s);
- f. The name of the certifying official duly authorized by the licensee to certify that licensable quantities of radioactive material under the jurisdiction of the DHHS/RHS are not possessed by the licensee, and to request that the license be terminated; and
- g. The dated signature of the certifying official of the licensee;

(3) Clearly indicate on the form required by (d)(2) above whether:

- a. All use of radioactive materials authorized by the license has been terminated;
- b. Radioactive contamination has been removed to the level outlined in He-P 4024.09 to the extent practicable;
- c. No radioactive material has ever been procured or possessed by the licensee under the authorization granted by the licensee's license;
- d. All radioactive material previously procured or possessed under the authorization granted by the license has been disposed of by:
 - 1. Transfer to another licensed entity authorized to possess the material and provide the recipient entity's name, address, and the license number and radiation regulatory licensing authority;
 - 2. Decay, survey, and disposal as non-radioactive trash; or
 - 3. A method in compliance with the provisions of He-P 4023;
- e. Radiation surveys or the equivalent as specified in He-P 4024.08(d) are attached; and
- f. Additional pages containing additional information are attached.

(4) Include, as additional attached pages to the Form RHP-10, a clear and detailed description of the method of disposal of radioactive material, if the licensee disposed of radioactive material using a method other than that indicated in He-P 4024.08(d)(3)d.1. or 2. above; and

(5) Include, as additional attached pages to the form, report(s) of detailed radiation surveys required by He-P 4024.08(d)(1).

He-P 4024.09 Termination of a License Without Restriction.

(a) A site shall be considered acceptable for unrestricted use only if:

(1) The residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 0.10 millisievert (10 mrem) per year, including that from groundwater sources of drinking water; and

(2) The residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA), taking into account consideration of any detriments, such as accidental deaths, expected to potentially result from decontamination and waste disposal.

(b) Specific licenses, including expired licenses, shall be terminated upon written notice to the licensee only when the DHHS/RHS determines that:

(1) Radioactive material has been properly disposed;

(2) Reasonable effort has been made to eliminate residual radioactive contamination, if present; and

(3) Documentation is provided to the DHHS/RHS that:

a. A radiation survey has been performed which demonstrates that the premises are suitable for release in accordance with DHHS/RHS requirements; or

b. Other information submitted by the licensee is sufficient to demonstrate that the premises are suitable for release in accordance with DHHS/RHS requirements; and

(4) Records required by He-P 4030.10(n)(6) to be submitted to the DHHS/RHS prior to license termination have been received by the DHHS/RHS.

He-P 4024.10 License Termination Under Restricted Conditions. A site shall be considered acceptable for license termination under restricted conditions only if:

(a) The licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of He-P 4024.09 would result in net public or environmental harm or were not being made because the residual levels associated with restricted conditions are ALARA, taking into account consideration of any detriments, such as accidental deaths, expected to potentially result from decontamination and waste disposal;

(b) The licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 0.10 millisievert (10 mrem) per year, including that from groundwater sources of drinking water;

(c) The licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site. Acceptable financial assurance mechanisms shall include:

(1) Funds placed into a trust segregated from the licensee's assets and outside the licensee's administrative control, and in which the adequacy of the trust funds is to be assessed based on an assumed annual one percent real rate of return on investment;

(2) A statement of intent in the case of federal, state, or local government licensees, as described in He-P 4030.09(j)(5); or

(3) When a governmental entity is assuming custody and ownership of a site, an arrangement that is deemed acceptable by such governmental entity;

(d) The licensee has submitted a decommissioning plan to the DHHS/RHS indicating the licensee's intent to decommission in accordance with He-P 4024.06(c) and specifying that the licensee intends to decommission by restricting use of the site; and

(e) The decommissioning plan required by (d) above sufficiently demonstrates:

(1) How the input of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, to include at a minimum the following:

a. Participation by representatives of a broad cross section of community interests who might be affected by the decommissioning;

b. An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

c. A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues;

(2) Whether provisions for institutional controls proposed by the licensee provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed the applicable limit in He-P 4020 through He-P 4023;

(3) Whether provisions for institutional controls will impose undue burden on the local community or other affected parties; and

(4) Whether the licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site; and

(f) Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable and would not exceed either:

(1) One millisievert (100 mrem) per year; or

(2) Five millisievert (500 mrem) per year provided the licensee:

- a. Demonstrates that further reductions in residual radioactivity necessary to comply with the one millisievert/year (100 mrem/y) value of He-P 4024.09(e)(3)a. are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm;
- b. Makes provisions for durable institutional controls; and
- c. Provides sufficient financial assurance, using an acceptable mechanism listed in He-P 4024.10(c), to enable a responsible government entity or independent third party, including a governmental custodian of a site, to:
 1. Carry out periodic rechecks of the site no less frequently than every 5 years to assure that the institutional controls remain in place as necessary to meet the criteria of He-P 4024.10(b); and
 2. Assume and carry out responsibilities for any necessary control and maintenance of those controls.

He-P 4024.11 Alternate Criteria for License Termination.

- (a) The DHHS/RHS shall terminate a license using alternate criteria greater than the dose criteria of He-P 4024.09(a), He-P 4024.10(b), and He-P 4024.10(e)(1)a.1. only if the licensee:
 - (1) Provides assurance that public health and safety would continue to be protected, and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the one millisievert/year (100 mrem/y) limit of He-P 4020.13 and He-P 4020.14, by submitting an analysis of possible sources of exposure;
 - (2) Has employed, to the extent practical, restrictions on site use according to the provisions of He-P 4024.10 in minimizing exposures at the site;
 - (3) Reduces doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal;
 - (4) Has submitted a decommissioning plan to the DHHS/RHS indicating the licensee's intent to decommission in accordance with this part and specifying that the licensee proposes to decommission by use of alternate criteria; and
 - (5) Has provided sufficient financial assurance in the form of a trust fund to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site.
- (b) The licensee shall document in the decommissioning plan required by (a)(4) above, how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice.
- (c) In seeking the advice described in (b) above, the licensee shall provide for:

- (1) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;
- (2) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and
- (3) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues.

(d) The use of alternate criteria to terminate a license shall require the approval of the DHHS/RHS after consideration of the staff's recommendations addressing comments provided by federal, state, and local governments and any public comments submitted pursuant to He-P 4024.13.

He-P 4024.12 Requirement to Use Peak Annual TEDE. When calculating TEDE to the average member of the critical group, the licensee shall determine the peak annual TEDE dose expected within the first 1000 years after decommissioning.

He-P 4024.13 Public Notification and Public Participation. Upon the receipt of a decommissioning plan from the licensee, a proposal by the licensee for release of a site pursuant to He-P 4024.10 or He-P 4024.11, or whenever the DHHS/RHS deems such notice to be in the public interest, the DHHS/RHS shall:

(a) Notify and solicit comments from:

- (1) Local and state governments in the vicinity of the site and any Indian Nation or other indigenous people that have treaty or statutory rights that could be affected by the decommissioning; and
- (2) The U.S. Environmental Protection Agency for cases where the licensee proposes to release a site pursuant to He-P 4024.11; and

(b) Publish a notice in a forum, such as local newspapers, letters to state or local organizations, or other appropriate forum, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.

He-P 4024.14 Applicability of Decommissioning Criteria Following License Termination. After a site has been decommissioned and the license terminated in accordance with the criteria in this part, additional cleanup shall be required if:

- (a) Based on new information, the DHHS/RHS determines that the criteria of this part were not met; and
- (b) Residual radioactivity remaining at the site could result in significant threat to public health and safety.

Readopt with amendment He-P 4095, effective 7-23-05 (Document #8393), cited and to read as follows:

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

PART He-P 4095 ASSIGNED PROTECTION FACTORS FOR RESPIRATORS

Statutory Authority RSA 125-F:5,V

He-P 4095.01 Assigned Protection Factors for Respirators. Assigned protection factors for respirators for use by licensees shall be in accordance with Table 4095.1 below:

Table 4095.1 Assigned Protection Factors (APF) for Respirators

	<u>Operating Mode</u>	Assigned Protection Factors
I. Air purifying respirators (Particulate only) Filtering faceplate disposable ^u -----	Negative Pressure-----	(1 ^u)
Facepiece, half ^v -----	Negative Pressure-----	10
Facepiece, full-----	Negative Pressure-----	100
Facepiece, half-----	Powered air-purifying respirators-	50
Facepiece, full-----	Powered air-purifying respirators-	1000
Helmet/hood-----	Powered air-purifying respirators-	1000
Facepiece, loosefitting-----	Powered air-purifying respirators-	25
II. Atmosphere supplying respirators (Particulate, gases, and vapors ^w)		
1: Air-line respirator:		
Facepiece, half-----	Demand-----	10
Facepiece, half-----	Continuous Flow-----	50
Facepiece, half-----	Pressure Demand-----	50
Facepiece, full-----	Demand-----	100
Facepiece, full-----	Continuous Flow-----	1000
Facepiece, full-----	Pressure Demand-----	1000
Helmet/hood-----	Continuous Flow-----	1000
Facepiece, loosefitting-----	Continuous Flow-----	25
Suit-----	Continuous Flow-----	(1 ^x)
2: Self-contained breathing apparatus (SCBA):		
Facepiece, full-----	Demand-----	^y 100
Facepiece, full-----	Pressure Demand-----	^z 10,000
Facepiece, full-----	Demand, recirculating-----	^y 100
Facepiece, full-----	Positive Pressure Recirculating---	^z 10,000
III. Combination respirators: Any combination of air-purifying and atmosphere-supplying respirators	Assigned protection factor for type and mode of operations as listed above	

He-P 4095.02 Additional Requirements for Protection Factors for Respirators. The licensee shall use the following to determine compliance with He-P 4095.01:

- (a) The assigned protection factors specified in Table He-P 4095.1 shall apply:

(1) Only in a respiratory protection program that meets the requirements of He-P 4022 and He-P 4095; and

(2) Only to airborne radiological hazards, and may not be appropriate to circumstances when chemical or other respiratory hazards exist instead of, or in addition to, radioactive hazards.

(b) Selection and use of respirators for circumstances described in He-P 4095.02(a)(2) shall also comply with United States Department of Labor regulations.

(c) For radioactive contaminants for which the concentration values in Table 1, column 3 of He-P 4090 are based on internal dose due to inhalation and may, in addition, present external exposure hazards at higher concentrations, the licensee shall consider whether limitations on occupancy be governed by external dose limits.

(d) Air purifying respirators with $APF < 100$ shall be equipped with particulate filters that are at least 95 percent efficient.

(e) Air purifying respirators with $APF = 100$ shall be equipped with particulate filters that are at least 99 percent efficient.

(f) Air purifying respirators with $APF > 100$ shall be equipped with particulate filters that are at least 99.97 percent efficient.

(g) In addition to the use of air purifying respirators for protection against radioactive particulates, the licensee may apply to the DHHS/RHS for the use of an APF greater than one for sorbent cartridges in an air purifying respirator as protection against airborne radioactive gases and vapors, for example, radioiodine.

(h) Items in Table 4095.1 marked with superscript u shall be an appropriate protection factor which shall be determined for use by individuals who may or may have not been medically screened or fit tested on the device provided that:

(1) No credit shall be taken for their use in estimating intake or dose; and

(2) All other respiratory protection program requirements specified in He-P 4022.08 apply.

(i) Notwithstanding the requirement of (h) above, insofar as an assigned protection factor has not been assigned for filtering faceplate disposable air purifying respirators, an APF equal to 10 may be used only if the licensee can demonstrate a fit factor of at least 100 by use of a validated or evaluated, qualitative or quantitative fit test.

(j) The items in Table 4095.1 marked with the superscript v shall be for under-chin type only, with no distinction made in this part between elastomeric half-masks with replaceable cartridges and those designed with the filter medium as an integral part of the facepiece (e.g., disposable or reusable disposable). Both types shall be acceptable so long as:

(1) The seal area of a half-mask designed with the filter medium as an integral part of the facepiece contains some substantial type of seal enhancing material such as rubber or plastic;

(2) The 2 or more suspension straps are adjustable;

(3) The filter medium is at least 95 percent efficient; and

(4) All other requirements of He-P 4022.08 and He-P 4095 are met.

(k) Items in Table 4095.1 marked with superscript w shall indicate that the assigned protection factors for gases and vapors shall not be applicable to radioactive contaminants that present an absorption or submersion hazard.

(l) A protection factor of 3 shall be assigned when atmosphere-supplying respirators are used to protect against tritium oxide.

(m) Protective actions for radioactive noble gases shall be based on external (submersion) dose considerations.

(n) Items in Table 4095.1 marked with superscript x shall be an appropriate protection factor which may be used in an acceptable respiratory protection program, only if all the other minimum respiratory program requirements contained in He-P 4022 and He-P 4095, with the exception of fit testing, are met.

(o) For use of the items in Table 4095.1 marked with superscript y, the licensee shall be implement institutional controls to assure that these devices are not used in areas immediately dangerous to life or health.

(p) Items in Table 4095.1 marked with superscript z shall be the type of respirator which may be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure, such as skin absorption, shall be taken into account in such circumstances.

(q) The device specified in (p) above shall not be used by any individual who experiences perceptible outward leakage of breathing gas while wearing the device.

APPENDIX

<u>Rule</u>	<u>State or Federal Statute or Federal Regulation Implemented</u>
He-P 4024 (specific provisions implementing specific statutes as specified below)	RSA 125-F:1, RSA 125-F:2, & RSA 125-F:5, II and V; Section 274 of the Atomic Energy Act of 1954, as amended
He-P 4024.01	10 CFR 20.1401
He-P 4024.02	10 CFR 20.1401
He-P 4024.03	10 CFR 20.1401
He-P 4024.04	10 CFR 10.1406
He-P 4024.05	10 CFR 30.36, 40.42, and 70.38
He-P 4024.06	10 CFR 30.36, 40.42, and 70.38
He-P 4024.07	10 CFR 30.36, 40.42, and 70.38
He-P 4024.08	10 CFR 30.36, 40.42, and 70.38
He-P 4024.09	10 CFR 20.1402
He-P 4024.10	10 CFR 20.1403
He-P 4024.11	10 CFR 20.1404
He-P 4024.12	10 CFR 20.1401
He-P 4024.13	10 CFR 20.1405
He-P 4024.14	10 CFR 20.1401
He-P 4095 (specific provisions implementing specific statutes as specified below)	RSA 125-F:1, RSA 125-F:2, & RSA 125-F:5 II and V; Section 274 of the Atomic Energy Act of 1954, as amended
He-P 4095.01	Appendix A to 10 CFR 20.36
He-P 4095.02	Appendix A to 10 CFR 20.36

PART He-P 4030 LICENSING OF RADIOACTIVE MATERIAL

~~Statutory Authority RSA 125 F:5, V~~

REVISION NOTE:

~~Doc. #6942, effective 2-1-99, repealed Parts He-P 2030, 2031, 2032, 2033, 2034, 2035, 2042 and 2093 relative to Radiation and Radioactive Material and adopted new rules to replace them and renumbered them as He-P 4030, 4031, 4032, 4033, 4034, 4035, 4093 and 4096.~~

He-P 4030.01 Requirements.

(a) No person shall manufacture, produce, receive, possess, use, transfer, own, or acquire ~~radioactive-byproduct~~ materials, except as authorized pursuant to a license issued by the DHHS/~~BRHRHS~~, or as otherwise provided in this chapter.

(b) In addition to the requirements of He-P 4030:

(1) All licensees are subject to the requirements of He-P 4001 through He-P 4003, He-P 4019 through He-P 4023, and He-P 4037;

(2) Licensees engaged in industrial radiographic operations are subject to the requirements of He-P 4034;

(3) Licensees using ~~radionuclides-byproduct materials~~ in the healing arts are subject to the requirements of He-P 4035;

(4) Licensees engaged in land disposal of ~~radioactive-byproduct~~ material are subject to the requirements of He-P 4060 through He-P 4064;

(5) Licensees engaged in wireline and subsurface tracer studies are subject to the requirements of He-P 4039;

(6) Licensees engaged in the manufacture or transfer of certain items containing ~~radioactive-byproduct~~ material are subject to He-P 4032;

(7) Licensees of broad scope other than human use are subject to He-P 4033; and

(8) General licenses are subject to He-P 4031-;

(9) Licensees engaged in irradiator operations are subjected to the requirements of He-P 4036;

(10) Licensees that possess and use accelerator-produced radioactive material or discrete sources of radium-226 are subjected to the requirements of He-P 4030(a);

~~Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07~~

New. #8959, eff 8-7-07

He-P 4030.02 Exemptions, Source Material.

(a) Any person shall be exempt from He-P 4030 to the extent that such person receives, possesses, uses, owns, or transfers source material in any chemical mixture, compound, solution, or alloy in which the source material is by weight less than 1/20 of 1 percent (0.05 percent) of the mixture, compound, solution, or alloy.

(b) Any person shall be exempt from He-P 4030 to the extent that such person receives, possesses, uses, or transfers unrefined and unprocessed ore containing source material.

(c) Any person shall be exempt from He-P 4030 to the extent that such person receives, possesses, uses, or transfers:

(1) Any quantities of thorium contained in:

- a. Incandescent gas mantles;
- b. Vacuum tubes;
- c. Welding rods;
- d. Electric lamps for illuminating purposes provided that each lamp shall not contain more than 50 milligrams of thorium;
- e. Germicidal lamps, sunlamps, and lamps for outdoor or industrial lighting provided that each lamp shall not contain more than 2 grams of thorium;
- f. Rare earth metals and compounds, mixtures, and products containing not more than 0.25 percent by weight thorium, uranium, or any combination of these; or
- g. Personnel neutron dosimeters, provided that each dosimeter shall not contain more than 50 milligrams of thorium;

(2) Source material contained in the following products:

- a. Glazed ceramic Tableware, provided that the glaze shall not contain more than 20 percent by weight source material;
- b. Glassware, containing not more than 10 percent by weight source material, but not including glass enamel or ceramic used in construction;
- c. Piezoelectric ceramic containing not more than 2 percent by weight source material; or
- d. Glass enamel or glass enamel frit containing not more than 10 percent by weight source material imported or ordered for importation into the United States, or initially distributed by manufacturers in the United States, before July 25, 1983;

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

(4) Any finished product or part fabricated of, or containing, tungsten-thorium or magnesium-thorium alloys, provided that the thorium content of the alloy shall not exceed 4 percent by weight and that this exemption shall not be deemed to authorize the chemical, physical, or metallurgical treatment or processing of any such product or part;

- (5) Uranium contained in counterweights installed in aircraft, rockets, projectiles, and missiles, or stored or handled in connection with installation or removal of such counterweights, provided that:
- a. The counterweights are manufactured in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, authorizing distribution by the licensee pursuant to 10 CFR Part 40;
 - b. Each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM";
 - c. Each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED";
 - d. This exemption shall not authorize the chemical, physical, or metallurgical treatment or processing of any such counterweights other than repair or restoration of any plating or other covering; and
 - e. For counterweights manufactured prior to December 31, 1969, the requirements specified in He-P 4030.02(c)(5)c. and d. shall be met if such counterweights are impressed with the legend: "CAUTION - RADIOACTIVE MATERIAL – URANIUM";
- (6) Natural or depleted uranium metal used as shielding constituting part of any shipping container, provided that:
- a. The shipping container is conspicuously and legibly impressed with the legend: "CAUTION - RADIOACTIVE SHIELDING – URANIUM"; and
 - b. The uranium metal is encased in mild steel or equally fire resistant metal of minimum wall thickness of 1/8 inch (3.2 mm);
- (7) Thorium contained in finished optical lenses, provided that each lens does not contain more than 30 percent by weight of thorium, and does not include:
- a. The shaping, grinding, or polishing of such lens or manufacturing processes other than the assembly of such lens into optical systems and devices without any alteration of the lens; or
 - b. The receipt, possession, use, or transfer of thorium contained in contact lenses, in spectacles, or in eyepieces in binoculars or other optical instruments;
- (8) Uranium contained in detector heads for use in fire detection units, provided that each detector head shall contain not more than 0.005 microcurie of uranium; or
- (9) Thorium contained in any finished aircraft engine part containing nickel-thoria alloy, provided that:
- a. The thorium shall be dispersed in the nickel-thoria alloy in the form of finely divided thoria such as thorium dioxide; and
 - b. The thorium content in the nickel-thoria alloy shall not exceed 4 percent by weight.

(d) The exemptions in He-P 4030.02(c) shall not authorize the manufacture of any of the products described.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.03 Exemptions, Radioactive Materials Other Than Source Materials.

(a) Except as provided in He-P 4030.03(b), any person shall be exempt from He-P 4030 to the extent that such person receives, possesses, uses, transfers, owns, or acquires products or materials containing ~~radioactive-byproduct~~ material in concentrations not in excess of those listed in He-P 4093. This exemption shall not be deemed to authorize the import of byproduct material or products containing byproduct material.

(b) No person shall introduce ~~radioactive-byproduct~~ material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under He-P 4030.03(a) or equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State, or Licensing State except in accordance with a license issued pursuant to He-P 4032.04 or a general license issued pursuant to He-P 4030.18.

(c) Except for persons who apply ~~radioactive-byproduct~~ material, or persons who incorporate ~~radioactive-byproduct~~ material into the following products, any person shall be exempt from this chapter to the extent that they receive, possess, use, transfer, own, or acquire the following products:

(1) Timepieces or hands or dials of timepieces which shall contain not more than the following specified quantities of radioactive material and which shall not exceed the following specified levels of radiation:

- a. 25 millicuries of tritium per timepiece;
- b. 5 millicuries of tritium per hand;
- c. 15 millicuries of tritium per dial to include bezels when used;
- d. 100 microcuries of promethium 147 per watch or 200 microcuries of promethium 147 per any other timepiece;
- e. 20 microcuries of promethium 147 per watch hand or 40 microcuries of promethium 147 per other timepiece hand;
- f. 60 microcuries of promethium 147 per watch dial or 120 microcuries of promethium 147 per other timepiece dial to include bezels when used; and
- g. The levels of radiation from hands and dials containing promethium 147 shall not exceed, when measured through 50 milligrams per square centimeter of absorber:

1. For wrist watches, 0.1 millirad per hour at 10 centimeters from any surface;

2. For pocket watches, 0.1 millirad per hour at 1 centimeter from any surface; and
3. For any other timepiece, 0.2 millirad per hour at 10 centimeters from any surface;

h. 0.037 megabecquerel (1 microcurie) of radium-226 per timepiece in intact timepieces manufactured prior to November 30, 2007.

(2) Radium dial timepieces, timepiece hands or dials which shall contain not more than the following specified quantities of radium and shall meet the following expressed conditions:

- a. 0.15 microcurie of radium per watch;
- b. 0.03 microcurie of radium per watch hand;
- c. 0.09 microcurie of radium per watch dial;
- d. 0.20 microcurie of radium per clock;
- e. 0.04 microcurie of radium per clock hand;
- f. 0.12 microcurie of radium per clock dial;
- g. The timepiece is not a pocket watch;
- h. The timepiece is marked or coded to identify the date of manufacture and that it contains radium; and
- i. The timepiece emits sufficient luminosity, omitting photoactivation, that its dial can be read in the dark during its entire design lifetime;

~~(3) Lock illuminators containing not more than 15 millicuries of tritium or not more than 2 millicuries of promethium 147 installed in automobile locks so that the levels of radiation from each lock illuminator containing promethium 147 does not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 50 milligrams per square centimeter of absorber; [Reserved]~~

(4) Precision balances containing not more than 1 millicurie of tritium per balance or not more than 0.5 millicurie of tritium per balance part manufactured before December 17, 2007;

~~(5) Automobile shift quadrants containing not more than 25 millicuries of tritium; [Reserved]~~

(6) Marine compasses containing not more than 750 millicuries of tritium gas and other marine navigational instruments containing not more than 250 millicuries of tritium gas manufactured before December 17, 2007;

~~(7) Thermostat dials and pointers containing not more than 25 millicuries of tritium per thermostat; [Reserved]~~

(8) Electron tubes, provided that:

a. Each tube shall not contain more than one of the following specified quantities of ~~radioactive-byproduct~~ material:

1. 150 millicuries of tritium per microwave receiver protector tube or 10 millicuries of tritium per any other electron tube;
2. 1 microcurie of cobalt 60;
3. 5 microcuries of nickel 63;
4. 30 microcuries of krypton 85;
5. 5 microcuries of cesium 137; and
6. 30 microcuries of promethium 147; and

b. The level of radiation due to ~~radioactive-byproduct~~ material contained in each electron tube, spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pick-up tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents shall not exceed 1 milliampere per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber;

(9) Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, one or more sources of ~~radioactive-byproduct~~ material provided that:

- a. Each source shall contain no more than one exempt quantity set forth in He-P 4096;
- b. Each instrument shall contain no more than 10 exempt quantities;
- c. For purposes of He-P 4030.03(c)(9)b., an instrument's source(s) may contain either one type or different types of radionuclides and an individual exempt quantity may be composed of fractional parts of one or more of the exempt quantities in He-P 4096, provided that the sum of such fractions shall not exceed unity; and
- d. For purposes of He-P 4030.03(c)(9)b., 0.05 microcurie of americium-241 shall be considered an exempt quantity under He-P 4096; and

~~(10) Spark gap irradiators containing not more than 1 microcurie of cobalt 60 per spark gap irradiator for use in electrically ignited fuel oil burners having a firing rate of at least 3 gallons (11.4 liters) per hour. [Reserved]~~

~~(11) Ionization chamber smoke detectors containing not more than 1 microcurie of americium-241 per detector in the form of a foil and designed to protect life and property from fires.~~

~~(d) Any person shall be exempt from these rules to the extent that such person receives, possesses, uses, transfers, owns, or acquires synthetic plastic resins containing scandium 46 which are designed for sand consolidation in oil wells, provided that:~~

~~(1) Such resins shall have been manufactured or imported in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, or shall have been manufactured in accordance with the specifications contained in a specific license or equivalent licensing document issued by the DHHS/BRH or any Agreement State, to the manufacturer of such resins pursuant to licensing requirements equivalent to those in Section 32.16 and 32.17 of 10 CFR Part 32 of the regulations of the U.S. Nuclear Regulatory Commission; and~~

~~(2) This exemption shall not authorize the manufacture of any resins containing scandium 46. [Reserved]~~

(e) Except for persons who manufacture, process, ~~or produce,~~ or initially transfer for sale or distribution gas and aerosol detectors, any person shall be exempt from the requirements in He-P 4030, He-P 4031, He-P 4032, He-P 4033, He-P 4034, and He-P 4036 ~~these rules~~ to the extent that such person receives, possesses, uses, transfers, owns, or acquires:

(1) ~~Radioactive-Byproduct~~ material in gas and aerosol detectors designed to protect life or property from fires and airborne hazards, provided that detectors containing radioactive material shall have been manufactured, imported, or transferred in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to Section 32.26 of 10 CFR Part 32; or

(2) Naturally occurring material in gas and aerosol detectors designed to protect life or property from fire and airborne hazards provided that detectors containing naturally occurring material shall have been manufactured, imported, or transferred in accordance with a specific license issued by an Agreement State pursuant to equivalent conditions as in Section 32.26 of 10 CFR part 32.

(f) Except for persons who manufacture, process, or produce self-luminous products, any person shall be exempt from these rules to the extent that such person receives, possesses, uses, transfers, owns, or acquires:

(1) Tritium, Krypton 85, or Promethium 147 in self-luminous products manufactured, processed, imported, or transferred in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to Section 32.22 of 10 CFR part 32; or

(2) Naturally occurring material in self-luminous products manufactured, processed, imported, or transferred in accordance with a specific license issued by an Agreement State or Licensing State pursuant to equivalent conditions as in Section 32.22 of 10 CFR part 32.

(g) The exemptions in He-P 4030.03(f) shall not apply to Tritium, Krypton 85, Promethium 147, or naturally occurring material used in products for frivolous purposes or in toys or ornaments.

(h) Except as provided in He-P 4030.03(j) ~~and through (k)~~, any person shall be exempt from these rules to the extent that such person receives, possesses, uses, transfers, owns, or acquires ~~radioactive-byproduct~~ material in individual quantities each of which does not exceed the applicable quantity set forth in He-P 4096.

(i) Any person who possesses ~~radioactive-byproduct~~ material received or acquired under the general license formerly provided in He-P 2031 shall be exempt from the requirements for a

license set forth in He-P 4030, He-P 4031, He-P 4032, He-P 4033, He-P 4034, and He-P 4036 to the extent that such person possesses, uses, transfers or owns such radioactive-byproduct material.

(j) The provisions of He-P 4030.03(h) and (i) shall not authorize the production, packaging, or repackaging of radioactive-byproduct material for purposes of commercial distribution, or the incorporation of radioactive-byproduct material into products intended for commercial distribution.

(k) No person shall, for purposes of commercial distribution, transfer radioactive byproduct material in the individual quantities set forth in He-P 4096, knowing or having reason to believe that such quantities of radioactive-byproduct material will be transferred to persons exempt under He-P 4030.03(h) or (i) or equivalent regulations of the Nuclear Regulatory Commission, an Agreement State, or a Licensing State except in accordance with a specific license issued by the Nuclear Regulatory Commission pursuant to Section 32.18 of 10 CFR part 32, equivalent regulations of an Agreement State or a Licensing State.

(l) No person may, for purposes of producing an increased radiation level, combined quantities of byproduct material covered by this exemption so that the aggregate quantity exceeds the limits set forth in in He-P 4096, except for byproduct material combined within a device placed in use before May 3, 1999, or otherwise permitted by the regulations in this part.

(m) A manufacturer, processor, or producer of a product or material is exempt from the requirements for a license set forth in He-P 4031, He-P 4032, He-P 4033, He-P 4034, He-P 4035, He-P 4036 to the extent that this person transfers byproduct material contained in a product or material in concentrations not in excess of those specified in He-P 4093 and introduced into the product or material by a licensee holding a specific license issued by the DHHS/RHS expressly authorized such introduction. This exemption does not apply to the transfer of byproduct material contained in any food, beverage, cosmetic, drug, or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.04 Exemptions, U.S. Government Contractors. Any U.S. Nuclear Regulatory Commission and U.S. Department of Energy Contractor or subcontractor of the following categories operating within this state shall be exempt from this part to the extent that such contractor or subcontractor under his contract receives, possesses, uses, transfers, owns, or acquires sources of radiation:

(a) Prime contractors performing work for the NRC or DOE at U.S. Government-owned or controlled sites;

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

(c) Prime contractors using or operating nuclear reactors or other nuclear devices in a U.S. Government-owned vehicle or vessel; and

(d) Any other prime contractor or subcontractor when the state and the NRC jointly determine that:

- (1) Under the terms of the contract or subcontract, there is assurance that the work ~~thereunder~~hereunder can be accomplished without undue risk to the public health and safety; and
- (2) The exemption of such contractor or subcontractor is otherwise appropriate.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.05 Radioactive Drug: Capsules Containing Carbon-14 Urea for “In Vivo” Diagnostic Use for Humans.

(a) Except as provided in He-P 4030.05(b) and (c), any person is exempt from the requirements for a license set forth in He-P 4030 and He-P 4035, provided that such person receives, possesses, uses, transfers, owns, or acquires capsules containing 37 kBq (1 μ Ci) carbon-14 urea (allowing for nominal variation that may occur during the manufacturing process) each, for “in vivo” diagnostic use for humans.

(b) Any person who desires to use the capsules for research involving human subjects shall apply for and receive a specific license pursuant to He-P 4035.

(c) Any person who desires to manufacture, prepare, process, produce, package, repack, or transfer for commercial distribution such capsules shall apply for and receive a specific license pursuant to He-P 4032.10.

(d) Nothing in this section relieves persons from complying with applicable FDA, Federal, and other State requirements governing receipt, administration, and use of drugs.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.06 Types of Licenses. Licenses for radioactive materials shall be of the following:

(a) General licenses, as provided in He P 4031, which grant authority to persons for certain activities involving radioactive material, and are effective without the filing of an application with the DHHS/~~BRH~~RHS or the issuance of licensing documents to the particular persons, although the filing of a certificate of registration with the DHHS/~~BRH~~RHS may be required by the particular general license, as described in He-P 4031;

(b) Specific licenses which require the submission of an application to the DHHS/~~BRH~~RHS and the issuance of a licensing document by the DHHS/~~BRH~~RHS, under the provisions of this part and He P 4032, through He-P 4036, and He-P 4039; and

(c) Specific license by rule which is issued without the necessity of filing an application for a specific license in the following circumstances:

- (1) When a site must be timely remediated of contamination by radioactive materials that are subject to licensing under these rules but are unlicensed; or
- (2) When radioactive materials existing as a result of improper handling, spillage, accidental contamination, or unregulated or illegal possession, transfer, or receipt, must be stored and those materials have not been licensed under these rules.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8488, eff 11-18-05; ss by #8959, eff 8-7-07

He-P 4030.07 Specific Licenses, Filing or Application. Application for specific licenses shall be filed in compliance with the following provisions:

(a) Applications for specific licenses shall be filed on a form prescribed by the DHHS/~~BRH-RHS~~ in He-P 4004;

(b) The DHHS/~~BRH-RHS~~ may at any time after the filing of the original application, and before the expiration of the license, require further statements in order to enable the DHHS/~~BRH-RHS~~ to determine whether the application should be granted or denied or whether a license should be modified or revoked;

(c) Each application shall be signed by the applicant or licensee or a person duly authorized by the applicant or the licensee to act for and on his behalf;

(d) An application for a license may include a request for a license authorizing one or more activities;

(e) In the application, the applicant may incorporate by reference, information contained in previous applications, statements, or reports filed with the DHHS/~~BRH-RHS~~, provided such references are clear and specific;

(f) Applications and documents submitted to the DHHS/~~BRH-RHS~~ may be made available for public inspection except that the DHHS/~~BRH-RHS~~ shall withhold any document or part thereof from public inspection if disclosure of its content is not required in the public interest and would adversely affect the interest of a person concerned;

(g) An application for a license to receive and possess radioactive material for commercial waste disposal by land burial or for the conduct of any other activity which the DHHS/~~BRH-RHS~~ determines will affect the quality of the environment shall be filed at least 9 months prior to commencement of construction of the plant or facility in which the activity will be conducted and shall be accompanied by an environmental report;

(h) Each application for a radioactive material license, other than a license exempted from He-P 4070 of this chapter, or an application for amendment of a license shall be accompanied by the fee prescribed in He-P 4070;

(i) An application for a specific license to authorize receipt, possession, or use of radioactive material in the form of a sealed source or in a device that contains a sealed source shall either:

- (1) Identify the sealed source or device that contains a sealed source by manufacturer and model number as ~~filed in an evaluation sheet in the U.S. Department of Health and Human Services "Radioactive Material Reference Manual" or inregistered with~~

the DPHS/RHS, the U.S. Nuclear Regulatory Commission "Registry of Radioactive Sealed Sources and Devices," 10 CFR 32.210, with an Agreement State, or for a source or a device containing radium-226 or accelerator-produced radioactive material with DPHS/RHS under provisions of He-P 4032.11; or

(2) Contain the information identified in He-P 4032.~~42~~11(b); or

(3) For sources or devices containing naturally occurring or accelerator-produced radioactive material manufactured prior to November 30, 2007 that are not registered with the DPHS/RHS, the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or with an Agreement State, and for which the applicant is unable to provide all categories of information specified in He-P 4032.11(b) or in 10 CFR 32.210(c), the applicant shall provide:

a. All available information identified in He-P 4032.11(b) or in 10 CFR 32.210(c) concerning the source, and, if applicable, the device; and

b. Sufficient additional information to demonstrate that there is reasonable assurance that the radiation safety properties of the source or device are adequate to protect health and minimize danger to life and property. Such information must include a description of radiation safety features, the intended use and associated operating experience, and the results of a recent leak test.

(j) As provided by He-P 4030.09(b), certain applications for specific licenses filed under He-P 4030, must contain a proposed decommissioning funding plan or a certification of financial assurance for decommissioning; and

(k) For applications to possess radioactive materials in unsealed form, on foils or plated sources, or sealed in glass in excess of the quantities in He-P 4030.08, Table 4030.1, the following requirements pertain:

(1) Each application shall contain either:

a. An evaluation showing that the maximum dose to a person offsite due to a release of radioactive materials would not exceed 1 rem effective dose equivalent or 5 rems to the thyroid; or

b. An emergency plan for responding to a release of radioactive material;

(2) The DHHS/~~BRH~~-RHS may use one or more of the following factors to support an evaluation submitted under He-P 4030.07(k)(1)a.:

a. The radioactive material is physically separated so that only a portion could be involved in an accident;

b. All or part of the radioactive material is not subject to release during an accident because of the way it is stored or packaged;

c. The release fraction in the respirable size range would be lower than the release fraction shown in Table 4030.1 due to the chemical or physical form of the material;

d. The solubility of the radioactive material would reduce the dose received;

- e. Facility design or engineered safety features in the facility would cause the release fraction to be lower than shown in Table 4030.1;
- f. Operating restrictions or procedures would prevent a release fraction as large as that shown in Table 4030.1; or
- g. Other factors appropriate for the specific facility;

(3) An emergency plan for responding to a release of radioactive material submitted under He-P 4030.06(k)(1)b. shall include the following information:

- a. A description of the licensee's facility and area near the site;
- b. An identification of each type of radioactive material accident for which protective actions may be needed;
- c. A classification system for classifying accidents as alerts or site area emergencies;
- d. Identification of the means of detecting each type of accident in a timely manner;
- e. A description of the means and equipment for mitigating the consequences of each type of accident, including those provided to protect workers onsite, and a description of the program for maintaining the equipment;
- f. A description of the methods and equipment to assess releases of radioactive materials;
- g. A description of the responsibilities of licensee personnel should an accident occur, including identification of personnel responsible for promptly notifying offsite response organizations and the DHHS/~~BRHRHS~~, and also responsibilities for developing, maintaining, and updating the plan;
- h. A commitment to and description of the means to promptly notify offsite response organizations and request offsite assistance, including medical assistance for the treatment of contaminated injured onsite workers;
- i. A commitment to establish a control point;
- j. A commitment to establish a notification and coordination plan such that the unavailability of some personnel, parts of the facility, and some equipment will not prevent the notification and coordination;
- k. Acknowledgment that the licensee shall also commit to notify the DHHS/~~BRH-RHS~~ immediately after notification of the appropriate offsite response organizations and not later than one hour after the licensee declares an emergency;
- l. A description of the types of information on facility status, radioactive releases, and recommended protective actions, if necessary, to be given to offsite response organizations and to the DHHS/~~BRHRHS~~;
- m. A description of the frequency, performance objectives, and plans for the training that the licensee will provide workers on how to respond to an emergency including any special instructions and orientation tours the licensee

would offer to fire, police, medical, and other emergency personnel, and documentation that the training shall:

1. Familiarize personnel with site-specific emergency procedures; and
 2. Thoroughly prepare site personnel for their responsibilities in the event of accident scenarios postulated as most probable for the specific site, including the use of team training for such scenarios;
- n. A description of the means of restoring the facility to a safe condition after an accident;
- o. Provisions for conducting quarterly communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies; and
- p. A certification that the applicant has met its responsibilities under the Emergency Planning and Community Right-to-Know Act of 1986, Title III, Pub. L. 99-499, if applicable to the applicant's activities at the proposed place of use of the radioactive material;
- (4) The exercises required by He-P 4030.06(k)(3)o. shall provide for:
- a. Quarterly communications checks with offsite response organizations which shall include the check and update of all necessary telephone numbers;
 - b. The invitation to offsite response organizations to participate in the biennial exercises;
 - c. Accident scenarios postulated as most probable for the specific site and which scenarios shall not be known to most exercise participants; and
 - d. Critiques of each exercise using individuals not having direct implementation responsibility for the plan and which shall evaluate the appropriateness of the plan, emergency procedures, facilities, equipment, training of personnel, and overall effectiveness of the response and which shall be corrected;
- (5) The licensee shall allow the offsite response organizations expected to respond in case of an accident 60 days to comment on the licensee's emergency plan before submitting it to DHHS/~~BRH~~RHS; and
- (6) The licensee shall provide any comments received within the 60 days to the DHHS/~~BRH~~RHS with the emergency plan.

(1) An application from a medical facility or educational institution to produce Positron Emission Tomography (PET) radioactive drugs for noncommercial transfer to licensees in its consortium authorized for medical use under He-P 4035 or equivalent Agreement State requirements shall include:

- (1) A request for authorization for production of PET radionuclides or evidence of an existing license issued under He-P 4030 or Agreement State requirements for a PET radionuclide production facility within its consortium from which it receives PET radionuclides;

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(2) Evidence that the applicant is qualified to produce radioactive drugs for medical use by meeting one of the criteria in He-P 4032.05(a)(2);

(3) Identification of individual(s) authorized to prepare the PET radioactive drugs if the applicant is a pharmacy, and documentation that each individual meets the requirements of an authorized nuclear pharmacist as specified in He-P 4032.05(b)(2); and

(4) Information identified in He-P 4032.05(a)(3) on the PET drugs to be noncommercially transferred to members of its consortium.

~~Source: (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800; INTERIM, eff 2-1-07, EXPIRED: 7-31-07~~

~~New: #8959, eff 8-7-07~~

He-P 4030.08 Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release. These quantities shall be as set forth in Table 4030.1 below:

Table 4030.1 Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release

Radioactive Material	Release Fraction	Quantity (curies)
Actinium-228	0.001	4,000
Americium-241	0.001	2
Americium-242	0.001	2
Americium-243	0.001	2
Antimony-124	0.01	4,000
Antimony-126	0.01	6,000
Barium-133	0.01	10,000
Barium-140	0.01	30,000
Bismuth-207	0.01	5,000
Bismuth-210	0.01	600
Cadmium-109	0.01	1,000
Cadmium-113	0.01	80
Calcium-45	0.01	20,000
Californium-252	0.001	9 (20 mg)
Carbon-14 (carbon dioxide)	0.01	50,000
(non-carbon dioxide)	0.01	50,000
Cerium-141	0.01	10,000
Cerium- 144	0.01	300
Cesium-134	0.01	2,000
Cesium-137	0.01	3,000
Chlorine-36	0.5	100
Chromium-51	0.01	300,000
Cobalt-60	0.001	5,000
Copper-64	0.01	200,000
Curium-242	0.001	60
Curium-243	0.001	3

Radioactive Material	Release Fraction	Quantity (curies)
Curium-244	0.001	4
Curium-245	0.001	2
Europium-152	0.01	500
Europium-154	0.01	400
Europium-155	0.01	3,000
Germanium-68	0.01	2,000
Gadolinium-153	0.01	5,000
Gold-198	0.01	30,000
Hafnium-172	0.01	400
Hafnium-181	0.01	7,000
Holmium-166m	0.01	100
Hydrogen-3	0.5	20,000
Iodine-125	0.5	10
Iodine-131	0.5	10
Indium-114m	0.01	1,000
Indium-192	0.001	40,000
Iron-55	0.01	40,000
Iron-59	0.01	7,000
Krypton-85	1.0	6,000,000
Lead-210	0.01	8
Manganese-58	0.01	60,000
Mercury-203	0.01	10,000
Molybdenum-99	0.01	30,000
Neptunium-237	0.001	2
Nickel-63	0.01	20,000
Niobium-94	0.01	00300
Phosphorus-32	0.5	100
Phosphorous-33	0.5	1,000
Polonium-210	0.01	10
Potassium-42	0.01	9,000
Promethium-145	0.01	4,000
Promethium-147	0.01	4,000
<u>Radium-226</u>	<u>0.001</u>	<u>100</u>
Ruthenium-106	0.01	200
Samarium-151	0.01	4,000
Scandium-46	0.01	3,000
Selenium-75	0.01	10,000
Silver-110m	0.01	1,000
Sodium-22	0.01	9,000
Sodium-24	0.01	10,000
Strontium-89	0.01	3,000
Strontium-90	0.01	90
Sulfur-35	0.5	900
Technetium-99	0.01	10,000
Technetium-99m	0.01	400,000
Tellurium-127m	0.01	5,000
Tellurium-129m	0.01	5,000
Terbium-160	0.01	4,000
Thulium-170	0.01	4,000

Radioactive Material	Release Fraction	Quantity (curies)
Tin-113	0.01	10,000
Tin-123	0.01	3,000
Tin-126	0.01	1,000
Titanium-44	0.01	100
Vanadium-48	0.01	7,000
Xenon-133	1.0	900,000
Yttrium-91	0.01	2,000
Zinc-65	0.01	5,000
Zirconium-93	0.01	400
Zirconium-95	0.01	5,000
Any other beta-gamma emitter	0.01	10,000
Mixed fission products	0.0	1,000
Mixed corrosion products	0.01	10,000
Contaminated equipment beta-gamma	0.001	10,000
Irradiated material, any form other than solid noncombustible	0.01	1,000
Irradiated material, solid non-combustible	0.001	10,000
Mixed radioactive waste, beta-Gamma	0.01	1,000
Packaged mixed waste, beta-gamma ¹	0.001	10,000
Any other alpha emitter	0.001	2
Contaminated equipment alpha	0.0001	20
Packaged waste, alpha ¹	0.0001	20
Combinations of radioactive materials listed above ²	-	-

¹Waste packaged in Type B containers does not require an emergency plan.

²For combinations of radioactive materials, consideration of the need for an emergency plan is required if the sum of the ratios of the quantity of each radioactive material authorized to the quantity listed for that material in Schedule C exceeds one.

~~Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07~~

~~New. #8959, eff 8-7-07~~

He-P 4030.09 Specific Licenses, Requirements for Issuance.

(a) A license application shall be approved if the DHHS/~~BRH-RHS~~ determines that:

- (1) The applicant is qualified by reason of training and experience to use the material in question for the purpose requested in accordance with these rules in such a manner as to minimize danger to public health and safety or property; and
- (2) The applicant's proposed equipment, facilities, and procedures are adequate to minimize danger to public health and safety or property; and

- (3) The issuance of the license will not be inimical to the health and safety of the public;
- (4) The applicant satisfies any applicable special requirements in He-P 4031 through He-P 4035 and He-P 4039; and
- (5) In the case of an application for a license to receive and possess radioactive material for commercial waste disposal by land burial, the applicant satisfies any applicable special requirements in He-P 4060 through He-P 4064.

(b) In the case of an application for a license to receive and possess radioactive material for the conduct of any activity which the DHHS/~~BRH-RHS~~ determines will significantly affect the quality of the environment, a license application for the facility in which the activity will be conducted shall be reviewed and approved by the DHHS/~~BRH-RHS~~ before any clearing of land, excavation, or other substantial action that would adversely affect the environment of a site other than site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring or testing to establish background information related to the suitability of the site or the protection of environmental values.

(c) Issuance of a license authorizing the activities of He-P 4030.09(b) shall be based upon a consideration by the DHHS/~~BRH-RHS~~ of the environmental, economic, technical, and other benefits in comparison with the environmental costs available alternatives and a determination that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values.

(d) ~~Violation of Commencement of construction in violation of~~ He-P 4030.09(b) prior to review and approval by the DHHS/~~BRH-RHS~~ shall be grounds for denial of a license to receive and possess ~~radioactive byproduct~~ material in such plant or facility. Commencement of construction as defined in He-P 4003.01 may include non-construction activities if the activity has a reasonable nexus to radiological safety and security.

(e) Each applicant for a specific license authorizing the possession and use of special nuclear material, source material, or ~~radioactive unsealed byproduct~~ material in quantities and amounts in excess of those indicated in Table 4030.2 below shall submit a decommissioning funding plan.

Table 4030.2 Quantities and Amounts Requiring Decommissioning Funding Plan

Type of Material	Exceeding
Special Nuclear Material	105 times He-P 4091
Source Material	100 mCi in readily dispersible form
Radioactive Byproduct Material (Unsealed)	Half-life greater than 120 days and in quantities exceeding 10^5 times the applicable quantities set forth in He-P 4091

(f) The decommissioning funding plan shall be submitted when a combination of isotopes is involved if R divided by 10^5 is greater than 1, where R is the sum of the ratios of quantity of each isotope to the applicable value in He-P 4091.

(g) Each applicant for or holder of a specific license authorizing possession and use of special nuclear material, source material, or radioactive material in excess of the values indicated in Table 4030.3 shall:

(1) Submit to DHHS/~~BRH-RHS~~ a decommissioning funding plan as described in He-P 4030.09(i); or

(2) Submit to DHHS/~~BRH-RHS~~ a certification that financial assurance for decommissioning shall be provided in the amount prescribed by Table 4030.3 below using one of the methods described in He-P 4030.09(j); and

(3) Submit to DHHS/~~BRH-RHS~~ as a part of the certification, a copy of the financial instrument obtained to satisfy the requirement of He-P 4030.09(j); and

(4) If, in surveys made under He-P 4022.01(a), residual radioactivity in the facility and environment, including the subsurface, is detected at levels that would, if left uncorrected, prevent the site from meeting the He-P 4024.09(a) criteria for unrestricted use, the licensee shall submit a decommissioning funding plan within one year of when the survey is completed.

Table 4030.3 Financial Assurance Amounts for Decommissioning

Type of Radioactive Material	Exceeding	Assurance Amount
Special Nuclear Material	Greater than 10^4 but less than or equal to 10^5 times the applicable quantities as indicated in He-P 4091. For a combination of isotopes, if R, as defined in He-P 4030.09(f) divided by 10^3 is greater than 1 but R divided by 10^4 is less than or equal to 1.	\$750,000 <u>1,125,000</u>
	Greater than 10^3 but less than or equal to 10^4 times the applicable quantities as indicated in He-P 4091. For a combination of isotopes, if R, as defined in He-P 4030.09(f) divided by 10^4 is greater than 1 but R divided by 10^5 is less than or equal to 1.	\$150,000 <u>225,000</u>
Source Material	Greater than 10 mCi but less than or equal to 100 mCi in a readily dispersible form. For a combination of isotopes, if R, as defined in He-P 4030.09(f) divided by 10^3 is greater than 1 but R divided by 10^4 is less than or equal to 1.	\$150,000 <u>113,000</u>
Radioactive <u>Byproduct</u> Material	Half-life greater than 120 days and in quantities:	
	Greater than 10^4 but less than or equal to 10^5 times applicable quantities in unsealed form as indicated in He-P 4091. For a combination of isotopes, if R, as defined in He-P 4030.09(f) divided by 10^4 is greater than 1 but R divided by 10^5 is less than or equal to 1.	\$750,000 <u>1,125,000</u>

Type of Radioactive Material	Exceeding	Assurance Amount
	Greater than 10^3 but less than or equal to 10^4 times the applicable quantities in unsealed form as indicated in He-P 4091. For a combination of isotopes, or if R, as defined in He-P 4030.09(f) divided by 10^4 is greater than 1 but R divided by 10^5 is less than or equal to 1.	\$150,000 <u>225,000</u>
	Greater than 10^{10} times the applicable quantities in sealed sources or plated sources. For a combination of isotopes, if R, as defined in He-P 4030.09(f) divided by 10^{10} is greater than 1.	\$75,000 <u>113,000</u>

(h) Certification may state that the appropriate assurance shall be obtained after the application has been approved and the license issued but prior to the receipt of licensed material.

(i) ~~(1)~~ Each decommissioning funding plan shall be submitted for review and approval and shall contain a detailed cost estimate for decommissioning, and a description of the method of assuring funds for such including means of adjusting cost estimates and associated funding levels over the life of the facility.

(a) A detailed cost estimate for decommissioning, in an amount reflecting:

1. The cost of an independent contractor to perform all decommissioning activities;

2. The cost of meeting the He-P 4024.09 criteria for unrestricted use, provided that, if the applicant or licensee can demonstrate its ability to meet the provisions of He-P 4024.10, the cost estimate may be based on meeting the He-P 4024.10 criteria;

3. The volume of onsite subsurface material containing residual radioactivity that will require remediation to meet the criteria for license termination; and

4. An adequate contingency factor.

(b) Identification of and justification for using the key assumptions contained in the Decommissioning Cost Estimate;

(c) A description of the method of assuring funds for decommissioning from He-P 4030(j) of this section, including means for adjusting cost estimates and associated funding levels periodically over the life of the facility;

(d) A certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning; and

(e) A signed original of the financial instrument obtained to satisfy the requirements of He-P 4030(i) of this section (unless a previously submitted and accepted financial instrument continues to cover the cost estimate for decommissioning).

(2) At the time of license renewal and at intervals not to exceed 3 years, the decommissioning funding plan must be resubmitted with adjustments as necessary to account for changes in costs and the extent of contamination. If the amount of financial assurance will be adjusted downward, this can not be done until the updated decommissioning funding plan is approved. The decommissioning funding plan must update the information submitted with the original or prior approved plan, and must specifically consider the effect of the following events on decommissioning costs:

(a) Spills of radioactive material producing additional residual radioactivity in onsite subsurface material;

(b) Waste inventory increasing above the amount previously estimated;

(c) Waste disposal costs increasing above the amount previously estimated;

(d) Facility modifications;

(e) Changes in authorized possession limits;

(f) Actual remediation costs that exceed the previous cost estimate;

(g) Onsite disposal; and

(h) Use of a settling pond.

(j) The financial instrument shall include the licensee's name, license number, and the name, address, and other contact information of the issuer, and, if a trust is used, the trustee. When any of the foregoing information changes, the licensee shall, within 30 days, submit financial instruments reflecting such changes. The financial instrument shall be a signed original or signed original duplicate, except where a copy of the signed original is specifically permitted.

Financial assurance for decommissioning shall be provided by any one or more of the following methods:

(1) Prepayment;

(2) A surety method or insurance;

(3) An external sinking fund;

(4) Any other funding methods which shall be demonstrated by the applicant or licensee to provide comparable assurance to methods listed in He-P 4030.09(g)(1) through (3); and

(5) In the case of state, or local government licensees, a statement of intent containing a cost estimate for decommissioning or an amount based on Table 4030.3, and indicating that funds for decommissioning shall be obtained when necessary.

(k) The prepayment method in (j)(1) above shall be:

(1) In the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities;

(2) Deposited prior to the start of operation into an account segregated from licensee assets and outside the licensee's administrative control of cash or liquid assets that will retain their value over the projected operating life of the facility; and

(3) In an amount such that the principal plus accumulated earnings shall be sufficient to pay the necessary costs.

(l) The surety method or insurance in (j)(2) above shall be in the form of a surety bond, letter of credit, line of credit, secured interest or other guarantee method such that the costs shall be paid should the licensee default.

(m) Any surety or insurance under He-P 4030.09(l) shall contain the following conditions:

(1) The surety or insurance shall be open-ended or, if written for a specified term, such as 5 years, shall be renewed automatically unless 90 days or more prior to the renewal date, the issuer notifies the DHHS/~~BRH-RHS~~, the trust account, and the licensee of its intention not to renew;

(2) The surety or insurance shall provide that the beneficiary may automatically collect prior to the expiration without proof of forfeiture if the licensee fails to provide a replacement acceptable to the DHHS/~~BRH-RHS~~ within 30 days after receipt of notification of cancellation;

(3) The beneficiary of the surety or insurance shall be a trust account and trustee such as a state or federal government agency or entity which has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency; and

(4) The surety or insurance shall remain in effect until the DHHS/~~BRH-RHS~~ has terminated the license.

(n) An external sinking fund in (j)(3) shall be:

(1) In the form of a trust, escrow account, government fund, certificate of deposit or deposit of government securities;

(2) Established and maintained by the periodic deposit of a prescribed amount into an account segregated from licensee assets and outside the licensee's administrative control;

(3) In a total amount for which the periodic deposits plus accumulated earnings shall be sufficient to pay the necessary costs at the time termination of operation is expected;

(4) Deposited to at least annually; and

(5) Coupled with a surety method or insurance, the value of which may decrease by the amount being accumulated in the sinking fund.

(o) Each person licensed under He-P 4030 shall keep records of information important to the safe and effective decommissioning of the facility in a specific location reserved for this purpose until the site is released for unrestricted use and the license terminated by the DHHS/~~BRHRHS~~.

(p) If records of relevant information are kept for other purposes, reference to these records and their locations shall be allowed to be kept with the records for decommissioning.

(q) Records important to decommissioning shall consist of:

(1) Recordings of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or ~~site which site, which~~ may be limited to instances:

- a. When contamination remains after any cleanup procedures; or
- b. When there is reasonable likelihood that contaminants may have spread to inaccessible areas such as seepage into porous materials such as concrete;

(2) Information on identification of involved radionuclides, quantities, chemical and physical forms, and concentrations, if known;

(3) As-built drawings and modifications of structures and equipment in restricted areas where ~~radioactive-byproduct~~ materials are used or stored, and of locations of possible inaccessible contamination such as buried pipes, but if drawings are not available, the licensee shall substitute appropriate records of available information concerning these areas and locations;

(4) Except for areas containing only sealed sources, provided the sealed sources have not leaked or no contamination remains after any leak, or ~~radioactive-byproduct~~ material having only half lives of less than 65 days, a list contained in a single document and updated every 2 years, of the following:

- a. All areas designated and formerly designated restricted areas as defined in He-P 4003;
- b. All areas outside of restricted areas that require documentation under He-P 4030.09(q);
- c. All areas outside of restricted areas where current and previous wastes have been buried as documented under He-P 4021.09; and
- d. All areas outside of restricted areas that contain material such that, if the license expired, the licensee would be required to either decontaminate the area to meet the criteria for decommissioning in He-P 4024, or apply for approval for disposal under He-P 4023.02; and

(5) Recordings of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and recordings of the funding method used for assuring funds if either a funding plan or certification is used.

(r) Before licensed activities are transferred or assigned in accordance with He-P 4030.15, licensees shall transfer all records required by He-P 4030.09(o) to the new licensee, and the new licensee shall be responsible for maintaining these records until the license is terminated.

(s) No license issued or granted pursuant to the regulations in He-P 4030.09, He-P 4031 through He-P 4036, and He-P 4039 of this regulation shall be subject to all the provisions of the Title X Public Health Chapter 125-F, as amended, now or hereafter in effect, and to all valid rules, regulations and orders of the Agency.

(1) No license issued or granted pursuant to the regulations in He-P 4030.09, He-P 4031 through He-P 4036, and He-P 4039 of this regulation nor any right under a license shall be transferred, assigned or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person, unless the Agency shall, after securing full information, find that the transfer is in accordance with the provisions of the Title X Public Health Chapter 125-F and shall give its consent in writing.

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(2) An application for transfer of license must include:

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a. The identity, technical and financial qualifications of the proposed transferee; and

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b. Financial assurance for decommissioning information required by He-P 4030.09.

(t) In providing financial assurance under He-P 4030.09, each licensee shall use the financial assurance funds only for decommissioning activities and each licensee shall monitor the balance of funds held to account for market variations. The licensee shall replenish the funds, and report such actions to the DHHS/RHS, as follows:

(1) If, at the end of a calendar quarter, the fund balance is below the amount necessary to cover the cost of decommissioning, the licensee shall increase the balance to cover the cost, and shall do so within 30 days after the end of the calendar quarter.

(2) If, at any time, the fund balance falls below 75 percent of the amount necessary to cover the cost of decommissioning, the licensee shall increase the balance to cover the cost, and shall do so within 30 days of the occurrence.

(3) Within 30 days of taking the actions required by He-P 4030.09(t)(1) or (t)(2), the licensee shall provide a written report of such actions to the DHHS/RHS, and state the new balance of the fund.

Source.—(See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; amd by #8488, eff 11-18-05; amd by #8800, INTERIM, eff 2-1-07; EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.10 Specific Licenses, Issuance.

(a) Upon a determination that an application meets the requirements of the act and the rules of the DHHS/~~BRHRHS~~, the DHHS/~~BRH-RHS~~ shall issue a specific license authorizing the proposed activity.

(b) The DHHS/~~BRH-RHS~~ shall incorporate in any license issued pursuant to this part and He-P 4031 through 4036, and He-P 4039, at the time of issuance or thereafter, by appropriate rule or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use, and transfer of radioactive material as it deems appropriate or necessary in order to:

- (1) Minimize danger to public health and safety or property;
- (2) Require such reports and the keeping of such records, and to provide for such inspections of activities under the license as may be appropriate or necessary; ~~and~~
- (3) Prevent loss or theft of material subject to this part; ~~and~~

(4) Security requirements for portable gauges.

(a) Each portable gauge licensee shall use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal, whenever portable gauges are not under the control and constant surveillance of the licensee.

(c) Specific licenses shall be issued to named persons upon applications filed pursuant to He-P 4030 and He-P 4004.

(d) Each license issued pursuant to this part and parts He-P 4031 through 4036, and He-P 4039, shall be subject to all the provisions of the act, to all rules of the DHHS/~~BRHRHS~~, and orders of the commissioner of the department of health and human services.

(e) Neither the license nor any right under the license issued or granted pursuant this part and parts He-P 4031 through 4036, and He-P 4039, shall be assigned or otherwise transferred in violation of the provision of the act.

(f) Each person licensed by the DHHS/~~BRH-RHS~~ pursuant to this part shall confine his use and possession of the material licensed to conditions specified on the license, such as:

- (1) Standard licensing conditions as set forth in these rules, or
- (2) Conditions formulated specifically for an individual license.

(g) Each licensee shall notify the DHHS/~~BRH-RHS~~ in writing when the licensee decides to permanently discontinue all activities involving materials authorized under the license.

(h) Each general licensee that is required to register by He-P 4031, and each specific licensee, shall notify the DHHS/~~BRH-RHS~~ in writing immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapter of Title 11 of the United States Code by or against:

- (1) The licensee;
- (2) An entity as that term is defined in 11 U.S.C. 101(14) controlling the licensee or listing the license or licensee as property of the estate; or

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(3) An affiliate as that term is defined in 11 U.S.C. 101(2) of the licensee.

(i) The notification specified in He-P 4030.10(h) shall indicate the bankruptcy court in which the petition for bankruptcy was filed and the date of the filing of the petition.

(j) Each licensee shall notify the DHHS/~~BRH~~ RHS of radiological incidents and events, as follows:

(1) As soon as possible but not later than 4 hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed the limits specified in He-P 4020, or releases of licensed material that could exceed the limits specified in He-P 4020; and

(2) Within 24 hours after the discovery of any of the following events involving licensed material:

a. An unplanned contamination event that:

1. Requires access to the contaminated area, by workers or the public, to be restricted for more than 24 hours by imposing additional radiological controls or by prohibiting entry into the area;

2. Involves a quantity of radioactive material greater than 5 times the lowest annual limit on intake specified in He-P 4090 for the material; and

3. Requires access to the area restricted for a reason other than to allow isotopes with a half-life of less than 24 hours to decay prior to decontamination;

b. An event in which equipment is disabled or fails to function as designed when:

1. The equipment is required by the rules or license condition to prevent releases exceeding regulatory limits, to prevent exposures to radiation and radioactive materials exceeding the limits specified by He-P 4020, or to mitigate the consequences of an accident;

2. The equipment is required to be available and operable when it is disabled or fails to function; and

3. No redundant equipment is available and operable to perform the required safety function;

c. An event that requires unplanned medical treatment at a medical facility of an individual with spreadable radioactive contamination on the individual's clothing or body; and

d. An unplanned fire or explosion damaging any licensed material or any device, container, or equipment containing licensed material when:

1. The quantity of radioactive material involved is greater than 5 times the lowest annual limit on intake specified in for the material; and

2. The damage affects the integrity of the licensed material or its container.

(k) Licensees shall make reports required by He-P 4030.10(j)(1) and (2) by telephone to the DHHS/~~BRH~~ RHS via the New Hampshire state police communications center at 603 271-3636.

(l) To the extent that the information is available at the time of notification, the information provided in the telephonic report pursuant to (k) above shall include:

- (1) The caller's name and call back telephone number;
- (2) A description of the event, including date and time;
- (3) The exact location of the event;
- (4) The isotopes, quantities, and chemical and physical form of the licensed material involved; and
- (5) Any personnel radiation exposure data available.

(m) Each licensee who makes a report required by He-P 4030.10(j)(1) and (2) shall submit a written follow-up report within 30 days of the initial report, which includes the following information:

- (1) A description of the event, including the probable cause and the manufacturer and model number (if applicable) of any equipment that failed or malfunctioned;
- (2) The exact location of the event;
- (3) The isotopes, quantities, and chemical and physical form of the licensed material involved;
- (4) Date and time of the event;
- (5) Corrective actions taken or planned and the results of any evaluations or assessments; and
- (6) The extent of exposure of individuals to radiation or to radioactive materials without identification of individuals by name.

(n) Relative to records, each person who receives radioactive material pursuant to a license issued pursuant He-P 4030 through He-P 4039 shall:

- (1) Keep records showing the receipt, transfer, and disposal of the radioactive material, as follows:
 - a. The licensee shall retain each record of receipt of radioactive material as long as the material is possessed and for 3 years following transfer or disposal of the material;
 - b. The licensee who transferred the radioactive material shall retain each record of transfer for 3 years after each transfer unless otherwise specified in this chapter; and

- c. The licensee who disposed of the material shall retain each record of disposal of radioactive material until the license that authorizes disposal of the material is terminated;
- (2) Retain each record that is required by this chapter or by license condition for the period specified by the applicable rule or license condition, except that if a retention period is not otherwise specified by rule or license condition, the record shall be retained until the license authorizing the activity that is subject to the recordkeeping requirement is terminated;
- (3) Retain records required to be maintained pursuant to this chapter in the following format:
- a. The original;
 - b. A reproduced copy, if such reproduced copy is duly authenticated by authorized personnel;
 - c. Microform, if such microform is duly authenticated by authorized personnel and is capable of producing a clear and legible copy after storage for the period specified by the rules; or
 - d. Stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period;
- (4) Ensure that all pertinent information, including stamps, initials, and signatures, are included on all required records, including letters, drawings, specifications;
- (5) Maintain adequate safeguards against tampering with and loss of records;
- (6) Prior to termination of a license authorizing possession of radioactive material with a half-life greater than 120 days, in an unsealed form, forward the following records to the DHHS/~~BRHRHS~~:
- a. Records of disposal of licensed material made under He-P 4023; and
 - b. Records required by He-P 4021.03(c)(4);
- (7) At the time of transfer of a radioactive material license authorizing possession of radioactive material with a half-life of greater than 120 days, in an unsealed form, transferred or assigned in accordance with He-P 4030.15 to a new licensee, transfer the following records to the new licensee and the new licensee will be responsible for maintaining these records until the license is terminated, the following:
- a. Records of disposal of licensed material made under He-P 4023; and
 - b. Records required by He-P 4021.03(c)(4); and
- (8) Prior to license termination, forward the records required by He-P 4030.09(o) – ~~(#)~~.
- (o) Each licensee preparing technetium-99m radiopharmaceuticals from molybdenum-99/technetium-99m generators or rubidium-82 from strontium-82/rubidium-82 generators shall test the generator eluates for molybdenum-99 breakthrough or strontium-82 and strontium-85

contamination, respectively, in accordance with He-P 4035.32. The licensee shall record the results of each test and retain each record for 3 years after the record is made.

(p)(1) Authorization under He-P 4030.10(p) to produce Positron Emission Tomography (PET) radioactive drugs for noncommercial transfer to medical use licensees in its consortium does not relieve the licensee from complying with applicable DPHS/RHS, agreement State, FDA, and other Federal requirements governing radioactive drugs;

(2) Each licensee authorized under He-P 4030.10(p) to produce PET radioactive drugs for noncommercial transfer to medical use licensees in its consortium shall:

a. Satisfy the labeling requirements in He-P 4032.05(a)(4) for each PET radioactive drug transport radiation shield and each syringe, vial, or other container used to hold a PET radioactive drug intended for noncommercial distribution to members of its consortium;

b. Possess and use instrumentation to measure the radioactivity of the PET radioactive drugs intended for noncommercial distribution to members of its consortium and meet the procedural, radioactivity measurement, instrument test, instrument check, and instrument adjustment requirements in He-P 4032.05(d).

(3) A licensee that is a pharmacy authorized under He-P 4030.07(l) to produce PET radioactive drugs for noncommercial transfer to medical use licensees in its consortium shall require that any individual that prepares PET radioactive drugs shall be:

a. An authorized nuclear pharmacist that meets the requirements in He-P 4032.05(b)(2), or

b. An individual under the supervision of an authorized nuclear pharmacist as specified in He-P 4035.11.

(4) A pharmacy, authorized under He-P 4030.07(l) to produce PET radioactive drugs for noncommercial transfer to medical use licensees in its consortium that allows an individual to work as an authorized nuclear pharmacist, shall meet the requirements of He-P 4032.05(b)(4).

~~Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8488, eff 11-18-05; ss by #8959, eff 8-7-07~~

He-P 4030.11 Specific Licenses, Expiration.

(a) Except as provided in He-P 4030.12, each specific license shall expire at the end of one year.

(b) Each licensee shall notify the DHHS/~~BRHRHS~~, in writing, and request termination of the license when the licensee decides to terminate all activities involving radioactive material authorized under the license. This notification and request for termination of the license shall include the reports and information specified in He-P 4030.11(d)(4) and (5).

(c) No less than 30 days before the expiration date specified in the license, the licensee shall either:

- (1) Submit an application for license renewal under He-P 4030.12; or
- (2) Notify the DHHS/~~BRHRHS~~, in writing, if the licensee decides not to renew the license.

(d) If a licensee does not submit an application for license renewal under He-P 4030.11, the licensee shall, on or before the expiration date specified in the license:

- (1) Terminate use of radioactive material;
- (2) Remove radioactive contamination in accordance with He-P 4023;
- (3) Dispose of radioactive material in accordance with He-P 4023;
- (4) Submit a completed DHHS/~~BRHRHS~~ Form ~~BRHRHS~~-10; and
- (5) Submit a radiation survey report of the licensed permanent location(s) of use and storage to confirm that the removable and fixed contamination levels are in accordance with levels specified in He-P 4021.21, as follows:
 - a. Report levels of radiation in units of microrads per hour of beta and gamma radiation at 1 centimeter and gamma radiation at 1 meter from surfaces;
 - b. Report levels of radioactivity, including alpha, in:
 1. Units of transformations per minute per 100 square centimeters or microcuries per 100 square centimeters removable and fixed on surfaces;
 2. Microcuries per milliliter in water; and
 3. Picocuries per gram in contaminated solids such as soils or concrete; and
 - c. Specify the survey or measurement instrument(s) used for conducting the survey and certify that each instrument was properly calibrated and tested.

(e) If no residual radioactive contamination attributable to activities conducted under the license is detected, the licensee shall submit a certification that no detectable radioactive contamination of the location(s) was found.

(f) If detectable levels of residual radioactive contamination attributable to activities conducted under the license are found, the license shall continue to be in effect beyond the expiration date, with respect to possession of residual radioactive material present as contamination until such time as the DHHS/~~BRH-RHS~~ notifies the licensee in writing that the license is terminated. During this time the licensee shall be subject to the provisions of He-P 4030.11(h).

(g) If detectable levels of residual radioactive contamination attributable to activities conducted under the license are found, the licensee shall submit a plan for decontamination of the residual radioactive contamination which shall include in addition to the information submitted under He-P 4030.11(d)(4) and (5), any expected levels of residual radioactive contamination which will remain at the time the license is terminated.

(h) Each licensee who possesses residual radioactive material under He-P 4030.11(d)(3), following the expiration date specified in the license, shall:

- (1) Limit actions involving radioactive material to those related to decontamination and other activities related to preparation for release for unrestricted use; and
- (2) Continue to control entry to restricted areas until the licensee has met the provisions of He-P 4020 for release for unrestricted use and the DHHS/~~BRH-RHS~~ has notified the licensee in writing that the license is terminated.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.12 Specific Licenses, Renewal.

(a) Applications for renewal of specific licenses shall be filed in accordance with He-P 4030.07.

(b) In any case in which a licensee, not less than 30 days prior to expiration of his existing license, has filed an application in proper form for renewal or for a new license authorizing the same activities, such existing license shall not expire until the application has been finally determined by the DHHS/~~BRH-RHS~~.

(c) If a licensee does not submit an application for license renewal, the licensee shall comply with the provisions of He P 4030.10.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.13 Specific Licenses, Amendment at Request of Licensee. Applications for amendment of a license shall:

(a) Be filed in accordance with He-P 4030.07; and

(b) Specify the respects in which the licensee desires its license to be amended and the grounds for such amendment.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.14 Specific Licenses, DHHS/~~BRH-RHS~~ Action of Applications to Renew or Amend. In considering an application by a licensee to renew or amend its license, the DHHS/~~BRH-RHS~~ shall apply the criteria set forth in this chapter for granting of an initial license.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.15 Specific Licenses, Inalienability. No license issued or granted under this part and no right to possess or utilize radioactive material granted by any license issued pursuant to this part shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person unless the DHHS/~~BRHRHS~~, after securing full information, find that the transfer is in accordance with the provisions of the act, and gives its consent in writing. An application for transfer of license shall include:

(a) The identity, technical and financial qualifications of the proposed transferee; and

(b) Financial assurance for decommissioning information required by He-P 4024.09, He-P 4024.10, and He-P 4030.09.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.16 Specific Licenses, Transfer of Material.

(a) No licensee shall transfer radioactive material except as authorized pursuant to Part He-P 4030.

(b) Except as otherwise provided in its license and subject to the provisions of He-P 4030.16(c) and (d), any licensee may transfer radioactive material:

(1) To the DHHS/~~BRH-RHS~~ only after receiving prior approval from the DHHS/~~BRHRHS~~;

(2) To the U.S. Nuclear Regulatory Commission;

(3) To any person exempt from He-P 4000 to the extent permitted under such exemption;

(4) To any person authorized to receive such material under terms of a general license or its equivalent or a specific license or equivalent licensing document, issued by the DHHS/~~BRHRHS~~, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State, or to any person otherwise authorized to receive such material by the Federal government of any agency thereof, the DHHS/~~BRHRHS~~, an Agreement State, or a Licensing State; or

(5) As otherwise authorized by the DHHS/~~BRH-RHS~~ in writing.

(c) Before transferring radioactive material to a specific licensee of the DHHS/~~BRHRHS~~, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State prior to receipt of the radioactive material shall verify that the transferee's license authorizes the receipt of the type, form, and quantity of radioactive material to be transferred.

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(d) The following methods for the verification required by He-P 4030.16(c) shall be acceptable:

(1) The transferor may have in its possession, and have read, a current copy of the transferee's specific license or registration certificate;

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

(3) For emergency shipments the transferor may accept oral certification by the transferee that it is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date, provided, that the oral certification is confirmed in writing within 10 days;

(4) The transferor may obtain other sources of information compiled by a reporting service from official records of the DHHS/~~BRHRHS~~, the U.S. Nuclear Regulatory Commission, or the licensing agency of an Agreement State or a Licensing State as to the identity of licensees and the scope and expiration dates of licenses and registration; or

(5) When none of the methods of verification described in He-P 4030.16(d)(1) to (4) are readily available or when a transferor desires to verify that information received by one of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the DHHS/~~BRHRHS~~, the U.S. Nuclear Regulatory Commission, or the licensing agency of an Agreement State or a Licensing State that the transferee is licensed to receive the radioactive material.

(e) Preparation for shipment and transport of radioactive material shall be in accordance with the provisions of He-P 4037.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.17 Specific Licenses, Modification, Revocation, and Termination.

(a) The terms and conditions of all licenses shall be subject to amendment, revision, or modification or the license may be suspended or revoked by reason of amendments to the act, or by reason of rules, and orders issued by the DHHS/~~BRHRHS~~.

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

(c) Except in cases of willfulness or those in which the public health, interest, or safety requires otherwise, no license shall be modified, suspended, or revoked unless, prior to the

institution of proceedings ~~therefor~~therefore, facts or conduct which may warrant such action shall have been called to the attention of the licensee in writing and the licensee shall have been accorded an opportunity to demonstrate or achieve compliance with all lawful requirements.

(d) The DHHS/~~BRH-RHS~~ shall terminate a specific license upon request submitted by the licensee to the DHHS/~~BRH-RHS~~ in writing, provided that the licensee shall meet the requirements of He-P 4030.16.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #8800, INTERIM, eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

He-P 4030.18 Reciprocal Recognition of Specific Licenses.

(a) Subject to He-P 4000, any person who holds a specific license from the NRC, an Agreement State, or a Licensing State, as defined in He-P 4003.01(i) and (ch), respectively, and issued by the agency having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, shall hereby be granted a general license to conduct the activities authorized in such licensing document within this state, except in areas of exclusive federal jurisdiction, for a period not in excess of 180 days in any calendar year, provided that:

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

(2) The out-of-state licensee notifies DHHS/~~BRH-RHS~~ in writing at least 3 working days prior to engaging in such activity and receives DHHS/~~BRH-RHS~~ approval.

(b) The DHHS/~~BRH-RHS~~ shall grant the approval required by (a)(2) above when a general licensee meets all of the requirements under He-P 4030.18.

(c) The notification required by (a)(2) above shall indicate the location, period, and type of proposed possession and use within this state.

(d) The notification shall be accompanied by a copy of the pertinent licensing document, a copy of the licensee's operating and emergency procedures, an annual fee as specified in He-P 4070, and a completed Form ~~BRH-RHS~~-15 containing the following:

(1) Name of licensee;

(2) Address of licensee;

(3) Contact person;

(4) Telephone number;

(5) Name of person(s) who will conduct licensed activities;

(6) Description of activities to be conducted in New Hampshire under the general license;

(7) Location at which activities will be conducted;

(8) Date and time on which activities will be conducted;

(9) A list of sealed sources and devices containing sealed sources, which will be possessed, used, installed, serviced or tested in New Hampshire;

(10) Number of specific license and name of agency issuing license; and

(11) The licensee's dated signature certifying that they have read the provisions under He-P 4030.18.

(e) If, for a specific case, the 3-day period required by (a)(2) above would endanger the public's health and safety, the licensee may, upon application to DHHS/~~BRH~~RHS, obtain permission to proceed sooner.

(f) The out-of-state licensee shall submit in its initial request for reciprocity the applicable New Hampshire annual license fee in accordance with He-P 4070, Table 4070.1, Annual Fees for Radioactive Material Licenses.

(g) The reciprocity fee required by (f) above shall cover a period of one year from the time of application, at which time a new fee submittal shall be required.

(h) The requirement in (f) above shall not waive the requirement for filing additional written notifications during the remainder of the calendar year following the receipt of the initial notification from a person engaging in activities under the general license provided in He-P 4030.18(a).

(i) The out-of-state licensee shall comply with all:

(1) Applicable rules of DHHS/~~BRH~~RHS; and

(2) Terms and conditions of the licensee's licensing document, except any such terms and conditions which are contrary to applicable rules of DHHS/~~BRH~~RHS.

(j) The out-of-state licensee shall supply additional information, either telephonically or in writing, as requested by DHHS/~~BRH~~RHS for the purposes of protecting public and worker health and safety and ensuring the safe use of radioactive sources within the state.

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

(1) Specifically licensed by DHHS/~~BRH~~RHS or by the U.S. Nuclear Regulatory Commission to receive such material; or

(2) Exempt from the requirements for a license for such material under He-P 4030.03.

(l) Before radioactive materials are used at a temporary job site within the state at any federal facility, the jurisdictional status of the job site shall be determined by the licensee.

(m) If the jurisdictional status of a temporary job site within the state at a federal facility is unknown, the licensee shall contact the federal agency to determine if the job site is under exclusive federal jurisdiction.

(n) In areas of exclusive federal jurisdiction, the general licensee shall be subject to all applicable rules, regulations, orders and fees of the NRC.

(o) Authorization for possession and use of radioactive materials at temporary job sites under exclusive federal jurisdiction shall be obtained from the NRC by either:

- (1) Filing a NRC Form-241 in accordance with 10 CFR 150.20(b); or
- (2) Applying for a specific NRC license.

(p) Before radioactive material is used by a specific licensee at a temporary job site in another state, authorization shall be obtained for the state if it is an Agreement State, or from the NRC for any non-Agreement State, either by filing for reciprocity or applying for and obtaining a specific license.

(q) Notwithstanding the provisions of He-P 4030.18(a), any person who holds a specific license issued by the NRC, an Agreement State, or a Licensing State authorizing the holder to manufacture, install, or service a device described in He-P 4031.04(c) within an area subject to the jurisdiction of the licensing body shall be considered by DHHS/~~BRH-RHS~~ to have a general license to install and service such device in this state provided that:

- (1) Such person shall file a report with the DHHS/~~BRH-RHS~~ within 30 days after the end of each calendar quarter in which any device is transferred to or serviced in this state;
- (2) The report required by (q)(1) above shall identify each general licensee by:
 - a. Name and address;
 - b. The type of device transferred; and
 - c. The quantity and type of radioactive material contained in the device;
- (3) The device shall have been manufactured, labeled, installed, and serviced in accordance with applicable provisions of the specific license, or equivalent licensing document, issued to such person by the NRC, an Agreement State, or a Licensing State;
- (4) Such person shall assure that any labels required to be affixed to the device under regulations of the authority which licensed manufacture of the device bear a statement that "Removal of this label is prohibited;"
- (5) In the event that a label, as specified in (q)(4) above, is missing or damaged, such person shall affix a label in accordance with the regulations of the authority which licensed manufacture of the device; and
- (6) The holder of the specific license shall furnish to each general licensee to whom the licensee transfers such device or on whose premises he or she installs such device a copy of the general license contained in He-P 4031.02.

(r) In accordance with RSA 125-F:10, the DHHS/~~BRH-RHS~~ shall withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by another agency, or any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to prevent undue hazard to public health and safety or property.

(s) A licensee to whom action has been taken as described in He-P 4030.18(r) shall be afforded a hearing within 15 days on application, in the form of a written request, to the DHHS requesting such hearing.

(t) A hearing held relative to action taken under He-P 4030.18(r) shall be conducted in accordance with He-C 200.

Source. (See Revision Note at part heading for He-P 4030) #6942, eff 2-1-99; ss by #7919, eff 7-18-03; ss by #8488, eff 11-18-05; ss by #8959, eff 8-7-07

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

PART He-P 4031 GENERAL LICENSES

He-P 4031.01 Purpose and Scope.

(a) This part establishes general licenses for the possession and use of ~~radioactive byproduct~~ material and a general license for ownership of ~~radioactive-byproduct~~ material.

(b) Specific provisions of He-P 4030 shall be applicable to general licenses established by this part.

(c) The specific provisions of He-P 4030 applicable to the general licenses are specified in He-P 4031.02.

He-P 4031.02 Terms and Conditions. The general license provided in this part shall be subject to the general provisions of He-P 4030.01, 4030.03(b), 4030.10(a), (c), (d), (i) and (j), He-P 4030.15, He-P 4030.16, He-P 4030.17, He-P 4001, He-P 4003, He-P 4019, He-P 4020, He-P 4021, He-P 4022, He-P 4023, and He-P 4037, unless indicated otherwise in the specific provision of the general license.

He-P 4031.03 General Licenses - Source Material.

~~(a) A general license shall be issued authorizing use and transfer of not more than 15 pounds of source material at any one time by commercial and industrial firms, research, educational, medical institutions, state or local government agencies for research, development, educational, commercial, or operational purposes, provided no person pursuant to this general license receives more than a total of 150 pounds of source material in any one calendar year.~~

(a) A general license shall be issued authorizing commercial and industrial firms, research, educational, and medical institutions, and state and local government agencies to receive, possess, use, and transfer uranium and thorium, in their natural isotopic concentrations and in the form of depleted uranium, for research, development, educational, commercial, or operational purposes, in the following forms and quantities:

(1) No more than 1.5 kg (3.3 lb) of uranium and thorium in dispersible forms, which shall include gaseous, liquid, and powder forms, at any one time, and under the following conditions:

a. Any material processed by the general licensee that alters the chemical or physical form of the material containing source material shall be accounted for as a dispersible form;

b. A person authorized to possess, use, and transfer source material under He-P 4032.03(a) shall not receive more than a total of 7 kg (15.4 lb) of uranium and thorium in any one calendar year;

c. Persons possessing source material in excess of these limits in b. above may:

(i) Continue to possess up to 7 kg (15.4 lb) of uranium and thorium at any one time for one year until the DHHS/RHS takes final action on a pending

application submitted on or before August 27, 2014, for a specific license for such material; and

(ii) Continue to receive up to 70 kg (154 lb) of uranium or thorium in any one calendar year until December 31, 2014, or until the DHHS/RHS takes final action on a pending application submitted on or before August 27, 2014, for a specific license for such material;

(2) No more than a total of 7 kg (15.4 lb) of uranium and thorium at any one time, and under the following conditions:

a. A person authorized to possess, use, and transfer source material under this paragraph shall not receive more than a total of 70 kg (154 lb) of uranium and thorium in any one calendar year; and

b. A person shall not alter the chemical or physical form of the source material possessed under He-P 4032.03(a) unless it is accounted for under the limits of He-P 4032.03(a)(1);

(3) No more than 7 kg (15.4 lb) of uranium, removed during the treatment of drinking water, at any one time. In addition, a person shall not remove more than 70 kg (154 lb) of uranium from drinking water during a calendar year under He-P 4032.03(a); or

(4) No more than 7 kg (15.4 lb) of uranium and thorium at laboratories for the purpose of determining the concentration of uranium and thorium contained within the material being analyzed at any one time. In addition, a person authorized to possess, use, and transfer source material under He-P 4032.03(a) shall not receive more than a total of 70 kg (154 lb) of source material in any one calendar year.

(b) Persons who receive, possess, use, or transfer source material pursuant to the general license issued in He-P 4031.03(a): ~~shall be exempt from the provisions of He P 4019 through He P 4023 provided that such person is not also in possession of source material under a specific license issued pursuant to He P 4030.~~

(1) Shall be prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as may be authorized by the DHHS/RHS in a specific license;

(2) Shall not abandon such source material;

(3) Shall dispose of such source material as follows:

a. A cumulative total of 0.5 kg (1.1 lb) of source material in a solid, non-dispersible form may be transferred each calendar year, by a person authorized to receive, possess, use, and transfer source material under this general license to persons receiving the material for permanent disposal. The recipient of source material transferred under the provisions of this paragraph shall be exempt from the requirements to obtain a license under this part to the extent the source material is permanently disposed. This provision shall not apply to

any person who is in possession of source material under a specific license issued under He-P 4032 or He-P 4033; or

b. In accordance with He-P 4023.01;

(4) Shall be subjected to the provisions in He-P 4020, He-P 4030.01, He-P 4030.10(j) through (n), He-P 4030.15, He-P 4030.16, and He-P 4031.02;

(5) Shall respond to written requests from the DHHS/RHS to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the person cannot provide the requested information within the allotted time, the person shall, within that same time period, request a longer period to supply the information by providing the DHHS/RHS, a written justification for the request; and

(6) Shall not export such source material except in accordance with 10 CFR Part 110.

(c) Persons who receive, possess, use or transfer source material pursuant to the general license in He-P 4031.03(a) are prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as authorized by the DHHS/BRH in a specific license. Any person who receives, possesses, uses, or transfers source material in accordance with He-P 4031.03(a) shall conduct activities so as to minimize contamination of the facility and the environment. When activities involving such source material are permanently ceased at any site, if evidence of significant contamination is identified, the general licensee shall notify the DHHS/RHS about such contamination and may consult with the DHHS/RHS as to the appropriateness of sampling and restoration activities to ensure that any contamination or residual source material remaining at the site where source material was used under this general license is not likely to result in exposures that exceed the limits in He-P 4024.09.

(d) A general license shall be issued authorizing the receipt of title to source material without regard to quantity, but shall not authorize the person to receive, possess, use, or transfer the source material. Any person who receives, possesses, uses, or transfers source material in accordance with the general license granted in He-P 4031.03(a) shall be exempt from the provisions of He-P 4019, He-P 4020, and He-P 4021 to the extent that such receipt, possession, use, and transfer are within the terms of this general license, except that such person shall comply with the provisions of He-P 4023.01 and He-P 4024.09 to the extent necessary to meet the provisions of He-P 4031.03(b)(2) and (c). However, this exemption shall not apply to any person who also holds a specific license issued under He-P 4032 or He-P 4033.

(e) A general license shall be issued to receive, acquire, possess, use, or transfer depleted uranium provided that:

(1) The depleted uranium is contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of the product or device in accordance with the provisions of He-P 4031.03(e)(2), (3), and (4);

(2) The depleted uranium authorized in He-P 4031.03(e)(1) is contained only in industrial products or devices which have been manufactured in accordance with a

specific license issued to the manufacturer by the U.S. Nuclear Regulatory Commission or an Agreement State which authorizes manufacture of the products or devices for distribution to persons generally licensed by the U.S. Nuclear Regulatory Commission or an Agreement State;

(3) A person who receives, acquires, possesses, or uses depleted uranium pursuant to the general license established by He-P 4031.03(e)(1):

- a. Shall not introduce such depleted uranium, in any form, into a chemical, physical, or metallurgical treatment or process, except when a treatment or process is for repair or restoration of the plating or covering of the depleted uranium;
- b. Shall not abandon such depleted uranium;
- c. Shall transfer or dispose of depleted uranium only by transfer in accordance with the provisions of He-P 4030.15;
- d. ~~When~~ Shall furnish the transferee a copy of this rule when depleted uranium is transferred in accordance with He-P 4031.03(e)(3)c, ~~the transferor shall furnish the transferee a copy of this rule;~~
- e. ~~In~~ Shall furnish the transferee a copy of He-P 4031 accompanied by a note explaining that use of the product or device is regulated by the U.S. Nuclear Regulatory Commission or an Agreement State in the case where the transferee receives the depleted uranium pursuant to a general license contained in the U.S. Nuclear Regulatory Commission's or an Agreement State's regulation equivalent to He-P 4031.03(e)(1), ~~the transferor shall furnish the transferee a copy of He-P 4031 accompanied by a note explaining that use of the product or device is regulated by the U.S. Nuclear Regulatory Commission or an Agreement State;~~
- f. ~~Within~~ Shall report within 30 days of any transfer, ~~the transferor shall a~~ report in writing to the DHHS/~~BRH~~ RHS the name and address of the person receiving the depleted uranium pursuant to such transfer; and
- g. ~~A general licensee shall~~ Shall not export depleted uranium except in accordance with a license issued by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 110; and

(4) Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by He-P 4031.03(e) shall be exempt from the requirements of He P 4019 through He-P 4023 with respect to the provisions of He-P 4031.

He-P 4031.04 General Licenses - ~~Radioactive-Byproduct~~ Material Other Than Source Material.

(a) ~~Reserved. A general license is hereby issued to transfer, receive, acquire, own, possess, and use radioactive material incorporated into the following devices or equipment which have been manufactured, tested and labeled by the manufacturer in accordance with a specific license~~

~~issued to the manufacturer by the U.S. Nuclear Regulatory Commission for use pursuant to 10 CFR 31, Section 31.3:~~

~~(1) Devices designed for use as static eliminators which shall contain, as a sealed source or sources, radioactive material consisting of not more than 500 microcuries of polonium 210 per device; and~~

~~(2) Devices designed for ionization of air which shall contain, as a sealed source or sources, radioactive material consisting of not more than 500 microcuries of polonium 210 or 50 millicuries of hydrogen 3 (tritium) per device.~~

(b) A general license ~~is hereby~~shall be issued to commercial and industrial firms and to research, educational and medical institutions, individuals in the conduct of their business, and state or local government agencies to own, receive, acquire, possess, use or transfer in accordance with the provisions of He-P 4031.04(c), (d), and (e), byproduct material, excluding special nuclear material, contained in any fixed device designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

(c) The general license in He-P 4031.04(b) shall apply only to byproduct material contained in devices which have been manufactured or initially transferred and labeled in accordance with the specifications contained in a specific license issued by the DHHS/~~BRH~~RHS pursuant to He-P 4032 or in accordance with the specifications contained in a specific license issued by the U.S. Nuclear Regulatory Commission or an Agreement State which authorizes distribution of devices to persons generally licensed by the NRC or an Agreement State.

(d) Devices containing byproduct material as described in He-P 4031.04(c) above shall have been received only from one of the specific licensees specified in He-P 4031.04(c) or through a transfer made in accordance with He-P 4031.04(e)(9).

(e) Any person who owns, receives, acquires, possesses, uses, or transfers byproduct material in a device pursuant to the general license in He-P 4031.04(b) shall:

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

(2) Assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than ~~six~~6-month intervals or at such other intervals as are specified on the label; however:

a. Devices containing only krypton shall not be required to be tested for leakage of radioactive material; and

b. Devices containing only tritium or not more than 100 microcuries of other beta and/or gamma emitting material or 10 microcuries of alpha emitting material and devices held in storage in the original shipping container prior to initial installation shall not be required to be tested for any purpose;

(3) Assure that the tests required by He-P 4031.04(e)(2) and other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:

- a. In accordance with the instructions provided by the labels; or
- b. By a person holding a specific license from the DHHS/~~BRHRHS~~, the NRC, or an Agreement State, to perform such activities;

(4) Maintain records showing compliance with the requirements He-P 4031.04(e)(2) and (3) which:

- a. Show the results of tests; and
- b. Show the dates of performance of, and the names of persons performing, testing, installation servicing, and removal from installation concerning the radioactive material, its shielding or containment;

(5) ~~Shall r~~Retain records as follows:

- a. Each record of a test for leakage or radioactive material required by He-P 4031.04(e)(2) shall be retained for ~~three~~3 years after the next required leak test is performed or until the sealed source is transferred or disposed of;
- b. Each record of a test on the “on-off” mechanism and indicator required by He-P 4031.04(e)(2) shall be retained for ~~three~~3 years after the next required test of the on-off mechanism and indicator is performed or until the sealed source is transferred or disposed of; and
- c. Each record that is required by He-P 4031.04(e)(3) shall be retained for ~~three~~3 years from the date of the recorded event or until the device is transferred or disposed of;

(6) Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on-off mechanism or indicator, or upon the detection of 0.005 microcurie or more removable radioactive material, shall immediately suspend operation of the device until it has been repaired by the manufacturer or other person holding a specific license from the DHHS/~~BRHRHS~~, the NRC, or an Agreement State to repair such devices, or disposed of by transfer to a person authorized by a specific license to receive the radioactive material contained in the device and, within 30 days, furnish to the DHHS/~~BRH-RHS~~ a report containing a brief description of the event and the remedial action taken, and in the case of detection of 0.005 microcurie or more removable radioactive contamination or failure of or damage to a source likely to result in contamination of the premises or the environs, a plan for ensuring that the premises and environs are acceptable for unrestricted use, must be furnished to the DHHS/~~BRHRHS~~, in accordance with the criteria set out in He-P 4021.20, and He-P 4024;

(7) Not abandon the device containing byproduct material;

(8) Not export the device containing byproduct material except in accordance with 10 CFR 110;

(9) Except as provided in He-P 4031.04(e)(10), transfer or dispose of the device containing byproduct material only by:

- a. Export as provided by He-P 4031.04(e)(8);
- b. By transfer to a general licensee as authorized by He-P 4031.04(e)(10); or
- c. By transfer to a specific licensee of the DHHS/~~BRH~~RHS, the NRC, or an Agreement State whose specific license authorizes him to receive the device and within 30 days after transfer or export of a device to a specific licensee shall furnish to the DHHS/~~BRH~~RHS a report containing identification of the device by manufacturer's or initial transferor's name, model number, and serial number, and the name, address, and license number of the person receiving the device, and the date of the transfer;

(10) Transfer byproduct material in a device pursuant to the general license in He-P 4031.04(b) by obtaining a written DHHS/RHS approval before transferring the device to any other specific licensee not specifically identified in He-P 4031.04(e)(9)c., except that a holder of a specific license may transfer a device for possession and use under its own specific license without prior approval if the holder:

- a. Verifies that the specific license authorizes the possession and use, or applies for and obtains an amendment to the license authorizing the possession and use;
- b. Removes, alters, covers, or clearly and unambiguously augments the existing label required by He-P 4031.04(e)(1) so that the device is labeled in compliance with He-P 4022.14, except that the manufacturer, model number, and serial number shall be retained;
- c. Obtains the manufacturer's or initial transferor's information concerning maintenance that would be applicable under the specific license, such as leak testing procedures; and
- d. Reports the transfer under He-P 4031.04(e)(9)c.;

~~(1011)~~ Transfer the device to another general licensee only:

- a. Where the device remains in use at a particular location, in which case the transferor shall give the transferee a copy of this rule and any safety documents identified in the label on the device and, within 30 days of the transfer, report to the DHHS/~~BRH~~RHS the manufacturer's or initial transferor's name, model number and serial number of the device transferred, the name and address of the transferee, and the name, position, and telephone number of an responsible individual identified by the transferee in accordance with He-P 4031.04(e)(14) to have knowledge of and authority to take actions to ensure compliance with these rules, and who may constitute a point of contact between the DHHS/~~BRH~~RHS and the transferee; or

b. Where the device is held in storage by an intermediate person in the original shipping container at its intended location of use prior to initial use by a general licensee;

~~(412)~~ Comply with the provisions of He-P 4021.12 and 4021.13 for reporting radiation incidents, theft, or loss of licensed material, but shall be exempt from the other requirements of He-P 4019 through He-P 4023;

~~(4213)~~ Respond to written requests from the DHHS/~~BRH-RHS~~ to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request, except:

~~a- that if~~ If the general licensee is unable to provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the information by providing the DHHS/~~BRH-RHS~~ a written justification for the request;

~~(4314)~~ Appoint an individual responsible for having knowledge of the appropriate rules and requirements, and for ensuring day-to-day compliance with the appropriate rules and requirements, and vested with the authority for taking required actions to comply with appropriate rules and requirements, although not relieving the general licensee of its responsibility in this regard;

~~(4415)~~ Register each device containing at least 370 MBq (10 mCi) of cesium-137, 3.7 MBq (0.1 mCi) of strontium-90, 37 MBq (1 mCi) of cobalt-60, or 37 MBq (1 mCi) or americium-241 or any other transuranic, based on the activity indicated on the device label. Each address for a location of use, as described under He-P 4031.04(e)(16) of this section, represents a separate general licensee and requires a separate registration and fee;

~~(4516)~~ Register any and all devices meeting the criteria set out in He-P 4031.04(e)(14) annually with the DHHS/~~BRH-RHS~~ and submit the fee required by He-P 4070. Registration shall be done by verifying, correcting, and/or adding to the information provided in a request for registration received from the DHHS/~~BRH-RHS~~. The registration information ~~must~~ shall be submitted to the DHHS/~~BRH-RHS~~ within 30 days of the date of the request for registration or as otherwise indicated in the request. In addition, a general licensee holding devices meeting the criteria of He-P 4031.04(e)(14) of this section is subject to the bankruptcy notification requirement in He-P 4030.02;

~~(4617)~~ In registering devices, furnish the following information and any other information specifically requested by the DHHS/~~BRH-RHS~~:

a. Name and mailing address of the general licensee;

b. Information about each device: the manufacturer (or initial transferor), model number, serial number, the radioisotope and activity (as indicated on the label);

- c. Name, title, and telephone number of the responsible person designated as a representative of the general licensee under He-P 4031.04(e);
- d. Address or location at which the device(s) are used and/or stored;
- e. Certification by the responsible representative of the general licensee that the information concerning the device(s) has been verified through a physical inventory and checking of label information; and
- f. Certification by the responsible representative of the general licensee that they are aware of the requirements of the general license;

(~~17~~18) Report changes to the mailing address for the location of use or a change in name of general licensee to the DHHS/~~BRH~~RHS within 30 days of the effective date of the change; and

(~~18~~19) Not hold devices that are not in use for longer than 2 years. If devices with shutters are not being used, the shutter ~~must~~shall be locked in the closed position. The testing required by He-P 4031.04(e) need not be performed during the period of storage only; however, when devices are put back into service or transferred to another person, and have not been tested within the required test interval, they ~~must~~shall be tested for leakage before use or transfer and the shutter tested before use. Devices kept in standby for future use ~~are~~shall be excluded from the ~~two~~2-year time limit if the general licensee performs quarterly physical inventories of these devices while they are in standby.

(f) The general license in He-P 4031.04(b) shall not authorize the manufacture or import of devices containing ~~radioactive-byproduct~~ material.

(g) The general license provided in He-P 4031.04(b) shall be subject to the provisions of He-P 4001 through He-P 4003, He-P 4030.10, He-P 4030.16, He-P 4030.17, and He-P 4037.

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

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

(2) Each device has been manufactured, assembled or imported in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission or each device has been manufactured or assembled in accordance with the specifications contained in a specific license issued by the DHHS/~~BRH~~RHS, an Agreement State, or a Licensing State to the manufacturer or assembler of such device pursuant to licensing requirements equivalent to those in section 32.53 of 10 CFR Part 32 of the regulations of the U.S. Nuclear Regulatory Commission.

(i) Persons who own, receive, acquire, possess, or use luminous safety devices pursuant to the general license in He-P 4031.04(h) shall be exempt from the requirements of He-P 4019 through 4023, except that they shall comply with the provisions of sections He-P 4021.12 and He-P 4021.13.

(j) The general license in He-P 4031.04(h) shall not authorize the manufacture, assembly, ~~or repair,~~ import or export of luminous safety devices containing tritium or promethium 147.

(k) ~~The~~ general license in He-P 4031.04(h) shall not authorize the ownership, receipt, acquisition, possession or use of promethium 147 contained in instrument dials.

(l) The general license in He-P 4031.04(h) shall be subject to the provisions of He-P 4001 through He-P 4003, He-P 4030.10, He-P 4030.16, He-P 4030.17 and He-P 4037.

(m) A general license shall be issued to those persons listed below to own, receive, acquire, possess, use, and transfer in accordance with the provisions of He-P 4031.04(p), (q) and (s) americium 241 or radium 226 in the form of calibration or reference sources:

(1) Any person who holds a specific license issued by the Agency which authorizes him to receive, possess, use, and transfer radioactive byproduct materials, source material; and

(2) Any person who holds a specific license issued by the U.S. Nuclear Regulatory Commission which authorizes him to receive, possess, use, and transfer special nuclear material.

(n) A general license shall be issued to receive, possess, use, and transfer plutonium in the form of calibration or reference sources in accordance with the provisions of He-P 4031.04(p), (q), and (s) to any person who holds a specific license issued by the DHHS/~~BRH~~ RHS which authorizes him to receive, possess, use, and transfer radioactive material.

(o) A general license shall be issued to any person to own, receive, possess, use, and transfer radium in the form of calibration or reference sources in accordance with equivalent provisions of He-P 4031.04(p), (q), and (s) who holds a specific license issued by the Agency which authorizes him to receive, possess, use, and transfer radioactive material.

(p) The general licenses in He-P 4031.04(m), (n), and (o) shall apply only to calibration or reference sources which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer or importer of the sources by the U.S. Nuclear Regulatory Commission, pursuant to section 32.57 of 10 CFR Part 32 or Section 70.39 of 10 CFR Part 70 or which have been manufactured in accordance with the specifications contained in a specific license or equivalent licensing document issued to the manufacturer by the DHHS/~~BRH~~ RHS, an Agreement State, or a Licensing State pursuant to licensing requirements equivalent to those contained in Section 32.57 of 10 CFR Part 32 or Section 70.39 of 10 CFR Part 70 of the regulations of the U.S. Nuclear Regulatory Commission.

(q) The general licenses provided in He-P 4031.04(m), ~~(n)~~ and (o) shall be subject to the provisions of He P 4001 through He-P 4003, He-P 4019 through He-P 4023, He-P 4030.10, He-P 4030.16, He-P 4030.17 and He-P 4037.

(r) Persons who own, receive, acquire, possess, use and transfer one or more calibration or reference sources pursuant to He-P 4031.04(m), (n), or (o):

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

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

a. "The receipt, possession, use and transfer of this source, Model _____, Serial No. _____, are subject to a general license and the regulations of the Nuclear Regulatory Commission or of a state with which the Commission has entered into an agreement for the exercise of regulatory authority. Do not remove this label. CAUTION-RADIOACTIVE MATERIAL
THIS SOURCE CONTAINS (AMERICIUM 241) or (PLUTONIUM) or other named material
DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE
(Name of Manufacturer or Importer);"; and

b. "The receipt, possession, use and transfer of this source, Model _____, Serial No. _____, are subject to a general license and the regulations of a Licensing State. Do not remove this label.
CAUTION - RADIOACTIVE MATERIAL
THIS SOURCE CONTAINS RADIUM-226
DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE
(Name of Manufacturer or Importer);";

(3) Shall not transfer, abandon, or dispose of such source except by transfer to a person authorized by a license from the DHHS/~~BRHRHS~~, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State to receive the source; ~~and~~

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

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

(s) The general licenses in He-P 4031.04(m), (n), and (o) shall not authorize the manufacture, import or export of calibration or reference sources containing americium-241, ~~plutonium~~, or radium-226.

(t) A general license shall be issued to own radioactive material without regard to quantity. Notwithstanding any other provisions of this part, this general license does not authorize the manufacture, production, transfer, receipt, possession, ~~or use~~, import or export of ~~radioactive-byproduct~~ material, except as authorized in a specific license.

(u) A general license shall be issued to own, receive, acquire, possess, use and transfer strontium 90 contained in ice detection devices, provided each device contains not more than fifty microcuries of strontium 90 and each device has been manufactured or ~~imported initially~~ transferred in accordance with a specific license issued by the Nuclear Regulatory Commission or each device has been manufactured in accordance with the specifications contained in a specific

license or equivalent licensing document issued by the DHHS/~~BRHRHS~~, an Agreement State, or a Licensing State to the manufacturer of such device pursuant to licensing requirements equivalent to those in section 32.61 of 10 CFR Part 32 of the regulations of the Nuclear Regulatory Commission.

(v) Persons who own, receive, acquire, possess, use, or transfer strontium 90 contained in ice detection devices pursuant to the general license in He-P 4031.04(u) shall:

(1) Upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating, to the device, discontinue use of the device until it has been inspected, tested for leakage and repaired by a person holding a specific license or equivalent licensing document from the Nuclear Regulatory Commission, an Agreement State, or a Licensing State to manufacture or service such devices; or shall dispose of the device pursuant to the provisions of those rules;

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

(3) Be exempt from the requirements of He-P 4019 through He-P 4023, except that such person shall comply with the provisions of He-P 4023, He-P 4021.12 and He-P 4021.13.

(w) The general license in He-P 4031.04(u) shall not authorize the manufacture, assembly, disassembly, ~~or~~ repair, or import of strontium 90 in ice detection devices.

(x) The general license in He-P 4031.04(u) shall be subject to the provisions of He-P 4001 through He-P 4003, He-P 4030.10, He-P 4030.16, He-P 4030.17, and He-P 4037.

He-P 4031.05 General License to Install Devices Generally Licensed in He-P 4031.04(b). Any person who holds a specific license issued by an Agreement State or the Nuclear Regulatory Commission, authorizing the holder to manufacture, install, or service a device described in He-P 4031.04(b) within such Agreement State or non-Agreement State, is hereby granted a general license to install and service such device in this state and a general license to install and service such device in offshore waters, as defined in 10 CFR provided:

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

(b) Such person assures that any labels required to be affixed to the device under regulations of the Agreement State or the Nuclear Regulatory Commission, which licensed manufacture of the device bear a statement that removal of the label is prohibited.

PART He-P 4032 SPECIFIC LICENSES FOR MANUFACTURE OR TRANSFER OF
CERTAIN ITEMS CONTAINING ~~RADIOACTIVE~~ BYPRODUCT
MATERIAL

He-P 4032.01 Purpose.

(a) This part shall prescribe requirements for the issuance of specific licenses to persons who manufacture or initially transfer items containing ~~radioactive~~ byproduct material for sale or distribution to:

- (1) Persons exempted from the licensing requirements of He-P 4030; and
- (2) Persons generally licensed under He-P 4031 or He-P 4035.

(b) This part shall prescribe requirements for manufacturers or initial transferors of sealed source or devices containing sealed sources which are to be used by persons specifically licensed under He-P 4030 or equivalent regulations of an Agreement State or Licensing State.

He-P 4032.02 Scope. The provisions and requirements of this part shall be in addition to, and not in substitution for, other requirements of this chapter.

(a) The requirements in this part, including provisions that are specific to licensees, shall apply to all persons with respect to accelerator-produced radioactive material or discrete sources of radium-226 on August 8, 2009, or earlier as noticed by the NRC, except that these persons may continue to manufacture or initially transfer items containing accelerator-produced radioactive material or discrete sources of radium-226 for sale or distribution to persons exempted from the licensing requirements of He-P 4030, and to sell or manufacture radioactive drugs and sources and devices to medical use licensees until the date of the NRC's final licensing determination, provided that the person submits a license application within 12 months from waiver expiration date of August 7, 2009 or within 12 months from the date of an earlier termination of the waiver as noticed by the NRC, whichever is earlier; or that the person submits an amendment request within 6 months from the waiver expiration date of August 7, 2009 or within 6 months from the date of an earlier termination of the waiver as noticed by the NRC, whichever date is earlier.

He-P 4032.03 Licensing the Manufacture and Distribution of Devices to Persons Generally Licensed.

(a) An application for a specific license to manufacture or initially transfer devices containing radioactive material, excluding special nuclear material, to persons generally licensed under He-P 4031.04 or equivalent regulations of the NRC, an Agreement State or Licensing State shall be approved if:

- (1) The applicant satisfies the general requirements of He-P 4030.09;
- (2) The applicant submits complete information relating to the design, manufacture, prototype testing, quality control, labels, proposed uses, installation, servicing, leak testing, operating and safety instructions, and potential hazards of the device to provide assurance that:
 - a. The device can be safely operated by persons not having training in radiological protection;

- b. Under ordinary conditions of handling, storage, and the use of the device, the radioactive material contained in the device cannot be released or inadvertently removed from the device;
- c. Under ordinary conditions of handling, storage, and the use of the device, it is unlikely that any person will receive in one year a dose in excess of 10% of the annual limits specified in He-P 4020.05; and
- d. Under accident conditions (such as fire and explosion) associated with handling, storage, and use of the device, it is unlikely that any person would receive an external radiation dose or dose commitment in excess of the organ doses in Table 4032.1 below:

Table 4032.1 Organ Doses Under Accident Conditions

Body Part	Organ Dose
Whole body; head and trunk; active blood-forming organs; gonads, or lens of eye	15 rems (150 mSv)
Hands and forearms; feet and localized areas of skin averaged over areas no longer than 1 square centimeter	200 rems (2 Sv)
Other organs	50 rems (500 mSv);

- (3) Each device bears a durable, legible, clearly visible label or labels, which contain in a clearly identified and separate statement:
 - a. Instructions and precautions necessary to assure safe installation, operation, and servicing of the device or identification of operating and service manuals used to provide this information;
 - b. The requirement, or exemption of requirement, for leak testing, or for testing any on-off mechanism and indicator, to include the maximum time interval for such testing, the identification of radioactive material by isotope, the quantity of radioactivity, and the date of determination of the quantity; and
 - c. The information called for in the following statement in the same form:
 1. "The receipt, possession, use and transfer of this device Model_____ Serial No._____ are subject to a general license or the equivalent and the regulations of the NRC, the Agreement State or the Licensing State which has regulatory authority";
 2. This label shall be maintained on the device in a legible condition;
 3. "Removal of this label is prohibited";
 4. The words, "CAUTION - RADIOACTIVE MATERIAL"; and
 5. The name of the manufacturer or distributor;
- (4) Each device having a separable source housing that provides the primary shielding for the source also bears, on the source housing, a durable label containing:
 - a. The device model number and serial number;
 - b. The isotope and quantity;

- c. The words, "CAUTION - RADIOACTIVE MATERIAL";
- d. The radiation symbol described in He-P 4022.11; and
- e. The name of the manufacturer or initial distributor; and

(5) Each device meeting the criteria of He-P 4031.04(e)(~~4516~~), bears a permanent, such as embossed, etched, stamped, or engraved, label affixed to the source housing if separable, or the device if the source housing is not separable, that includes the words, "CAUTION-RADIOACTIVE MATERIAL", and, if practicable, the radiation symbol described in He-P 4022.11.

(b) Should an applicant under He-P 4032.03(a) desire that a device be required to be leak tested or tested for proper operation of the on-off mechanism and indicator, at intervals greater than 6 months, the DHHS/~~BRH-RHS~~ shall consider at least the following information in determining the acceptable interval:

- (1) Primary containment (source capsule);
- (2) Protection of primary containment;
- (3) Method of sealing containment;
- (4) Containment construction materials;
- (5) Form of contained radioactive material;
- (6) Maximum temperature withstood during prototype test;
- (7) Maximum pressure withstood during prototype tests;
- (8) Maximum quantity of contained radioactive material;
- (9) Radiotoxicity of contained radioactive material; and
- (10) Operating experience with identical devices or similarly designed and constructed devices.

(c) In the event the applicant under He-P 4032.03(a) desires that the general licensee under He-P 4031, or under equivalent regulations of the NRC, an Agreement State, or a Licensing State, be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on-off mechanism and indicator, or remove the device from installation, the applicant shall:

- (1) Include written instructions to be followed by the general licensee;
- (2) Include the estimated calendar quarter doses associated with such activity or activities, and bases for such estimates; and
- (3) Demonstrate that performance of such activity or activities by an individual untrained in radiological protection is unlikely to cause that individual to receive a calendar quarter dose in excess of 10% of the limits specified in He-P 4020.

(d) If a device containing radioactive material is to be transferred for use under the general license contained in He-P 4031.04(b), each person that is licensed under He-P 4032.03

shall provide to each person to whom a device is to be transferred, prior to transferring the device, the following:

- (1) A copy of the general license contained in He-P 4031.04(b), except if paragraphs He-P 4031.04(e)(2) through (4) or He-P 4031.04(e)(~~4~~15) do not apply to the particular device, those paragraphs may be omitted;
- (2) A copy of He-P 4031.02, He-P 4030.10(j), He-P 4021.12, He-P 4021.13, and He-P 4021.19;
- (3) A list of the services that can only be performed by a specific licensee;
- (4) Information on acceptable disposal options including estimated costs of disposal; and
- (5) An indication that the DHHS/~~BRH~~RHS shall take enforcement action for improper disposal.

(e) If the transfer specified in He-P 4032.03(d) is through an intermediate person, the information to be provided as described in He-P 4032.03(d) shall also be provided to the intended user prior to initial transfer to the intermediate person.

(f) If radioactive material is to be transferred in a device for use under an equivalent general license of an Agreement State or NRC, each person that is licensed under He-P 4032.03 shall provide to each person to whom a device is to be transferred, prior to transferring the device, the following:

- (1) A copy of the Agreement State's regulations equivalent to He-P 4031.02, He-P 4030.10(j), He-P 4021.12, He-P 4021.13, and He-P 4021.19, a copy of 10 CFR §§31.5, 31.2, 30.51, 20.2201, and 20.2202, or a copy of He-P 4031.02, He-P 4030.10(j), He-P 4021.12, He-P 4021.13, and He-P-4021.19, except if certain paragraphs of these rules do not apply to the particular device, those paragraphs may be omitted. If a copy of the New Hampshire rules is provided to a prospective general licensee in lieu of the applicable Agreement State's or NRC regulations, it shall be accompanied by a note explaining that use of the device is regulated by the Agreement State or NRC, as applicable; and if certain paragraphs of the regulations do not apply to the particular device, those paragraphs may be omitted;
- (2) A list of the services that can only be performed by a specific licensee;
- (3) Information on acceptable disposal options including estimated costs of disposal; and
- (4) The name or title, address, and phone number of the contact at the Agreement State regulatory agency or NRC from which additional information may be obtained.

(g) If the transfer specified in He-P 4032.03(f) is through an intermediate person, the information to be provided as described in He-P 4032.03(f) shall also be provided to the intended user prior to initial transfer to the intermediate person.

(h) In lieu of the requirements of He-P 4032.03(d) through (g), the licensee may propose an alternative approach to informing customers, subject to approval by the DHHS/~~BRH~~RHS. In its review of such a request, the DHHS/~~BRH~~RHS shall assure that the proposed alternative approach to informing customers:

- (1) Meets the essential objectives of He-P 4032.03(d) through (g);
- (2) Provides the same information as required by He-P 4032.03(d) through (g); and
- (3) Is not inimical to public health and safety.

(i) Each device that is transferred after November 17, 2005, shall meet the labeling requirements in He-P 4032.03(a)(3) through (5).

(j) If a notification of bankruptcy has been made under He-P 4030.10(g) or the license is to be terminated, each person licensed under He-P 4032.03 shall provide, upon request, to the DHHS/~~BRH-RHS~~, the NRC, and to any appropriate Agreement State, records of final disposition required under He-P 4032.03(l) and (m).

(k) Each person licensed under He-P 4032.03 to initially transfer devices to generally licensed persons shall:

(1) Report, in a clear and legible report, to the DHHS/~~BRH-RHS~~ all transfers of such devices to persons for use under the general license in He-P 4031.03 including:

- a. The identity of each general licensee by name and mailing address, and address location of use;
- b. The name, title, and telephone number of the individual identified by the general licensee as having knowledge of and authority to take required actions to ensue compliance with the applicable rules, and who may constitute a point of contact between the DHHS/~~BRH-RHS~~ and the general licensee;
- c. The date of transfer;
- d. The type, model number, and serial number of device transferred;
- e. The quantity and type of radioactive material contained in the device;
- f. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the same information for both the intended user and each intermediate person, and clearly designate the intermediate person(s); and
- g. The identity of the specific licensee submitting the report, including the license number of the specific licensee;

(2) Report, in a clear and legible report, to the DHHS/~~BRH-RHS~~ all receipts of devices from persons licensed under He-P 4031.03, including, for devices received from persons generally licensed under He-P 4031.03:

- a. The identity of the general licensee by name and address;
- b. The type, model number, and serial number of the device received;
- c. The date of receipt, and, in the case of devices not initially transferred by the reporting licensee, the name of the manufacturer or initial transferor; and
- d. The identity of the specific licensee submitting the report, including the license number of the specific licensee;

- (3) Report to the DHHS/~~BRH-RHS~~ the identity of the general licensee, the device, and the changes to information on the device label, if the licensee authorized under He-P 4032.03 makes changes to a device possessed by a general licensee authorized under He-P 4031.04(b), such that the label must be changed to update required information;
- (4) Report to the DHHS/~~BRH-RHS~~ if no transfers have been made to or from persons generally licensed under He-P 4031.04(b) during the reporting period;
- (5) Report to the NRC, on NRC Form 653 "Transfers of Industrial Devices Report" or in a clear and legible report containing all data required by the form, all transfers of such devices to persons for use under the NRC general license in section 31.5 of 10 CFR 31;
- (6) Report to the responsible Agreement State or Licensing State agency all transfers of such devices to persons for use under a general license in the Agreement State's or Licensing State's regulations equivalent to He-P 4031;
- (7) Identify in the report required by He-P 4032.03(k)(5) or (6), the following:
 - a. The identity of each general licensee by name and mailing address, and address location of use;
 - b. The name, title, and telephone number of the individual identified by the general licensee as having knowledge of and authority to take required actions to ensue compliance with the applicable rules, and who may constitute a point of contact between the agency and the general licensee;
 - c. The date of transfer;
 - d. The type, model, and serial number of the device transferred;
 - e. The quantity and type of radioactive material contained in the device;
 - f. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the same information for both the intended user and each intermediate person, and clearly designate the intermediate person(s); and
 - g. The identity of the specific licensee submitting the report, including the license number of the specific licensee;
- (8) Report to the NRC, on NRC Form 653 "Transfers of Industrial Devices Report" or in a clear and legible report containing all data required by the form, all receipts of such devices from persons authorized under the NRC general license in section 31.5 of 10 CFR 31;
- (9) Report to the responsible Agreement State or Licensing State agency all receipts of such devices from persons authorized under a general license in the Agreement State's or Licensing State's regulations equivalent to He-P 4031.04;
- (10) Include in the report for devices received from persons generally licensed under either Agreement State, Licensing State, or NRC regulations equivalent to He-P 4031.04:

- a. The identity of the general licensee by name and address;
 - b. The type, model number, and serial number of the device received;
 - c. The date of receipt, and, in the case of devices not initially transferred by the reporting licensee, the name of the manufacturer or initial transferor; and
 - d. The identity of the specific licensee submitting the report, including the license number of the specific licensee;
- (11) Report to the responsible Agreement State or Licensing State agency or the NRC, the identity of the general licensee, the device, and the changes to information on the device label, if the licensee authorized under He-P 4032.03 makes changes to a device possessed by a general licensee authorized under regulations equivalent to He-P 4031.04(b), such that the label must be changed to update required information;
- (12) Report to the NRC, if no transfers have been made to or from NRC general licensees during the reporting period;
- (13) Report to the Agreement State or Licensing State agency if no transfers have been made to or from that Agreement State or Licensing State during the reporting period;
- (14) Keep records showing:
- a. The name of each general licensee or intermediate person to whom transfers of radioactive material in devices for use pursuant to the general license provided in He-P 4031.04, or equivalent regulations of the NRC, an Agreement State or Licensing State have been made;
 - b. Address of each general licensee or intermediate person to whom transfers of radioactive material in devices for use pursuant to the general license provided in He-P 4031.04, or equivalent regulations of the NRC, an Agreement State or Licensing State have been made;
 - c. The point of contact for each general licensee or intermediate person to whom transfers of radioactive material in devices for use pursuant to the general license provided in He-P 4031.04, or equivalent regulations of the NRC, an Agreement State or Licensing State have been made;
 - d. The date of each transfer of radioactive material;
 - e. Identification of the radioisotope contained in each device transferred;
 - f. The quantity of radioactivity in each device transferred;
 - g. The identity of any intermediate person; and
 - h. The requirements of He-P 4031 specifics for this transfer;
- (15) Cover each calendar quarter in its reports submitted under He-P 4032;

(16) Submit reports required in He-P 4032.03 within 30 days of the end of the calendar quarter; and

(17) Indicate in reports required in He-P 4032.03, the period covered by the report.

(l) Each person licensed under He-P 4032.03 shall maintain all information concerning transfers and receipts of devices that supports the reports required by this section.

(m) Records required by (l) shall be maintained for a period of 3 years following the date of the recorded event.

He-P 4032.04 Licensing the Introduction of Radioactive Material Into Products in Exempt Concentrations.

(a) In addition to the requirements in He-P 4030.09, a specific license authorizing the introduction of radioactive material into a product or material owned by or in the possession of the licensee or another to be transferred to persons exempt under paragraph He-P 4030.03 shall be issued if:

(1) The applicant submits:

- a. A description of the product or material into which the radioactive material will be introduced;
- b. The intended use of the radioactive material and the product into which it is introduced;
- c. The method of introduction;
- d. The initial concentration of the radioactive material in the product or material;
- e. The control methods to assure that no more than the specified concentration is introduced into the product or material;
- f. The estimated time interval between introduction and transfer of the product or material; and
- g. The estimated concentration of the radioactive material in the product or material at the time of transfer by the licensee; and

(2) The applicant provides reasonable assurance that:

- a. The concentrations of radioactive material at the time of transfer will not exceed the concentration in He-P 4093;
- b. That reconcentration of the radioactive material in concentrations exceeding those in He-P 4093 is not likely;
- c. That use of lower concentrations is not feasible; and
- d. That the product or material is not likely to be incorporated in any food, beverage, cosmetic, drug, or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

(b) Each person licensed under He-P 4032.04 shall file an annual report with the DHHS/~~BR~~RHS.

(c) The annual report in (b) above shall:

(1) Identify:

- a. The type and quantity of each product or material into which radioactive material has been introduced during the reporting period;
- b. Name and address of the person who owned or possessed the product or material, into which radioactive material has been introduced, at the time of introduction;
- c. The type and quantity of radionuclide introduced into each such product or material; and
- d. The initial concentrations of the radionuclide in the product or material at time of transfer of the radioactive material by the licensee;

(2) Indicate if no transfers of radioactive material have been made pursuant to He-P 4032.04 during the reporting period;

(3) Cover the year ending June 30; and

(4) Be filed within 30 days thereafter.

He-P 4032.05 Manufacture, Preparation, ~~and-or~~ Distribution of Radiopharmaceuticals Containing ~~Radioactive-Byproduct~~ Material for Medical Use Under Group Licenses.

(a) An application for a specific license to manufacture, prepare, ~~and-or~~ distribute radiopharmaceuticals containing ~~radioactive-byproduct~~ material for use by persons licensed pursuant to He-P 4035 shall be approved if:

(1) The applicant satisfies the requirements specified in He-P 4030.09;

(2) The applicant submits evidence that the applicant is at least one of the following:

- a. Registered ~~or licensed~~ with the U.S. Food and Drug Administration (FDA) as ~~a-the owner or operator of a drug manufacturer~~reestablishment that engages in the manufacture, preparation, propagation, compounding, or processing of a drug under 21 CFR 207.20(a);
- b. Registered or licensed with a state agency as a drug manufacturer;
- c. Licensed as a pharmacy by a State Board of Pharmacy; ~~or~~
- d. Operating as a nuclear pharmacy within a medical institution; or
- e. A Positron Emission Tomography (PET) drug production facility registered with DHHS/RHS.

(3) The applicant submits the following information:

- a. The radionuclide;
 - b. The chemical and physical form;
 - c. The packaging including maximum activity per package; and
 - d. The shielding provided by the packaging of the radioactive material shall be appropriate for safe handling and storage of radiopharmaceuticals by group licensees; and
- (4) The applicant satisfies the following labeling requirements:
- a. A label is affixed to each transport radiation shield of a radioactive drug to be transferred for commercial distribution;
 - b. The label shall include:
 - 1. The radiation symbol and the words “CAUTION, RADIOACTIVE MATERIAL” or “DANGER, RADIOACTIVE MATERIAL”;
 - 2. The name of the radioactive drug or its abbreviation;
 - 3. The quantity of radioactivity at a specified date and time; and
 - 4. For radioactive drugs with a half-life greater than 100 days, the time may be omitted; and
 - c. A label is affixed to each syringe, vial, or other container used to hold a radioactive drug to be transferred for commercial distribution.
 - d. The label required in He-P 4032.05 (a)(4)c. shall include:
 - 1. The radiation symbol and the words “CAUTION, RADIOACTIVE MATERIAL” or “DANGER, RADIOACTIVE MATERIAL”; and
 - 2. An identifier that ensures that the syringe, vial, or other container can be correlated with the information on the transport radiation shield label; and
 - e. The labels, leaflets or brochures required by He-P 4032.03(a)(4) shall be in addition to the labeling required by the Food and Drug Administration (FDA), and shall be separate from or, if approved by the FDA may be combined with, the labeling required by FDA.
- (b) A licensee described by He-P 4032.01(a)(2)c. or d.:
- (1) May prepare radioactive drugs for medical use, provided that the radioactive drug is prepared by either an authorized nuclear pharmacist, as specified in He-P 4032.05(b)(2) and (c), or an individual under the supervision of an authorized nuclear pharmacist, as specified in He-P 4035;
 - (2) May allow a pharmacist to work as an authorized pharmacist if:
 - a. This individual qualifies as an authorized nuclear pharmacist as defined in He-P 4035;

b. This individual meets the requirements specified in He-P 4035 and the licensee has received an approved license amendment identifying this individual as an authorized nuclear pharmacist; or

c. This individual is designated as an authorized nuclear pharmacist in accordance with He-P 4032.05(c).

(3) May designate a pharmacist as defined in He-P ~~40034035.03~~(eye) as an authorized nuclear pharmacist if: ~~the individual is identified as of December 2, 1994, as an "authorized user" on a nuclear pharmacy license issued by the DHHS/BRH under this part.~~

a. The individual was a nuclear pharmacist preparing only radioactive drugs containing accelerator-produced radioactive material, and

b. The individual practiced at a pharmacy at a Government agency or Federally recognized Indian Tribe before November 30, 2007 or at all other pharmacies before August 8, 2009, or an earlier date as noticed by the NRC.

(4) Shall provide to the DHHS/~~BRH-RHS~~ a copy of each individual's certification by ~~the Board of Pharmaceutical Specialties~~a specialty board whose certification process has been recognized by; the NRC or an Agreement State as specified in He-P 4035.74(a) with the written attestation signed by a preceptor as required by He-P 4035.74(b)(2); or the Commission or Agreement State license or Licensing State license, or the permit issued by a licensee of broad scope, or the authorization from a commercial nuclear pharmacy authorized to list its own authorized nuclear pharmacist, and a copy of the state pharmacy licensure or registration, no later than 30 days after the date that the licensee allows pursuant to He-P 4032.05(b)(2)a. and (b)(2)c., the individual to work as an authorized nuclear pharmacist.

(c) The actions authorized in He-P 4032.05(b)(1) and (b)(2) are permitted in spite of more restrictive language in license conditions.

(d) A licensee authorized under He-P 4032.05 shall:

(1) Possess and use instrumentation to measure the radioactivity of radioactive drugs;

(2) Have procedures for use of the instrumentation;

(3) Measure, by direct measurement or by combination of measurements and calculations, the amount of radioactivity in dosages of alpha-, beta-, or photon-, emitting radioactive drugs prior to transfer for commercial distribution; and

(4) Perform tests before initial use, periodically, and following repair, on each measurement instrument for accuracy, linearity, and geometry dependence, as appropriate for the use of the instrument, and make adjustments when necessary; and

(5) Check each measurement instrument for constancy and proper operation at the beginning of each day of use.

(e) Nothing in this section relieves the licensee from complying with applicable FDA, other federal, and state requirements governing radioactive drugs.

He-P 4032.06 Manufacture and Distribution of Generators or Reagent Kits for Preparation of Radiopharmaceuticals Containing Radioactive Material.

(a) An application for a specific license to manufacture and distribute generators or reagent kits containing radioactive material or reagent kits not containing radioactive material used for preparation of radiopharmaceuticals by persons licensed pursuant to He-P 4035 shall be approved if:

- (1) The applicant satisfies the general requirements specified in He-P 4030.09;
- (2) The applicant submits evidence that:
 - a. The generator or reagent kit is to be manufactured, labeled, and packaged in accordance with the Federal Food, Drug, and Cosmetic Act or the Public Health Service Act, such as a new drug application (NDA) approved by the Food and Drug Administration (FDA), a biological product license issued by FDA, or a "Notice of Claimed Investigational Exemption for a New Drug" (IND) that has been accepted by the FDA; or
 - b. The manufacture and distribution of the generator or reagent kit are not subject to the Federal Food, Drug, and Cosmetic Act and the Public Health Service Act;
- (3) The applicant submits the following information:
 - a. The radionuclide;
 - b. The chemical and physical form;
 - c. The packaging including maximum activity per package; and
 - d. The shielding provided by the packaging of the radioactive material contained in the generator or reagent kit;
- (4) The label affixed to the generator or reagent kit contains information on the radionuclide, quantity, and date of assay; and
- (5) The label affixed to the generator or reagent kit, or the leaflet or brochure which accompanies the generator or reagent kit, contains:
 - a. Radiation safety information on the procedures to be followed and the equipment and shielding to be used in eluding the generator or processing radioactive material with the reagent kit; and
 - b. A statement that this generator or reagent kit is approved for use by persons licensed by the DHHS/~~BRH-RHS~~ pursuant to He-P 4035 or under equivalent licenses of the U.S. Nuclear Regulatory Commission, an Agreement State or Licensing State.

(b) The labels, leaflets, or brochures required by He-P 4032.06(a)(4) and (a)(5) are in addition to the labeling required by FDA and they may be separate from, or if approved by the FDA may be combined with, the labeling required by FDA.

He-P 4032.07 Manufacture and Distribution of Sources or Devices Containing Radioactive-Byproduct Material for Medical Use.

(a) An application for a specific license to manufacture and distribute sources and devices containing radioactive-byproduct material to persons licensed pursuant to He-P 4035 for use as a calibration, transmission, or reference source, or sources for the uses in ~~Group VI of brachytherapy, or sealed sources for diagnosis, or sealed sources for the use in teletherapy in accordance with~~ He-P 4035 may be approved if:

- (1) The applicant satisfies the general requirements in He-P 4030.09;
- (2) The applicant submits the following radiation safety information for each type of source or device:
 - a. The radioactive-byproduct material contained, its chemical and physical form, and amount;
 - b. Details of design and construction of the source or device;
 - c. Procedures for, and results of, prototype tests to demonstrate that the source or device shall maintain its integrity under stresses likely to be encountered in normal use and accidents;
 - d. For devices containing radioactive-byproduct material, the radiation profile of a prototype device;
 - e. Details of quality control procedures to assure that production sources and devices meet the standards of the design and prototype tests;
 - f. Procedures and standards for calibrating sources and devices;
 - g. Legend and methods for labeling sources and devices for their radioactive content; and
 - h. Instruction for handling and storing the source or device from the radiation safety standpoint, as follows:
 1. These instructions shall be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device; or
 2. If the instructions are too lengthy for such label, they may be summarized on the label and printed in detail on a brochure which is referenced on the label; and
- (3) The label affixed to the source or device, or to the permanent storage container for the source or device, contains the following information:
 - a. The radionuclide;
 - b. Quantity;
 - c. Date of assay;
 - d. A statement that the (name of source or device) is licensed by the DHHS/~~BRH-RHS~~ for distribution to persons licensed pursuant to He-P 4035

group VI or under equivalent licenses of the U.S. Nuclear Regulatory Commission, an Agreement State, or Licensing State; and

e. For sources which do not require long term storage, the label may be on a leaflet or brochure which accompanies the source.

(b) In the event the applicant desires that the source or device be required to be tested for leakage of radioactive material at intervals longer than 6 months:

(1) The application shall include sufficient information to demonstrate that such longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source; and

(2) In determining the acceptable interval for test of leakage of radioactive material, the DHHS/~~BRH~~RHS will consider information that includes, but is not limited to:

- a. Primary containment (source capsule);
- b. Protection of primary containment;
- c. Method of sealing containment;
- d. Containment construction materials;
- e. Form of contained radioactive material;
- f. Maximum temperature withstood during prototype tests;
- g. Maximum pressure withstood during prototype tests;
- h. Maximum quantity of contained radioactive material;
- i. Radiotoxicity of contained radioactive material; and
- j. Operating experience with identical sources or devices or similarly designed and constructed sources or devices.

He-P 4032.08 Special Requirements for the Manufacture, Assembly, or Repair of Luminous Safety Devices for Use in Aircraft. An application for a specific license to manufacture, assemble, or repair luminous safety devices containing tritium or promethium-147 for use in aircraft, for distribution to persons generally licensed under He-P 4031.02(h) may be approved if:

- (a) The applicant satisfies the general requirements specified in He-P 4030.09; and
- (b) The applicant satisfies the requirements of 10 CFR 32.53, 32.54, 32.55 and 32.56 and 32.101.

He-P 4032.09 Licensing the Distribution of Radioactive Material in Exempt Quantities.

(a) An application for specific license to distribute radioactive material other than source or byproduct material to persons exempted from licensing pursuant to He-P 4030.08 may be approved if:

- (1) The radioactive material is not contained in any food, beverage, cosmetic, drug, or other commodity designed for ingestion or inhalation by, or application to, a human being;
- (2) The radioactive material is in the form of processed chemical elements, compounds, or mixtures, tissue samples, bioassay samples, counting standards, plated or encapsulated sources, or similar substances, identified as radioactive and to be used for its radioactive properties, but is not incorporated into any manufactured or assembled commodity, product, or device intended for commercial distribution; and
- (3) The applicant submits copies of prototype labels and brochures and the DHHS/~~BRH~~RHS approves such labels and brochures.

(b) The license issued under He-P 4032.09 is subject to the following conditions:

- (1) No more than 10 exempt quantities provided the sum of the fractions shall not exceed one which may be composed of fractional parts shall be sold or transferred in any single transaction;
- (2) Each exempt quantity shall be separately and individually packaged;
- (3) No more than 10 packaged exempt quantities shall be contained in any outer package for transfer to persons exempt pursuant to He-P 4030.03;
- (4) The outer package shall be such that the dose rate at the external surface of the package does not exceed 0.5 millirem per hour;
- (5) The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label which:
 - a. Identifies the radionuclide and the quantity of radioactivity; and
 - b. Bears the words "Radioactive Material"; and
- (6) In addition to the labeling information required by He-P 4032.09, the label affixed to the immediate container, or an accompanying brochure, shall:
 - a. State that the contents are exempt from Licensing State requirements;
 - b. Bear the words "Radioactive Material – Not for Human Use – Introduction into Foods, Beverages, Cosmetics, Drugs, or Medicinal, or into Products Manufactured for Commercial Distribution is Prohibited – Exempt Quantities Should Not be Combined"; and
 - c. Set forth additional radiation safety precautions and instructions relating to the handling, use, storage, and disposal of the radioactive material.

(c) Each person licensed under He-P 4032.09 shall maintain records identifying, by name and address, each person to whom radioactive material is transferred for use under He-P 4030.03 or the equivalent rules of an Agreement State or Licensing State, and the kinds and quantities of radioactive material transferred.

(d) An annual summary report shall be filed with the DHHS/~~BRH~~RHS, as follows:

- (1) Each report shall state the total quantity of each radionuclide transferred under the specific license;
- (2) Each report shall cover the year ending June 30;
- (3) Each report shall be filed within 30 days after the end of the quarter; and
- (4) If no transfers of radioactive material have been made pursuant to this section during the reporting period, the report shall so indicate.

He-P 4032.10 Licensing the Incorporation of Radioactive Material Other than Source or Byproduct Material into Gas and Aerosol Detectors.

(a) In addition to the requirements set forth in He-P 4030.09, an application for a specific license authorizing the incorporation of radioactive material other than source or byproduct material into gas and aerosol detectors to be distributed to persons exempt under He-P 4030.03 shall only be approved if the application satisfies requirements equivalent to those contained in 10 CFR 32.26.

(b) The maximum quantity of radium-226 in each device shall not exceed 0.1 microcurie.

He-P 4032.11 Special Requirements for License to Manufacture, Import or Initially Distribute Sealed Sources or Devices Containing Sealed Sources to Persons Having a Specific License.

(a) An application for license to manufacture, import (NARM only) or initially distribute sealed sources or devices containing sealed sources for initial transfer to persons having a specific license to receive such sealed sources or devices shall be approved subject to the following conditions:

- (1) The applicant satisfies the general requirements specified in He-P 4030.09; and
- (2) The licensee subject to He-P 4032.11 shall not transfer a sealed source or device containing a sealed source to any person except in accordance with the requirements of He-P 4030.16.

(b) Any manufacture, importer of NARM or initial distributor of a sealed source or device containing a sealed source whose product is intended for use under a specific license may submit a request to the DHHS/~~BRH~~RHS for evaluation of radiation safety information about its product and for filing an evaluation sheet in the U.S. Department of Health and Human Services "Radioactive Material Reference Manual" or in the U.S. Nuclear Regulatory Commission "Registry of Radioactive Sealed Sources and Devices", as follows:

- (1) A request for evaluation of a sealed source or device containing a sealed source shall be submitted in duplicate and shall include information required by He-P 4032.11(b)(2) or (3), as applicable, demonstrating that the radiation safety properties of such source or device will not endanger public health and safety or property;

(2) A request for evaluation of a sealed source shall include the following radiation safety information:

- a. Proposed uses for the sealed source;
- b. Chemical and physical form and maximum quantity of radioactive material in the sealed source;
- c. Details of design of the sealed source, radiation and its shielding including blueprints, engineering drawings or annotated drawings;
- d. Details of construction of the sealed source including a description of materials used in construction;
- e. Radiation profile of a prototype sealed source;
- f. Procedures for and results of prototype testing;
- g. Details of quality control procedures to be followed in manufacture;
- h. A description or facsimile of labeling to be affixed to the sealed source;
- i. Leak testing procedures; and
- j. Any additional information, including experimental studies and tests, required by the DHHS/~~BRH-RHS~~ to facilitate a determination of the safety of the sealed source, as required by He-P 4030.09;

(3) A request for evaluation of a device containing a sealed source shall include the following radiation safety information:

- a. Proposed uses for the device;
- b. Manufacturer, model number, chemical and physical form and maximum quantity of radioactivity in the sealed source or sources to be used in the device;
- c. Details of design of the sealed source, including blueprints, engineering drawings or annotated drawings;
- d. Details of construction of the sealed source including a description of materials used in construction;
- e. Radiation profile of a prototype device;
- f. Procedures for and results of prototype testing;
- g. Details of quality control procedures to be followed in manufacture;
- h. A description or facsimile of labeling to be affixed to the device;
- i. Leak testing procedures;
- j. A description of potential hazards in installation, service, manufacture, handling, use, and operation of the device;
- k. Information about installation, service, and maintenance procedures;

- l. Handling, operating, and safety instructions; and
 - m. Any additional information, including experimental studies and tests, required by the DHHS/~~BRH-RHS~~ to facilitate a determination of the safety of the device as required by He-P 4030.09; and
- (4) The person submitting a request for evaluation of a product shall manufacture and distribute the product in accordance with:
- a. The statements and representations, including the quality control program, described in the request; and
 - b. The provisions of the evaluation sheet prepared by the DHHS/~~BRH-RHS~~ and submitted to the U.S. Department of Health and Human Services, for filing in the "Radioactive Material Reference Manual" or in the U.S. Nuclear Regulatory Commission, for filing in the "Registry of Radioactive Sealed Sources and Devices."
- (c) When evaluating a sealed source or device, the DHHS/~~BRH-RHS~~ will apply the radiation safety criteria described in 10 CFR 32.210(d), published January 1, 1993, exclusive of subsequent amendments or editions.

He-P 4032.12 Prohibition. No person shall introduce ~~radioactive byproduct~~ material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under He-P ~~4032.12~~4030.03 or equivalent regulations of an Agreement State, the Nuclear Regulatory Commission or Licensing State, except in accordance with a license issued pursuant to He-P 4032.04 or the general license provided in He-P 4030.18.

He-P 4032.13 Serialization of Nationally Tracked Sources.

(a) Each licensee who manufactures a nationally tracked source after February 6, 2007 shall assign a unique serial number to each nationally tracked source. Serial numbers must be composed only of alpha-numeric characters.

He-P 4032.14 Special Requirements for License to Manufacture or Initially Transfer Calibration Sources Containing Americium-241 or Radium-226 for Distribution to Persons Generally Licensed Under He-P 4031.04(r).

(a) An application for a specific license to manufacture or initially transfer calibration or reference sources containing americium-241 or radium-226 for distribution to persons generally licensed under He-P 4031.04(r), will be approved if:

(1) The applicant satisfies the general requirements of He-P 4030.09;

(2) The applicant submits sufficient information regarding each type of calibration or reference source pertinent to evaluation of the potential radiation exposure, including:

a. Chemical and physical form and maximum quantity of americium-241 or radium-226 in the source;

b. Details of construction and design;

c. Details of the method of incorporation and binding of the americium-241 or radium-226 in the source;

d. Procedures for and results of prototype testing of sources, which are designed to contain more than 185 Bq (0.005 microcurie) of americium-241 or radium-226, to demonstrate that the americium-241 or radium-226 contained in each source will not be released or be removed from the source under normal conditions of use;

e. Details of quality control procedures to be followed in manufacture of the source;

f. Description of labeling to be affixed to the source or the storage container for the source; and

g. Any additional information, including experimental studies and tests, required by the DHHS/RHS to facilitate a determination of the safety of the source.

(3) Each source will contain no more than 185 kilobecquerel (5 microcurie) of americium-241 or radium-226; and

(4) The DHHS/RHS determines, with respect to any type of source containing more than 185 becquerel (0.005 microbecquerel) of americium-241 or radium-226, that:

a. The method of incorporation and binding of the americium-241 or radium-226 in the source is such that the americium-241 or radium-226 will not be released or be removed from the source under normal conditions of use and handling of the source; and

b. The source has been subjected to and has satisfactorily passed the prototype tests prescribed by He-P 4032.14(b).

(b) An applicant for a license pursuant to He-P 4032.14(a) shall, for any type of source which is designed to contain more than 185 becquerel (0.005 microcurie) of americium-241 or radium-226, conduct prototype tests, in the order listed, on each of five prototypes of such source, which contains more than 185 becquerel (0.005 microcurie) of americium-241 or radium-226, as follows:

(1) Initial measurement. The quantity of radioactive material deposited on the source shall be measured by direct counting of the source;

(2) Dry wipe test. The entire radioactive surface of the source shall be wiped with filter paper with the application of moderate finger pressure. Removal of radioactive material from the source shall be determined by measuring the radioactivity on the filter paper or by direct measurement of the radioactivity on the source following the dry wipe;

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(3) Wet wipe test. The entire radioactive surface of the source shall be wiped with filter paper, moistened with water, with the application of moderate finger pressure. Removal of radioactive material from the source shall be determined by measuring the radioactivity on the filter paper after it has dried or by direct measurement of the radioactivity on the source following the wetwipe;

(4) Water soak test. The source shall be immersed in water at room temperature for a period of 24 consecutive hours. The source shall then be removed from the water. Removal of radioactive material from the source shall be determined by direct measurement of the radioactivity on the source after it has dried or by measuring the radioactivity in the residue obtained by evaporation of the water in which the source was immerse;

(5) Dry wipe test. On completion of the preceding test in this section, the dry wipe test described in He-P 4032.14(b)(2) shall be repeated; and

(6) Observations. Removal of more than 185 becquerel (0.005 microcurie) of radioactivity in any test prescribed by this section shall be cause for rejection of the source design. Results of prototype tests submitted to the DHHS/RHS shall be given in terms of radioactivity in microcuries and percent of removal from the total amount of radioactive material deposited on the source.

(c) Labeling of devices. Each person licensed under He-P 4032.14 shall affix to each source, or storage container for the source, a label which shall contain sufficient information relative to safe use and storage of the source and shall include the following statement or a substantially similar statement which contains the information called for in the following statement:

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(1) "The receipt, possession, use and transfer of this source, Model ____, Serial No. ____, are subject to a general license and the regulations of the DHHS/RHS, the NRC or an Agreement State. Do not remove this label. CAUTION-- RADIOACTIVE MATERIAL-- THIS SOURCE CONTAINS (AMERICIUM-241) OR (RADIUM-226). DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE (Name of Manufacturer or Transferor)."

(d) Leak testing of each source. Each person licensed under He-P 4032.14 shall perform a dry wipe test upon each source containing more than 3.7 kilobecquerel (0.1 microcurie) of americium-241 or radium-226 prior to transferring the source to a general licensee under He-P 4031.04(r). This test shall be performed by wiping the entire radioactive surface of the source with a filter paper with the application of moderate finger pressure. The radioactivity on the paper shall be measured by using radiation detection instrumentation capable of detecting 185 becquerel (0.005 microcurie) of americium-241 or radium-226. If any such test discloses more than 185 becquerel (0.005 microcurie) of radioactive material, the source shall be deemed to be leaking or losing americium-241 or radium-226 and shall not be transferred to a general licensee under He-P 4031.04(r) or equivalent regulations of an Agreement State.

He-P 4032.15 Manufacture and Distribution of Radioactive Material for Certain In Vitro Clinical or Laboratory Testing Under General License. An application for a specific license to manufacture or distribute radioactive material for use under the general license of He-P 4031.06 will be approved if:

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(a) The applicant satisfies the general requirements specified in He-P 4030.09;

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

(1) Carbon-14 in units not exceeding 370 kilobecquerel (10 microcurie) each;

(2) Cobalt-57 in units not exceeding 370 kilobecquerel (10 microcurie) each;

(3) Hydrogen-3 (tritium) in units not exceeding 1.85 megabecquerel (50 microcurie) each;

(4) Iodine-125 in units not exceeding 370 kilobecquerel (10 microcurie) each;

(5) Mock Iodine-125 in units not exceeding 1.85 kilobecquerel (0.05 microcurie) of iodine-129 and 185 becquerel (0.005 microcurie) of americium-241 each;

(6) Iodine-131 in units not exceeding 370 kilobecquerel (10 microcurie) each;

(7) Iron-59 in units not exceeding 740 kilobecquerel (20 microcurie) each; and

(8) Selenium-75 in units not exceeding 370 kilobecquerel (10 microcurie) each.

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

(1) Identifying the radioactive contents as to chemical form and radionuclide, and indicating that the amount of radioactivity does not exceed 370 kiloBq (10 microcurie) of iodine-125, iodine-131, carbon-14, cobalt-57, or selenium-75; 1.85 megaBq (50 microcurie) of hydrogen-3 (tritium); 740 kiloBq (20 microcurie) of iron-59; or Mock Iodine-125 in units not exceeding 1.85 kiloBq (0.05 microcurie) of iodine-129 and 185 becquerel (0.005 microcurie) of americium-241 each; and

(2) Displaying the radiation caution symbol described in D.1901a, and the words, "CAUTION, RADIOACTIVE MATERIAL", and "Not for Internal or External Use in Humans or Animals".

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

“This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories or hospitals and only for *in vitro* clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to the regulations and a general license of the DHHS/RHS or the NRC or of a State with which the NRC has entered into an agreement for the exercise of regulatory authority. (Name of Manufacturer)”

(e) The label affixed to the unit, or the leaflet or brochure which accompanies the package, contains adequate information as to the precautions to be observed in handling and storing such radioactive material. In the case of the Mock Iodine-125 reference or calibration source, the information accompanying the source shall also contain directions to the licensee regarding the waste disposal requirements set out in He-P 4023.01 of these rules.

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He-P 4033.07 License Quantities for License of Broad Scope. License quantities for licenses of broad scope shall be as described in Table 4033.1.

Table 4033.1 Quantities of Radioactive-Byproduct Material for Licenses of Broad Scope

<u>Radioactive-Byproduct</u> Material	Column 1 (curies)	Column 2 (curies)
Antimony-122	1.0	0.01
Antimony-124	1.0	0.01
Antimony-125	1.0	0.01
Arsenic-73	10.0	0.1
Arsenic-74	1.0	0.01
Arsenic-76	1.0	0.01
Arsenic-77	10.0	0.1
Barium-131	10.0	0.1
Barium-140	1.0	0.01
Beryllium-7	10.0	0.1
Bismuth-210	0.1	0.001
Bromine-82	10.0	0.1
Cadmium-109	1.0	0.01
Cadmium-115m	1.0	0.01
Cadmium-115	10.0	0.1
Calcium-45	1.0	0.01
Calcium-47	10.0	0.1
Carbon-14	100.0	1.0
Cerium-141	10.0	0.1
Cerium-143	10.0	0.1
Cerium-144	0.1	0.001
Cesium-131	100.0	1.0
Cesium-134m	100.0	1.0
Cesium 134	0.1	0.001
Cesium-135	1.0	0.01
Cesium-136	10.0	0.1
Cesium-137	0.1	0.001
Chlorine-36	1.0	0.01
Chlorine-38	100.0	1.0
Chromium-51	100.0	1.0
Cobalt-57	10.0	0.1
Cobalt-58m	100.0	1.0
Cobalt-58	1.0	0.01
Cobalt-60	0.1	0.001
Copper-64	10.0	0.1
Dysprosium-165	100.0	1.0
Dysprosium-166	10.0	0.1
Erbium-169	10.0	0.1
Erbium-171	10.0	0.1
Europium-152 (9.2 h)	10.0	0.1
Europium-152 (13 y)	0.1	0.001
Europium-154	0.1	0.001
Europium-155	1.0	0.01
Fluorine-18	100.0	1.0

<u>Radioactive-Byproduct</u> Material	Column 1 (curies)	Column 2 (curies)
Gadolinium-153	1.0	0.01
Gadolinium-159	10.0	0.1
Gallium-72	10.0	0.1
Germanium-71	100.0	1.0
Gold-198	10.0	0.1
Gold-199	10.0	0.1
Hafnium-181	1.0	0.01
Holmium-166	10.0	0.1
Hydrogen-3	100.0	1.0
Indium-113m	100.0	1.0
Indium-114m	1.0	0.01
Indium-115m	100.0	1.0
Indium-115	1.0	0.01
Iodine-125	0.1	0.001
Iodine-126	0.1	0.001
Iodine-129	0.1	0.001
Iodine-131	0.1	0.001
Iodine-132	10.0	0.1
Iodine-133	1.0	0.01
Iodine-134	10.0	0.1
Iodine-135	1.0	0.01
Iridium-192	1.0	0.01
Iridium-194	10.0	0.1
Iron-55	10.0	0.1
Iron-59	1.0	0.01
Krypton-85	100.0	1.0
Krypton-87	10.0	0.1
Lanthanum-140	1.0	0.01
Lutetium-177	10.0	0.1
Manganese-52	1.0	0.01
Manganese-54	1.0	0.01
Manganese-56	10.0	0.1
Mercury-197m	10.0	0.1
Mercury-197	10.0	0.1
Mercury-203	1.0	0.01
Molybdenum-99	10.0	0.1
Neodymium-147	10.0	0.1
Neodymium-149	10.0	0.1
Nickel-59	10.0	0.1
Nickel-63	1.0	0.01
Nickel-65	10.0	0.1
Niobium-93m	1.0	0.01
Niobium-95	1.0	0.01
Niobium-97	100.0	1.0
Osmium-185	1.0	0.01
Osmium-191m	100.0	1.0
Osmium-191	10.0	0.1
Osmium-193	10.0	0.1
Palladium-103	10.0	0.1

<u>Radioactive-Byproduct</u> Material	Column 1 (curies)	Column 2 (curies)
Palladium-109	10.0	0.1
Phosphorus-32	1.0	0.01
Phosphorus-33	10.0	0.1
Platinum-191	10.0	0.1
Platinum-193m	100.0	1.0
Platinum-193	10.0	0.1
Platinum-197m	100.0	1.0
Platinum-197	10.0	0.1
Polonium-210	0.01	0.0001
Potassium-42	1.0	0.01
Praseodymium-142	10.0	0.1
Praseodymium-143	10.0	0.1
Promethium-147	1.0	0.01
Promethium-149	10.0	0.1
Radium-226	0.01	0.0001
Rhenium-186	10.0	0.1
Rhenium-188	10.0	0.1
Rhodium-103m	1,000.0	10.0
Rhodium-105	10.0	0.1
Rubidium-86	1.0	0.01
Rubidium-87	1.0	0.01
Ruthenium-97	100.0	1.0
Ruthenium-103	1.0	0.01
Ruthenium-105	10.0	0.1
Ruthenium-106	0.1	0.001
Samarium-151	1.0	0.01
Samarium-153	10.0	0.1
Scandium-46	1.0	0.01
Scandium-47	10.0	0.1
Scandium-48	1.0	0.01
Selenium-75	1.0	0.01
Silicon-31	10.0	0.1
Silver-105	1.0	0.01
Silver-110m	0.1	0.001
Silver-111	10.0	0.1
Sodium-22	0.1	0.001
Sodium-24	1.0	0.01
Strontium-85m	1,000.0	10.0
Strontium-85	1.0	0.01
Strontium-89	1.0	0.01
Strontium-90	0.01	0.0001
Strontium-91	10.0	0.1
Strontium-92	10.0	0.1
Sulphur-35	10.0	0.1
Tantalum-182	1.0	0.01
Technetium-96	10.0	0.1
Technetium-97m	10.0	0.1
Technetium-97	10.0	0.1
Technetium-99m	100.0	1.0

<u>Radioactive-Byproduct</u> Material	Column 1 (curies)	Column 2 (curies)
Technetium-99	1.0	0.01
Tellurium-125m	1.0	0.01
Tellurium-127m	1.0	0.01
Tellurium-127	10.0	0.1
Tellurium-129m	1.0	0.01
Tellurium-129	100.0	1.0
Tellurium-131m	10.0	0.1
Tellurium-132	1.0	0.01
Terbium-160	1.0	0.01
Thallium-200	10.0	0.1
Thallium-201	10.0	0.1
Thallium-202	10.0	0.1
Thallium-204	1.0	0.01
Thulium-170	1.0	0.01
Thulium-171	1.0	0.01
Tin-113	1.0	0.01
Tin-125	1.0	0.01
Tungsten-181	1.0	0.01
Tungsten-185	1.0	0.01
Tungsten-187	10.0	0.1
Vanadium-48	1.0	0.01
Xenon-131m	1,000.0	10.0
Xenon-133	100.0	1.0
Xenon-135	100.0	1.0
Ytterbium-175	10.0	0.1
Yttrium-90	1.0	0.01
Yttrium-91	1.0	0.01
Yttrium-92	10.0	0.1
Yttrium-93	1.0	0.01
Zinc-65	1.0	0.01
Zinc-69m	10.0	0.1
Zinc-69	100.0	1.0
Zirconium-93	1.0	0.01
Zirconium-95	1.0	0.01
Zirconium-97	1.0	0.01
Any <u>Radioactive-Byproduct</u> material other than source material, special nuclear material, or alpha emitting <u>radioactivebyproduct</u> material not listed above.	0.1	0.001

Source. (See Revision Note at part heading for He-P 4033) #6942, eff 2-1-99; ss by #8800, INTERIM eff 2-1-07, EXPIRED: 7-31-07

New. #8959, eff 8-7-07

~~Readopt He-P 4090, effective 9-20-03 (document #7959), cited and to read as follows:~~

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

~~Statutory Authority RSA 125 F:5, V; and RSA 125 F:7~~

He-P 4090 ANNUAL LIMITS ON INTAKE (ALI) AND DERIVED AIR CONCENTRATIONS (DAC) OF RADIONUCLIDES FOR OCCUPATIONAL EXPOSURE; EFFLUENT CONCENTRATIONS; CONCENTRATIONS FOR RELEASE TO SANITARY SEWERAGE

He-P 4090.01 Annual Limits on Intake (ALI) and Derived Air Concentrations (DAC) of Radionuclides For Occupational Exposure; Effluent Concentrations; Concentrations for Release To Sanitary Sewerage. The annual limits on intake (ALI) and the derived air concentrations (DAC) of radionuclides for occupational exposure; effluent concentration; concentrations for release to sanitary sewerage shall be in compliance with Table 4090.1 below:

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (µCi/ml)
			Oral Ingestion ALI (µCi)	Inhalation		Air (µCi/ml)	Water (µCi/ml)	
				ALI (µCi)	DAC (µCi/ml)			
1	Hydrogen-3	Water, DAC includes skin absorption	8E+4	8E+4	2E-5	1E-7	1E-3	1E-2
		Gas (HT or T ₂) Submersion ¹ ; Use above values as HT and T ₂ oxidize in air and in the body to HTO.						
4	Beryllium-7	W, all compounds except those given for Y	4E+4	2E+4	9E-6	3E-8	6E-4	6E-3
		Y, oxides, halides, and nitrates	-	2E+4	8E-6	3E-8	-	-
4	Beryllium-10	W, see ⁷ Be	1E+3 LLI wall (1E+3)	2E+2	6E-8	2E-10	-	-
		Y, see ⁷ Be	-	1E+1	6E-9	2E-11	-	-
6	Carbon-11 ²	Monoxide	-	1E+6	5E-4	2E-6	-	-
		Dioxide	-	6E+5	3E-4	9E-7	-	-
		Compounds	4E+5	4E+5	2E-4	6E-7	6E-3	6E-2
6	Carbon-14	Monoxide	-	2E+6	7E-4	2E-6	-	-
		Dioxide	-	2E+5	9E-5	3E-7	-	-
		Compounds	2E+3	2E+3	1E-6	3E-9	3E-5	3E-4
7	Nitrogen-13 ²	Submersion ¹	-	-	4E-6	2E-8	-	-
8	Oxygen-15 ²	Submersion ¹	-	-	4E-6	2E-8	-	-
9	Fluorine-18 ²	D, fluorides of H, Li, Na, K, Rb, Cs, and Fr	5E+4 St wall (5E+4)	7E+4	3E-5	1E-7	-	-
		W, fluorides of Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, As, Sb, Bi, Fe, Ru, Os, Co, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, V, Nb, Ta, Mn, Tc, and Re	-	9E+4	4E-5	1E-7	7E-4	7E-3
		Y, lanthanum fluoride	-	8E+4	3E-5	1E-7	-	-

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Initial Proposal 5/18/11 2

11	Sodium-22	D, all compounds	4E+2	6E+2	3E-7	9E-10	6E-6	6E-5
11	Sodium-24	D, all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
12	Magnesium-28	D, all compounds except those given for W W, oxides, hydroxides, carbides, halides, and nitrates	7E+2 -	2E+3 1E+3	7E-7 5E-7	2E-9 2E-9	9E-6 -	9E-5 -
13	Aluminum-26	D, all compounds except those given for W W, oxides, hydroxides, carbides, halides, and nitrates	4E+2 -	6E+1 9E+1	3E-8 4E-8	9E-11 1E-10	6E-6 -	6E-5 -
14	Silicon-31	D, all compounds except those given for W and Y W, oxides, hydroxides, carbides, and nitrates Y, aluminosilicate glass	9E+3 - -	3E+4 3E+4 3E+4	1E-5 1E-5 1E-5	4E-8 5E-8 4E-8	1E-4 - -	1E-3 - -
14	Silicon-32	D, see ³¹ Si LLI wall (3E+3) W, see ³¹ Si Y, see ³¹ Si	2E+3 - -	2E+2 - 1E+2 5E+0	1E-7 - 5E-8 2E-9	3E-10 - 2E-10 7E-12	- 4E-5 - -	- 4E-4 - -
15	Phosphorus-32	D, all compounds except phosphates given for W W, phosphates of Zn ²⁺ , S ²⁻ , Mg ²⁺ , Fe ³⁺ , Bi ³⁺ , and lanthanides	6E+2 -	9E+2 4E+2	4E-7 2E-7	1E-9 5E-10	9E-6 -	9E-5 -
15	Phosphorus-33	D, see ³² P W, see ³² P	6E+3 -	8E+3 3E+3	4E-6 1E-6	1E-8 4E-9	8E-5 -	8E-4 -
16	Sulfur-35	Vapor D, sulfides and sulfates except those given for W LLI wall (8E+3) W, elemental sulfur, sulfides of Sr, Ba, Ge, Sn, Pb, As, Sb, Bi, Cu, Ag, Au, Zn, Cd, Hg, W, and Mo. Sulfates of Ca, Sr, Ba, Ra, As, Sb, and Bi	- 1E+4 - 6E+3	1E+4 2E+4 -	6E-6 7E-6 -	2E-8 2E-8 -	- - 1E-4	- - 1E-3
17	Chlorine-36	D, chlorides of H, Li, Na, K, Rb, Cs, and Fr W, chlorides of lanthanides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Tc, and Re	2E+3 -	2E+3 2E+2	1E-6 1E-7	3E-9 3E-10	2E-5 -	2E-4 -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u> ALI (μCi)	<u>Inhalation</u> ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
17	Chlorine-38 ²	D, see ³⁶ Cl	2E+4 St wall (3E+4)	4E+4	2E-5	6E-8	-	-
		W, see ³⁶ Cl	-	5E+4	2E-5	6E-8	3E-4	3E-3
17	Chlorine-39 ²	D, see ³⁶ Cl	2E+4 St wall (4E+4)	5E+4	2E-5	7E-8	-	-
		W, see ³⁶ Cl	-	6E+4	2E-5	8E-8	5E-4	5E-3
18	Argon-37	Submersion ¹	-	-	1E+0	6E-3	-	-
18	Argon-39	Submersion ¹	-	-	2E-4	8E-7	-	-
18	Argon-41	Submersion ¹	-	-	3E-6	1E-8	-	-
19	Potassium-40	D, all compounds	3E+2	4E+2	2E-7	6E-10	4E-6	4E-5
19	Potassium-42	D, all compounds	5E+3	5E+3	2E-6	7E-9	6E-5	6E-4
19	Potassium-43	D, all compounds	6E+3	9E+3	4E-6	1E-8	9E-5	9E-4
19	Potassium-44 ²	D, all compounds	2E+4 St wall (4E+4)	7E+4	3E-5	9E-8	-	-
			-	-	-	-	5E-4	5E-3
19	Potassium-45 ²	D, all compounds	3E+4 St wall (5E+4)	1E+5	5E-5	2E-7	-	-
			-	-	-	-	7E-4	7E-3
20	Calcium-41	W, all compounds	3E+3 Bone surf (4E+3)	4E+3 Bone surf (4E+3)	2E-6	-	-	-
			-	-	-	5E-9	6E-5	6E-4
20	Calcium-45	W, all compounds	2E+3	8E+2	4E-7	1E-9	2E-5	2E-4
20	Calcium-47	W, all compounds	8E+2	9E+2	4E-7	1E-9	1E-5	1E-4
21	Scandium-43	Y, all compounds	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
21	Scandium-44m	Y, all compounds	5E+2	7E+2	3E-7	1E-9	7E-6	7E-5
21	Scandium-44	Y, all compounds	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
21	Scandium-46	Y, all compounds	9E+2	2E+2	1E-7	3E-10	1E-5	1E-4
21	Scandium-47	Y, all compounds	2E+3 LLI wall (3E+3)	3E+3	1E-6	4E-9	-	-
			-	-	-	-	4E-5	4E-4
21	Scandium-48	Y, all compounds	8E+2	1E+3	6E-7	2E-9	1E-5	1E-4
21	Scandium-49 ²	Y, all compounds	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
22	Titanium-44	D, all compounds except those given for W and Y	3E+2	1E+1	5E-9	2E-11	4E-6	4E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	3E+1	1E-8	4E-11	-	-
		Y, SrTiO ₃	-	6E+0	2E-9	8E-12	-	-

Table I

Table II

Table III

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Atomic No.	Radionuclide	Class	Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
22	Titanium-45	D, see ⁴⁴ Ti W, see ⁴⁴ Ti Y, see ⁴⁴ Ti	9E+3 - -	3E+4 4E+4 3E+4	1E-5 1E-5 1E-5	3E-8 5E-8 4E-8	1E-4 - -	1E-3 - -
23	Vanadium-47 ²	D, all compounds except those given for W	3E+4 St wall (3E+4)	8E+4 -	3E-5 -	1E-7 -	- 4E-4	- 4E-3
		W, oxides, hydroxides, carbides, and halides	-	1E+5	4E-5	1E-7	-	-
23	Vanadium-48	D, see ⁴⁷ V W, see ⁴⁷ V	6E+2 -	1E+3 6E+2	5E-7 3E-7	2E-9 9E-10	9E-6 -	9E-5 -
23	Vanadium-49	D, see ⁴⁷ V W, see ⁴⁷ V	7E+4 LLI wall (9E+4) -	3E+4 Bone surf (3E+4) 2E+4	1E-5 - 8E-6	- 5E-8 2E-8	- 1E-3 -	- 1E-2 -
24	Chromium-48	D, all compounds except those given for W and Y	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, halides and nitrates	-	7E+3	3E-6	1E-8	-	-
		Y, oxides and hydroxides	-	7E+3	3E-6	1E-8	-	-
24	Chromium-49 ²	D, see ⁴⁸ Cr W, see ⁴⁸ Cr Y, see ⁴⁸ Cr	3E+4 - -	8E+4 1E+5 9E+4	4E-5 4E-5 4E-5	1E-7 1E-7 1E-7	4E-4 - -	4E-3 - -
24	Chromium-51	D, see ⁴⁸ Cr W, see ⁴⁸ Cr Y, see ⁴⁸ Cr	4E+4 - -	5E+4 2E+4 2E+4	2E-5 1E-5 8E-6	6E-8 3E-8 3E-8	5E-4 - -	5E-3 - -
25	Manganese-51 ²	D, all compounds except those given for W	2E+4	5E+4	2E-5	7E-8	3E-4	3E-3
		W, oxides, hydroxides, halides, and nitrates	-	6E+4	3E-5	8E-8	-	-
25	Manganese-52m ²	D, see ⁵¹ Mn W, see ⁵¹ Mn	3E+4 St wall (4E+4) -	9E+4 - 1E+5	4E-5 - 4E-5	1E-7 - 1E-7	- 5E-4 -	- 5E-3 -
25	Manganese-52	D, see ⁵¹ Mn W, see ⁵¹ Mn	7E+2 -	1E+3 9E+2	5E-7 4E-7	2E-9 1E-9	1E-5 -	1E-4 -
25	Manganese-53	D, see ⁵¹ Mn W, see ⁵¹ Mn	5E+4 - -	1E+4 Bone surf (2E+4) 1E+4	5E-6 - 5E-6	- 3E-8 2E-8	7E-4 - -	7E-3 - -
25	Manganese-54	D, see ⁵¹ Mn W, see ⁵¹ Mn	2E+3 -	9E+2 8E+2	4E-7 3E-7	1E-9 1E-9	3E-5 -	3E-4 -
25	Manganese-56	D, see ⁵¹ Mn W, see ⁵¹ Mn	5E+3 -	2E+4 2E+4	6E-6 9E-6	2E-8 3E-8	7E-5 -	7E-4 -
26	Iron-52	D, all compounds except those given for W	9E+2	3E+3	1E-6	4E-9	1E-5	1E-4
		W, oxides, hydroxides, and halides	-	2E+3	1E-6	3E-9	-	-

Table I
Occupational Values

Table II
Effluent Concentrations

Table III
Releases to Sewers

Atomic No.	Radionuclide	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (µCi/ml)	
			Oral	Inhalation			Air		Water
			ALI (µCi)	ALI (µCi)	DAC (µCi/ml)	(µCi/ml)	(µCi/ml)		
26	Iron-55	D, see ⁵² Fe W, see ⁵² Fe	9E+3 -	2E+3 4E+3	8E-7 2E-6	3E-9 6E-9	1E-4 -	1E-3 -	
26	Iron-59	D, see ⁵² Fe W, see ⁵² Fe	8E+2 -	3E+2 5E+2	1E-7 2E-7	5E-10 7E-10	1E-5 -	1E-4 -	
26	Iron-60	D, see ⁵² Fe W, see ⁵² Fe	3E+1 -	6E+0 2E+1	3E-9 8E-9	9E-12 3E-11	4E-7 -	4E-6 -	
27	Cobalt-55	W, all compounds except those given for Y Y, oxides, hydroxides, halides, and nitrates	1E+3 -	3E+3 3E+3	1E-6 1E-6	4E-9 4E-9	2E-5 -	2E-4 -	
27	Cobalt-56	W, see ⁵⁵ Co Y, see ⁵⁵ Co	5E+2 4E+2	3E+2 2E+2	1E-7 8E-8	4E-10 3E-10	6E-6 -	6E-5 -	
27	Cobalt-57	W, see ⁵⁵ Co Y, see ⁵⁵ Co	8E+3 4E+3	3E+3 7E+2	1E-6 3E-7	4E-9 9E-10	6E-5 -	6E-4 -	
27	Cobalt-58m	W, see ⁵⁵ Co Y, see ⁵⁵ Co	6E+4 -	9E+4 6E+4	4E-5 3E-5	1E-7 9E-8	8E-4 -	8E-3 -	
27	Cobalt-58	W, see ⁵⁵ Co Y, see ⁵⁵ Co	2E+3 1E+3	1E+3 7E+2	5E-7 3E-7	2E-9 1E-9	2E-5 -	2E-4 -	
27	Cobalt-60m ²	W, see ⁵⁵ Co St wall (1E+6) Y, see ⁵⁵ Co	1E+6 - -	4E+6 - 3E+6	2E-3 - 1E-3	6E-6 - 4E-6	- 2E-2 -	- 2E-1 -	
27	Cobalt-60	W, see ⁵⁵ Co Y, see ⁵⁵ Co	5E+2 2E+2	2E+2 3E+1	7E-8 1E-8	2E-10 5E-11	3E-6 -	3E-5 -	
27	Cobalt-61 ²	W, see ⁵⁵ Co Y, see ⁵⁵ Co	2E+4 2E+4	6E+4 6E+4	3E-5 2E-5	9E-8 8E-8	3E-4 -	3E-3 -	
27	Cobalt-62m ²	W, see ⁵⁵ Co St wall (5E+4) Y, see ⁵⁵ Co	4E+4 - -	2E+5 - 2E+5	7E-5 - 6E-5	2E-7 - 2E-7	- 7E-4 -	- 7E-3 -	
28	Nickel-56	D, all compounds except those given for W W, oxides, hydroxides, and carbides Vapor	1E+3 - -	2E+3 1E+3 1E+3	8E-7 5E-7 5E-7	3E-9 2E-9 2E-9	2E-5 - -	2E-4 - -	
28	Nickel-57	D, see ⁵⁶ Ni W, see ⁵⁶ Ni Vapor	2E+3 - -	5E+3 3E+3 6E+3	2E-6 1E-6 3E-6	7E-9 4E-9 9E-9	2E-5 - -	2E-4 - -	
28	Nickel-59	D, see ⁵⁶ Ni W, see ⁵⁶ Ni Vapor	2E+4 - -	4E+3 7E+3 2E+3	2E-6 3E-6 8E-7	5E-9 1E-8 3E-9	3E-4 - -	3E-3 - -	
28	Nickel-63	D, see ⁵⁶ Ni W, see ⁵⁶ Ni Vapor	9E+3 - -	2E+3 3E+3 8E+2	7E-7 1E-6 3E-7	2E-9 4E-9 1E-9	1E-4 - -	1E-3 - -	

Table I

Table II

Table III

Occupational Values

Effluent Concentrations

Releases to Sewers

Col. 1
Oral

Col. 2

Col. 3

Col. 1

Col. 2

Monthly

Atomic No.	Radionuclide	Class	Ingestion	Inhalation		Air (μCi/ml)	Water (μCi/ml)	Average Concentration (μCi/ml)
			ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
28	Nickel-65	D, see ⁵⁶ Ni	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see ⁵⁶ Ni	-	3E+4	1E-5	4E-8	-	-
		Vapor	-	2E+4	7E-6	2E-8	-	-
28	Nickel-66	D, see ⁵⁶ Ni	4E+2	2E+3	7E-7	2E-9	-	-
			LLI wall (5E+2)	-	-	-	6E-6	6E-5
		W, see ⁵⁶ Ni	-	6E+2	3E-7	9E-10	-	-
	Vapor	-	3E+3	1E-6	4E-9	-	-	
29	Copper-60 ²	D, all compounds except those given for W and Y	3E+4	9E+4	4E-5	1E-7	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
	Y, oxides and hydroxides	-	1E+5	4E-5	1E-7	-	-	
29	Copper-61	D, see ⁶⁰ Cu	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see ⁶⁰ Cu	-	4E+4	2E-5	6E-8	-	-
		Y, see ⁶⁰ Cu	-	4E+4	1E-5	5E-8	-	-
29	Copper-64	D, see ⁶⁰ Cu	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see ⁶⁰ Cu	-	2E+4	1E-5	3E-8	-	-
		Y, see ⁶⁰ Cu	-	2E+4	9E-6	3E-8	-	-
29	Copper-67	D, see ⁶⁰ Cu	5E+3	8E+3	3E-6	1E-8	6E-5	6E-4
		W, see ⁶⁰ Cu	-	5E+3	2E-6	7E-9	-	-
		Y, see ⁶⁰ Cu	-	5E+3	2E-6	6E-9	-	-
30	Zinc-62	Y, all compounds	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
30	Zinc-63 ²	Y, all compounds	2E+4	7E+4	3E-5	9E-8	-	-
			St wall (3E+4)	-	-	-	3E-4	3E-3
30	Zinc-65	Y, all compounds	4E+2	3E+2	1E-7	4E-10	5E-6	5E-5
30	Zinc-69m	Y, all compounds	4E+3	7E+3	3E-6	1E-8	6E-5	6E-4
30	Zinc-69 ²	Y, all compounds	6E+4	1E+5	6E-5	2E-7	8E-4	8E-3
30	Zinc-71m	Y, all compounds	6E+3	2E+4	7E-6	2E-8	8E-5	8E-4
30	Zinc-72	Y, all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
31	Gallium-65 ²	D, all compounds except those given for W	5E+4	2E+5	7E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	9E-4	9E-3
		W, oxides, hydroxides, carbides, halides, and nitrates	-	2E+5	8E-5	3E-7	-	-
31	Gallium-66	D, see ⁶⁵ Ga	1E+3	4E+3	1E-6	5E-9	1E-5	1E-4
		W, see ⁶⁵ Ga	-	3E+3	1E-6	4E-9	-	-
31	Gallium-67	D, see ⁶⁵ Ga	7E+3	1E+4	6E-6	2E-8	1E-4	1E-3
		W, see ⁶⁵ Ga	-	1E+4	4E-6	1E-8	-	-

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
31	Gallium-68 ²	D, see ⁶⁵ Ga W, see ⁶⁸ Ga	2E+4 -	4E+4 5E+4	2E-5 2E-5	6E-8 7E-8	2E-4 -	2E-3 -
31	Gallium-70 ²	D, see ⁶⁹ Ga W, see ⁶⁹ Ga	5E+4 St wall (7E+4) -	2E+5 - 2E+5	7E-5 - 8E-5	2E-7 - 3E-7	- 1E-3 -	- 1E-2 -
31	Gallium-72	D, see ⁶⁵ Ga W, see ⁶⁸ Ga	1E+3 -	4E+3 3E+3	1E-6 1E-6	5E-9 4E-9	2E-5 -	2E-4 -
31	Gallium-73	D, see ⁶⁹ Ga W, see ⁶⁸ Ga	5E+3 -	2E+4 2E+4	6E-6 6E-6	2E-8 2E-8	7E-5 -	7E-4 -
32	Germanium-66	D, all compounds except those given for W W, oxides, sulfides, and halides	2E+4 -	3E+4 2E+4	1E-5 8E-6	4E-8 3E-8	3E-4 -	3E-3 -
32	Germanium-67 ²	D, see ⁶⁶ Ge W, see ⁶⁶ Ge	3E+4 St wall (4E+4) -	9E+4 - 1E+5	4E-5 - 4E-5	1E-7 - 1E-7	- 6E-4 -	- 6E-3 -
32	Germanium-68	D, see ⁶⁶ Ge W, see ⁶⁶ Ge	5E+3 -	4E+3 1E+2	2E-6 4E-8	5E-9 1E-10	6E-5 -	6E-4 -
32	Germanium-69	D, see ⁶⁶ Ge W, see ⁶⁶ Ge	1E+4 -	2E+4 8E+3	6E-6 3E-6	2E-8 1E-8	2E-4 -	2E-3 -
32	Germanium-71	D, see ⁶⁶ Ge W, see ⁶⁶ Ge	5E+5 -	4E+5 4E+4	2E-4 2E-5	6E-7 6E-8	7E-3 -	7E-2 -
32	Germanium-75 ²	D, see ⁶⁶ Ge W, see ⁶⁶ Ge	4E+4 St wall (7E+4) -	8E+4 - 8E+4	3E-5 - 4E-5	1E-7 - 1E-7	- 9E-4 -	- 9E-3 -
32	Germanium-77	D, see ⁶⁶ Ge W, see ⁶⁶ Ge	9E+3 -	1E+4 6E+3	4E-6 2E-6	1E-8 8E-9	1E-4 -	1E-3 -
32	Germanium-78 ²	D, see ⁶⁶ Ge W, see ⁶⁶ Ge	2E+4 St wall (2E+4) -	2E+4 - 2E+4	9E-6 - 9E-6	3E-8 - 3E-8	- 3E-4 -	- 3E-3 -
33	Arsenic-69 ²	W, all compounds	3E+4 St wall (4E+4) -	1E+5 - -	5E-5 - -	2E-7 - -	- 6E-4 -	- 6E-3 -
33	Arsenic-70 ²	W, all compounds	1E+4	5E+4	2E-5	7E-8	2E-4	2E-3
33	Arsenic-71	W, all compounds	4E+3	5E+3	2E-6	6E-9	5E-5	5E-4
33	Arsenic-72	W, all compounds	9E+2	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-73	W, all compounds	8E+3	2E+3	7E-7	2E-9	1E-4	1E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
33	Arsenic-74	W, all compounds	1E+3	8E+2	3E-7	1E-9	2E-5	2E-4
33	Arsenic-76	W, all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-77	W, all compounds	4E+3 LLI wall (5E+3)	5E+3	2E-6	7E-9	- 6E-5	- 6E-4
33	Arsenic-78 ²	W, all compounds	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
34	Selenium-70 ²	D, all compounds except those given for W W, oxides, hydroxides, carbides, and elemental Se	2E+4 1E+4	4E+4 4E+4	2E-5 2E-5	5E-8 6E-8	1E-4 -	1E-3 -
34	Selenium-73m ²	D, see ⁷⁰ Se W, see ⁷⁰ Se	6E+4 3E+4	2E+5 1E+5	6E-5 6E-5	2E-7 2E-7	4E-4 -	4E-3 -
34	Selenium-73	D, see ⁷⁰ Se W, see ⁷⁰ Se	3E+3 -	1E+4 2E+4	5E-6 7E-6	2E-8 2E-8	4E-5 -	4E-4 -
34	Selenium-75	D, see ⁷⁰ Se W, see ⁷⁰ Se	5E+2 -	7E+2 6E+2	3E-7 3E-7	1E-9 8E-10	7E-6 -	7E-5 -
34	Selenium-79	D, see ⁷⁰ Se W, see ⁷⁰ Se	6E+2 -	8E+2 6E+2	3E-7 2E-7	1E-9 8E-10	8E-6 -	8E-5 -
34	Selenium-81m ²	D, see ⁷⁰ Se W, see ⁷⁰ Se	4E+4 2E+4	7E+4 7E+4	3E-5 3E-5	9E-8 1E-7	3E-4 -	3E-3 -
34	Selenium-81 ²	D, see ⁷⁰ Se W, see ⁷⁰ Se	6E+4 St wall (8E+4) -	2E+5 -	9E-5 -	3E-7 -	- 1E-3 -	- 1E-2 -
34	Selenium-83 ²	D, see ⁷⁰ Se W, see ⁷⁰ Se	4E+4 3E+4	1E+5 1E+5	5E-5 5E-5	2E-7 2E-7	4E-4 -	4E-3 -
35	Bromine-74m ²	D, bromides of H, Li, Na, K, Rb, Cs, and Fr W, bromides of lanthanides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, Hf, V, Nb, Ta, Mn, Tc, and Re	1E+4 St wall (2E+4) -	4E+4 -	2E-5 -	5E-8 -	- 3E-4	- 3E-3
35	Bromine-74 ²	D, see ^{74m} Br W, see ^{74m} Br	2E+4 St wall (4E+4) -	7E+4 -	3E-5 -	1E-7 -	- 5E-4	- 5E-3

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
35	Bromine-75 ²	D, see ^{74m} Br	3E+4 St wall (4E+4)	5E+4	2E-5	7E-8	-	-
		W, see ^{74m} Br	-	5E+4	2E-5	7E-8	5E-4	5E-3
35	Bromine-76	D, see ^{74m} Br	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
		W, see ^{74m} Br	-	4E+3	2E-6	6E-9	-	-
35	Bromine-77	D, see ^{74m} Br	2E+4	2E+4	1E-5	3E-8	2E-4	2E-3
		W, see ^{74m} Br	-	2E+4	8E-6	3E-8	-	-
35	Bromine-80m	D, see ^{74m} Br	2E+4	2E+4	7E-6	2E-8	3E-4	3E-3
		W, see ^{74m} Br	-	1E+4	6E-6	2E-8	-	-
35	Bromine-80 ²	D, see ^{74m} Br	5E+4 St wall (9E+4)	2E+5	8E-5	3E-7	-	-
		W, see ^{74m} Br	-	2E+5	9E-5	3E-7	1E-3	1E-2
35	Bromine-82	D, see ^{74m} Br	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W, see ^{74m} Br	-	4E+3	2E-6	5E-9	-	-
35	Bromine-83	D, see ^{74m} Br	5E+4 St wall (7E+4)	6E+4	3E-5	9E-8	-	-
		W, see ^{74m} Br	-	6E+4	3E-5	9E-8	9E-4	9E-3
35	Bromine-84 ²	D, see ^{74m} Br	2E+4 St wall (3E+4)	6E+4	2E-5	8E-8	-	-
		W, see ^{74m} Br	-	6E+4	3E-5	9E-8	4E-4	4E-3
36	Krypton-74 ²	Submersion1	-	-	3E-6	1E-8	-	-
36	Krypton-76	Submersion1	-	-	9E-6	4E-8	-	-
36	Krypton-77 ²	Submersion1	-	-	4E-6	2E-8	-	-
36	Krypton-79	Submersion1	-	-	2E-5	7E-8	-	-
36	Krypton-81	Submersion1	-	-	7E-4	3E-6	-	-
36	Krypton-83m ²	Submersion1	-	-	1E-2	5E-5	-	-
36	Krypton-85m	Submersion1	-	-	2E-5	1E-7	-	-
36	Krypton-85	Submersion1	-	-	1E-4	7E-7	-	-
36	Krypton-87 ²	Submersion1	-	-	5E-6	2E-8	-	-
36	Krypton-88	Submersion1	-	-	2E-6	9E-9	-	-
37	Rubidium-79 ²	D, all compounds	4E+4 St wall (6E+4)	1E+5	5E-5	2E-7	-	-
			-	-	-	-	8E-4	8E-3
37	Rubidium-81m ²	D, all compounds	2E+5 St wall (3E+5)	3E+5	1E-4	5E-7	-	-
			-	-	-	-	4E-3	4E-2

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
				ALI (μCi)	DAC (μCi/ml)			
37	Rubidium-81	D, all compounds	4E+4	5E+4	2E-5	7E-8	5E-4	5E-3
37	Rubidium-82m	D, all compounds	1E+4	2E+4	7E-6	2E-8	2E-4	2E-3
37	Rubidium-83	D, all compounds	6E+2	1E+3	4E-7	1E-9	9E-6	9E-5
37	Rubidium-84	D, all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-86	D, all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-87	D, all compounds	1E+3	2E+3	6E-7	2E-9	1E-5	1E-4
37	Rubidium-88 ²	D, all compounds	2E+4 St wall (3E+4)	6E+4 -	3E-5 -	9E-8 -	- 4E-4	- 4E-3
37	Rubidium-89 ²	D, all compounds	4E+4 St wall (6E+4)	1E+5 -	6E-5 -	2E-7 -	- 9E-4	- 9E-3
38	Strontium-80 ²	D, all soluble compounds except SrTiO Y, all insoluble compounds and SrTiO ₄	4E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	6E-5 -	6E-4 -
38	Strontium-81 ²	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	3E+4 2E+4	8E+4 8E+4	3E-5 3E-5	1E-7 1E-7	3E-4 -	3E-3 -
38	Strontium-82	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	3E+2 LLI wall (2E+2) 2E+2	4E+2 -	2E-7 -	6E-10 -	- 3E-6	- 3E-5
38	Strontium-83	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	3E+3 2E+3	7E+3 4E+3	3E-6 1E-6	1E-8 5E-9	3E-5 -	3E-4 -
38	Strontium-85m ²	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	2E+5 -	6E+5 8E+5	3E-4 4E-4	9E-7 1E-6	3E-3 -	3E-2 -
38	Strontium-85	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	3E+3 -	3E+3 2E+3	1E-6 6E-7	4E-9 2E-9	4E-5 -	4E-4 -
38	Strontium-87m	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	5E+4 4E+4	1E+5 2E+5	5E-5 6E-5	2E-7 2E-7	6E-4 -	6E-3 -
38	Strontium-89	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	6E+2 LLI wall (6E+2) 5E+2	8E+2 -	4E-7 -	1E-9 -	- 8E-6	- 8E-5
38	Strontium-90	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	3E+1 Bone surf (4E+1) -	2E+1 Bone surf (2E+1) 4E+0	8E-9 -	- 3E-11 6E-12	- 5E-7 -	- 5E-6 -
38	Strontium-91	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	2E+3 -	6E+3 4E+3	2E-6 1E-6	8E-9 5E-9	2E-5 -	2E-4 -

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Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air	Water	
			ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)	
38	Strontium-92	D, see ⁸⁰ Sr Y, see ⁸⁰ Sr	3E+3 -	9E+3 7E+3	4E-6 3E-6	1E-8 9E-9	4E-5 -	4E-4 -
39	Yttrium-86m ²	W, all compounds except those given for Y Y, oxides and hydroxides	2E+4 -	6E+4 5E+4	2E-5 2E-5	8E-8 8E-8	3E-4 -	3E-3 -
39	Yttrium-86	W, see ^{86m} Y Y, see ^{86m} Y	1E+3 -	3E+3 3E+3	1E-6 1E-6	5E-9 5E-9	2E-5 -	2E-4 -
39	Yttrium-87	W, see ^{86m} Y Y, see ^{86m} Y	2E+3 -	3E+3 3E+3	1E-6 1E-6	5E-9 5E-9	3E-5 -	3E-4 -
39	Yttrium-88	W, see ^{86m} Y Y, see ^{86m} Y	1E+3 -	3E+2 2E+2	1E-7 1E-7	3E-10 3E-10	1E-5 -	1E-4 -
39	Yttrium-90m	W, see ^{86m} Y Y, see ^{86m} Y	8E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	1E-4 -	1E-3 -
39	Yttrium-90	W, see ^{86m} Y LLI wall (5E+2) Y, see ^{86m} Y	4E+2 - -	7E+2 - 6E+2	3E-7 - 3E-7	9E-10 - 9E-10	- 7E-6 -	- 7E-5 -
39	Yttrium-91m ²	W, see ^{86m} Y Y, see ^{86m} Y	1E+5 -	2E+5 2E+5	1E-4 7E-5	3E-7 2E-7	2E-3 -	2E-2 -
39	Yttrium-91	W, see ^{86m} Y LLI wall (6E+2) Y, see ^{86m} Y	5E+2 - -	2E+2 - 1E+2	7E-8 - 5E-8	2E-10 - 2E-10	- 8E-6 -	- 8E-5 -
39	Yttrium-92	W, see ^{86m} Y Y, see ^{86m} Y	3E+3 -	9E+3 8E+3	4E-6 3E-6	1E-8 1E-8	4E-5 -	4E-4 -
39	Yttrium-93	W, see ^{86m} Y Y, see ^{86m} Y	1E+3 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	2E-5 -	2E-4 -
39	Yttrium-94 ²	W, see ^{86m} Y St wall (3E+4) Y, see ^{86m} Y	2E+4 - -	8E+4 - 8E+4	3E-5 - 3E-5	1E-7 - 1E-7	- 4E-4 -	- 4E-3 -
39	Yttrium-95 ²	W, see ^{86m} Y St wall (5E+4) Y, see ^{86m} Y	4E+4 - -	2E+5 - 1E+5	6E-5 - 6E-5	2E-7 - 2E-7	- 7E-4 -	- 7E-3 -
40	Zirconium-86	D, all compounds except those given for W and Y W, oxides, hydroxides, halides, and nitrates Y, carbide	1E+3 - -	4E+3 3E+3 2E+3	2E-6 1E-6 1E-6	6E-9 4E-9 3E-9	2E-5 - -	2E-4 - -
40	Zirconium-88	D, see ⁸⁶ Zr W, see ⁸⁶ Zr Y, see ⁸⁶ Zr	4E+3 - -	2E+2 5E+2 3E+2	9E-8 2E-7 1E-7	3E-10 7E-10 4E-10	5E-5 - -	5E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
40	Zirconium-89	D, see ⁸⁶ Zr	2E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see ⁸⁶ Zr	-	2E+3	1E-6	3E-9	-	-
		Y, see ⁸⁶ Zr	-	2E+3	1E-6	3E-9	-	-
40	Zirconium-93	D, see ⁸⁶ Zr	1E+3	6E+0	3E-9	-	-	-
		Bone surf (3E+3)	-	Bone surf (2E+1)	-	2E-11	4E-5	4E-4
		W, see ⁸⁶ Zr	-	2E+1	1E-8	-	-	-
		-	-	Bone surf (6E+1)	-	9E-11	-	-
40	Zirconium-95	D, see ⁸⁶ Zr	1E+3	1E+2	5E-8	-	2E-5	2E-4
		-	-	Bone surf (3E+2)	-	4E-10	-	-
		W, see ⁸⁶ Zr	-	4E+2	2E-7	5E-10	-	-
40	Zirconium-97	D, see ⁸⁶ Zr	6E+2	2E+3	8E-7	3E-9	9E-6	9E-5
		W, see ⁸⁶ Zr	-	1E+3	6E-7	2E-9	-	-
		Y, see ⁸⁶ Zr	-	1E+3	5E-7	2E-9	-	-
41	Niobium-88 ²	W, all compounds except those given for Y	5E+4	2E+5	9E-5	3E-7	-	-
		St wall (7E+4)	-	-	-	-	1E-3	1E-2
		Y, oxides and hydroxides	-	2E+5	9E-5	3E-7	-	-
41	Niobium-89 ² (66 min)	W, see ⁸⁸ Nb	1E+4	4E+4	2E-5	6E-8	1E-4	1E-3
		Y, see ⁸⁸ Nb	-	4E+4	2E-5	5E-8	-	-
41	Niobium-89 (122 min)	W, see ⁸⁸ Nb	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y, see ⁸⁸ Nb	-	2E+4	6E-6	2E-8	-	-
41	Niobium-90	W, see ⁸⁸ Nb	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		Y, see ⁸⁸ Nb	-	2E+3	1E-6	3E-9	-	-
41	Niobium-93m	W, see ⁸⁸ Nb	9E+3	2E+3	8E-7	3E-9	-	-
		LLI wall (1E+4)	-	-	-	-	2E-4	2E-3
41	Niobium-94	W, see ⁸⁸ Nb	9E+2	2E+2	8E-8	3E-10	1E-5	1E-4
		Y, see ⁸⁸ Nb	-	2E+1	6E-9	2E-11	-	-
41	Niobium-95m	W, see ⁸⁸ Nb	2E+3	3E+3	1E-6	4E-9	-	-
		LLI wall (2E+3)	-	-	-	-	3E-5	3E-4
41	Niobium-95	W, see ⁸⁸ Nb	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
		Y, see ⁸⁸ Nb	-	1E+3	5E-7	2E-9	-	-
41	Niobium-96	W, see ⁸⁸ Nb	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, see ⁸⁸ Nb	-	2E+3	1E-6	3E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion (μCi)	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
				ALI (μCi)	DAC (μCi/ml)			
41	Niobium-97 ²	W, see ⁸⁸ Nb Y, see 88Nb	2E+4 -	8E+4 7E+4	3E-5 3E-5	1E-7 1E-7	3E-4 -	3E-3 -
41	Niobium-98 ²	W, see ⁸⁸ Nb Y, see ⁸⁸ Nb	1E+4 -	5E+4 5E+4	2E-5 2E-5	8E-8 7E-8	2E-4 -	2E-3 -
42	Molybdenum-90	D, all compounds except those given for Y Y, oxides, hydroxides, and MoS	4E+3 2E+3	7E+3 5E+3	3E-6 2E-6	1E-8 6E-9	3E-5 -	3E-4 -
42	Molybdenum-93m	D, see ⁹⁰ Mo Y, see ⁹⁰ Mo	9E+3 4E+3	2E+4 1E+4	7E-6 6E-6	2E-8 2E-8	6E-5 -	6E-4 -
42	Molybdenum-93	D, see ⁹⁰ Mo Y, see ⁹⁰ Mo	4E+3 2E+4	5E+3 2E+2	2E-6 8E-8	8E-9 2E-10	5E-5 -	5E-4 -
42	Molybdenum-99	D, see ⁹⁰ Mo	2E+3	3E+3	1E-6	4E-9	-	-
		LLI wall (1E+3)	-	-	-	-	2E-5	2E-4
		Y, see ⁹⁰ Mo	1E+3	1E+3	6E-7	2E-9	-	-
42	Molybdenum-101 ²	D, see ⁹⁰ Mo	4E+4	1E+5	6E-5	2E-7	-	-
		St wall (5E+4)	-	-	-	-	7E-4	7E-3
		Y, see ⁹⁰ Mo	-	1E+5	6E-5	2E-7	-	-
43	Technetium-93m ²	D, all compounds except those given for W W, oxides, hydroxides, halides, and nitrates	7E+4 -	2E+5 3E+5	6E-5 1E-4	2E-7 4E-7	1E-3 -	1E-2 -
43	Technetium-93	D, see ^{93m} Tc W, see ^{93m} Tc	3E+4 -	7E+4 1E+5	3E-5 4E-5	1E-7 1E-7	4E-4 -	4E-3 -
43	Technetium-94m ²	D, see ^{93m} Tc W, see ^{93m} Tc	2E+4 -	4E+4 6E+4	2E-5 2E-5	6E-8 8E-8	3E-4 -	3E-3 -
43	Technetium-94	D, see ^{93m} Tc W, see ^{93m} Tc	9E+3 -	2E+4 2E+4	8E-6 1E-5	3E-8 3E-8	1E-4 -	1E-3 -
43	Technetium-95m	D, see ^{93m} Tc W, see ^{93m} Tc	4E+3 -	5E+3 2E+3	2E-6 8E-7	8E-9 3E-9	5E-5 -	5E-4 -
43	Technetium-95	D, see ^{93m} Tc W, see ^{93m} Tc	1E+4 -	2E+4 2E+4	9E-6 8E-6	3E-8 3E-8	1E-4 -	1E-3 -
43	Technetium-96m ²	D, see ^{93m} Tc W, see ^{93m} Tc	2E+5 -	3E+5 2E+5	1E-4 1E-4	4E-7 3E-7	2E-3 -	2E-2 -
43	Technetium-96	D, see ^{93m} Tc W, see ^{93m} Tc	2E+3 -	3E+3 2E+3	1E-6 9E-7	5E-9 3E-9	3E-5 -	3E-4 -
43	Technetium-97m	D, see ^{93m} Tc	5E+3	7E+3	3E-6	-	6E-5	6E-4
		St wall (7E+3)	-	-	-	1E-8	-	-
		W, see ^{93m} Tc	-	1E+3	1E+3	5E-7	2E-9	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
43	Technetium-97	D, see ^{93m} Tc W, see ^{93m} Tc	4E+4 -	5E+4 6E+3	2E-5 2E-6	7E-8 8E-9	5E-4 -	5E-3 -
43	Technetium-98	D, see ^{93m} Tc W, see ^{93m} Tc	1E+3 -	2E+3 3E+2	7E-7 1E-7	2E-9 4E-10	1E-5 -	1E-4 -
43	Technetium-99m	D, see ^{93m} Tc W, see ^{93m} Tc	8E+4 -	2E+5 2E+5	6E-5 1E-4	2E-7 3E-7	1E-3 -	1E-2 -
43	Technetium-99	D, see ^{93m} Tc W, see ^{93m} Tc	4E+3 - -	5E+3 St wall (6E+3) 7E+2	2E-6 - 3E-7	- 8E-9 9E-10	6E-5 - -	6E-4 - -
43	Technetium-101 ²	D, see ^{93m} Tc W, see ^{93m} Tc	9E+4 St wall (1E+5) -	3E+5 - 4E+5	1E-4 - 2E-4	5E-7 - 5E-7	- 2E-3 -	- 2E-2 -
43	Technetium-104 ²	D, see ^{93m} Tc W, see ^{93m} Tc	2E+4 St wall (3E+4) -	7E+4 - 9E+4	3E-5 - 4E-5	1E-7 - 1E-7	- 4E-4 -	- 4E-3 -
44	Ruthenium-94 ²	D, all compounds except those given for W and Y W, halides Y, oxides and hydroxides	2E+4 - -	4E+4 6E+4 6E+4	2E-5 3E-5 2E-5	6E-8 9E-8 8E-8	2E-4 - -	2E-3 - -
44	Ruthenium-97	D, see ⁹⁴ Ru W, see ⁹⁴ Ru Y, see ⁹⁴ Ru	8E+3 - -	2E+4 1E+4 1E+4	8E-6 5E-6 5E-6	3E-8 2E-8 2E-8	1E-4 - -	1E-3 - -
44	Ruthenium-103	D, see ⁹⁴ Ru W, see ⁹⁴ Ru Y, see ⁹⁴ Ru	2E+3 - -	2E+3 1E+3 6E+2	7E-7 4E-7 3E-7	2E-9 1E-9 9E-10	3E-5 - -	3E-4 - -
44	Ruthenium-105	D, see ⁹⁴ Ru W, see ⁹⁴ Ru Y, see ⁹⁴ Ru	5E+3 - -	1E+4 1E+4 1E+4	6E-6 6E-6 5E-6	2E-8 2E-8 2E-8	7E-5 - -	7E-4 - -
44	Ruthenium-106	D, see ⁹⁴ Ru W, see ⁹⁴ Ru Y, see ⁹⁴ Ru	2E+2 LLI wall (2E+2) - -	9E+1 - 5E+1 1E+1	4E-8 - 2E-8 5E-9	1E-10 - 8E-11 2E-11	- 3E-6 - -	- 3E-5 - -
45	Rhodium-99m	D, all compounds except those given for W and Y W, halides Y, oxides and hydroxides	2E+4 - -	6E+4 8E+4 7E+4	2E-5 3E-5 3E-5	8E-8 1E-7 9E-8	2E-4 - -	2E-3 - -
45	Rhodium-99	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	2E+3 - -	3E+3 2E+3 2E+3	1E-6 9E-7 8E-7	4E-9 3E-9 3E-9	3E-5 - -	3E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion (μCi)	ALI (μCi)	DAC (μCi/ml)			
45	Rhodium-100	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	2E+3 - -	5E+3 4E+3 4E+3	2E-6 2E-6 2E-6	7E-9 6E-9 5E-9	2E-5 - -	2E-4 - -
45	Rhodium-101m	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	6E+3 - -	1E+4 8E+3 8E+3	5E-6 4E-6 3E-6	2E-8 1E-8 1E-8	8E-5 - -	8E-4 - -
45	Rhodium-101	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	2E+3 - -	5E+2 8E+2 2E+2	2E-7 3E-7 6E-8	7E-10 1E-9 2E-10	3E-5 - -	3E-4 - -
45	Rhodium-102m	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	1E+3 LLI wall (1E+3) - -	5E+2 - 4E+2 1E+2	2E-7 - 2E-7 5E-8	7E-10 - 5E-10 2E-10	- 2E-5 - -	- 2E-4 - -
45	Rhodium-102	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	6E+2 - -	9E+1 2E+2 6E+1	4E-8 7E-8 2E-8	1E-10 2E-10 8E-11	8E-6 - -	8E-5 - -
45	Rhodium-103m ²	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	4E+5 - -	1E+6 1E+6 1E+6	5E-4 5E-4 5E-4	2E-6 2E-6 2E-6	6E-3 - -	6E-2 - -
45	Rhodium-105	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	4E+3 LLI wall (4E+3) - -	1E+4 - 6E+3 6E+3	5E-6 - 3E-6 2E-6	2E-8 - 9E-9 8E-9	- 5E-5 - -	- 5E-4 - -
45	Rhodium-106m	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	8E+3 - -	3E+4 4E+4 4E+4	1E-5 2E-5 1E-5	4E-8 5E-8 5E-8	1E-4 - -	1E-3 - -
45	Rhodium-107 ²	D, see ^{99m} Rh W, see ^{99m} Rh Y, see ^{99m} Rh	7E+4 St wall (9E+4) - -	2E+5 - 3E+5 3E+5	1E-4 - 1E-4 1E-4	3E-7 - 4E-7 3E-7	- 1E-3 - -	- 1E-2 - -
46	Palladium-100	D, all compounds except those given for W and Y W, nitrates Y, oxides and hydroxides	1E+3 - -	1E+3 1E+3 1E+3	6E-7 5E-7 6E-7	2E-9 2E-9 2E-9	2E-5 - -	2E-4 - -
46	Palladium-101	D, see ¹⁰⁰ Pd W, see ¹⁰⁰ Pd Y, see ¹⁰⁰ Pd	1E+4 - -	3E+4 3E+4 3E+4	1E-5 1E-5 1E-5	5E-8 5E-8 4E-8	2E-4 - -	2E-3 - -
46	Palladium-103	D, see ¹⁰⁰ Pd W, see ¹⁰⁰ Pd Y, see ¹⁰⁰ Pd	6E+3 LLI wall (7E+3) - -	6E+3 - 4E+3 4E+3	3E-6 - 2E-6 1E-6	9E-9 - 6E-9 5E-9	- 1E-4 - -	- 1E-3 - -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion (μCi)	Inhalation (μCi)		Air (μCi/ml)	Water (μCi/ml)	
	ALI (μCi)	ALI (μCi)	DAC (μCi/ml)					
46	Palladium-107	D, see ¹⁰⁰ Pd	3E+4	2E+4	9E-6	-	-	-
		(4E+4)	LLI wall (2E+4)	Kidneys	-	-	-	-
		W, see ¹⁰⁰ Pd	-	7E+3	3E-6	5E-4	5E-3	-
		Y, see ¹⁰⁰ Pd	-	4E+2	2E-7	1E-8	-	-
46	Palladium-109	D, see ¹⁰⁰ Pd	2E+3	6E+3	3E-6	9E-9	3E-5	3E-4
		W, see ¹⁰⁰ Pd	-	5E+3	2E-6	8E-9	-	-
		Y, see ¹⁰⁰ Pd	-	5E+3	2E-6	6E-9	-	-
47	Silver-102 ²	D, all compounds except those given for W and Y	5E+4	2E+5	8E-5	2E-7	-	-
		St wall (6E+4)	-	-	-	-	9E-4	9E-3
		W, nitrates and sulfides	-	2E+5	9E-5	3E-7	-	-
		Y, oxides and hydroxides	-	2E+5	8E-5	3E-7	-	-
47	Silver-103 ²	D, see ¹⁰² Ag	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
		W, see ¹⁰² Ag	-	1E+5	5E-5	2E-7	-	-
		Y, see ¹⁰² Ag	-	1E+5	5E-5	2E-7	-	-
47	Silver-104m ²	D, see ¹⁰² Ag	3E+4	9E+4	4E-5	1E-7	4E-4	4E-3
		W, see ¹⁰² Ag	-	1E+5	5E-5	2E-7	-	-
		Y, see ¹⁰² Ag	-	1E+5	5E-5	2E-7	-	-
47	Silver-104 ²	D, see ¹⁰² Ag	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
		W, see ¹⁰² Ag	-	1E+5	6E-5	2E-7	-	-
		Y, see ¹⁰² Ag	-	1E+5	6E-5	2E-7	-	-
47	Silver-105	D, see ¹⁰² Ag	3E+3	1E+3	4E-7	1E-9	4E-5	4E-4
		W, see ¹⁰² Ag	-	2E+3	7E-7	2E-9	-	-
		Y, see ¹⁰² Ag	-	2E+3	7E-7	2E-9	-	-
47	Silver-106m	D, see ¹⁰² Ag	8E+2	7E+2	3E-7	1E-9	1E-5	1E-4
		W, see ¹⁰² Ag	-	9E+2	4E-7	1E-9	-	-
		Y, see ¹⁰² Ag	-	9E+2	4E-7	1E-9	-	-
47	Silver-106 ²	D, see ¹⁰² Ag	6E+4	2E+5	8E-5	3E-7	-	-
		(6E+4)	St. wall	-	-	-	9E-4	9E-3
		W, see ¹⁰² Ag	-	2E+5	9E-5	3E-7	-	-
		Y, see ¹⁰² Ag	-	2E+5	8E-5	3E-7	-	-
47	Silver-108m	D, see ¹⁰² Ag	6E+2	2E+2	8E-8	3E-10	9E-6	9E-5
		W, see ¹⁰² Ag	-	3E+2	1E-7	4E-10	-	-
		Y, see ¹⁰² Ag	-	2E+1	1E-8	3E-11	-	-
47	Silver-110m	D, see ¹⁰² Ag	5E+2	1E+2	5E-8	2E-10	6E-6	6E-5
		W, see ¹⁰² Ag	-	2E+2	8E-8	3E-10	-	-
		Y, see ¹⁰² Ag	-	9E+1	4E-8	1E-10	-	-
47	Silver-111	D, see ¹⁰² Ag	9E+2	2E+3	6E-7	-	-	-
		LLI wall (1E+3)	Liver (2E+3)	-	-	2E-9	2E-5	2E-4
		W, see ¹⁰² Ag	-	9E+2	4E-7	1E-9	-	-
		Y, see ¹⁰² Ag	-	9E+2	4E-7	1E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
47	Silver-112	D, see ¹⁰² Ag	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see ¹⁰² Ag	-	1E+4	4E-6	1E-8	-	-
		Y, see ¹⁰² Ag	-	9E+3	4E-6	1E-8	-	-
47	Silver-115 ²	D, see ¹⁰² Ag	3E+4	9E+4	4E-5	1E-7	-	-
		St wall (3E+4)	-	-	-	-	4E-4	4E-3
		W, see ¹⁰² Ag	-	9E+4	4E-5	1E-7	-	-
48	Cadmium-104 ²	Y, see ¹⁰² Ag	-	8E+4	3E-5	1E-7	-	-
		D, all compounds except those given for W and Y	2E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
48	Cadmium-107	Y, oxides and hydroxides	-	1E+5	5E-5	2E-7	-	-
		D, see ¹⁰⁴ Cd	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
		W, see ¹⁰⁴ Cd	-	6E+4	2E-5	8E-8	-	-
48	Cadmium-109	Y, see ¹⁰⁴ Cd	-	5E+4	2E-5	7E-8	-	-
		D, see ¹⁰⁴ Cd	3E+2	4E+1	1E-8	-	-	-
		Kidneys (4E+2)	-	4E+1	1E-8	-	-	-
48	Cadmium-113m	W, see ¹⁰⁴ Cd	-	1E+2	5E-8	7E-11	6E-6	6E-5
		Y, see ¹⁰⁴ Cd	-	1E+2	5E-8	2E-10	-	-
		D, see ¹⁰⁴ Cd	2E+1	2E+0	1E-9	-	-	-
48	Cadmium-113	Kidneys (4E+1)	-	2E+0	9E-10	5E-12	5E-7	5E-6
		W, see ¹⁰⁴ Cd	-	8E+0	4E-9	-	-	-
		Y, see ¹⁰⁴ Cd	-	1E+1	5E-9	2E-11	-	-
48	Cadmium-115	D, see ¹⁰⁴ Cd	2E+1	2E+0	9E-10	-	-	-
		Kidneys (3E+1)	-	3E+0	-	5E-12	4E-7	4E-6
		W, see ¹⁰⁴ Cd	-	8E+0	3E-9	-	-	-
48	Cadmium-115m	Y, see ¹⁰⁴ Cd	-	1E+1	6E-9	2E-11	-	-
		D, see ¹⁰⁴ Cd	3E+2	5E+1	2E-8	-	4E-6	4E-5
		Kidneys (8E+1)	-	5E+1	2E-8	-	4E-6	4E-5
48	Cadmium-117m	W, see ¹⁰⁴ Cd	-	1E+2	5E-8	2E-10	-	-
		Y, see ¹⁰⁴ Cd	-	1E+2	6E-8	2E-10	-	-
		D, see ¹⁰⁴ Cd	9E+2	1E+3	6E-7	2E-9	-	-
48	Cadmium-115	LLI wall (1E+3)	-	-	-	-	1E-5	1E-4
		W, see ¹⁰⁴ Cd	-	1E+3	5E-7	2E-9	-	-
		Y, see ¹⁰⁴ Cd	-	1E+3	6E-7	2E-9	-	-
48	Cadmium-117m	D, see ¹⁰⁴ Cd	5E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		W, see ¹⁰⁴ Cd	-	2E+4	7E-6	2E-8	-	-
		Y, see ¹⁰⁴ Cd	-	1E+4	6E-6	2E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion (μCi)	ALI (μCi)	DAC (μCi/ml)			
48	Cadmium-117	D, see ¹⁰⁴ Cd W, see ¹⁰⁴ Cd Y, see ¹⁰⁴ Cd	5E+3 - -	1E+4 2E+4 1E+4	5E-6 7E-6 6E-6	2E-8 2E-8 2E-8	6E-5 - -	6E-4 - -
49	Indium-109	D, all compounds except those given for W W, oxides, hydroxides, halides, and nitrates	2E+4 -	4E+4 6E+4	2E-5 3E-5	6E-8 9E-8	3E-4 -	3E-3 -
49	Indium-110 ² (69.1 min)	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	2E+4 -	4E+4 6E+4	2E-5 2E-5	6E-8 8E-8	2E-4 -	2E-3 -
49	Indium-110 (4.9 h)	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	5E+3 -	2E+4 2E+4	7E-6 8E-6	2E-8 3E-8	7E-5 -	7E-4 -
49	Indium-111	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	4E+3 -	6E+3 6E+3	3E-6 3E-6	9E-9 9E-9	6E-5 -	6E-4 -
49	Indium-112 ²	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	2E+5 -	6E+5 7E+5	3E-4 3E-4	9E-7 1E-6	2E-3 -	2E-2 -
49	Indium-113m ²	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	5E+4 -	1E+5 2E+5	6E-5 8E-5	2E-7 3E-7	7E-4 -	7E-3 -
49	Indium-114m	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	3E+2 LLI wall (4E+2) -	6E+1 - 1E+2	3E-8 - 4E-8	9E-11 - 1E-10	- 5E-6 -	- 5E-5 -
49	Indium-115m	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	1E+4 -	4E+4 5E+4	2E-5 2E-5	6E-8 7E-8	2E-4 -	2E-3 -
49	Indium-115	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	4E+1 -	1E+0 5E+0	6E-10 2E-9	2E-12 8E-12	5E-7 -	5E-6 -
49	Indium-116m ²	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	2E+4 -	8E+4 1E+5	3E-5 5E-5	1E-7 2E-7	3E-4 -	3E-3 -
49	Indium-117m ²	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	1E+4 -	3E+4 4E+4	1E-5 2E-5	5E-8 6E-8	2E-4 -	2E-3 -
49	Indium-117 ²	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	6E+4 -	2E+5 2E+5	7E-5 9E-5	2E-7 3E-7	8E-4 -	8E-3 -
49	Indium-119m ²	D, see ¹⁰⁹ In W, see ¹⁰⁹ In	4E+4 St wall (5E+4) -	1E+5 - 1E+5	5E-5 - 6E-5	2E-7 - 2E-7	- 7E-4 -	- 7E-3 -
50	Tin-110	D, all compounds except those given for W W, sulfides, oxides, hydroxides, halides, nitrates, and stannic phosphate	4E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	5E-5 -	5E-4 -
50	Tin-111 ²	D, see ¹¹⁰ Sn W, see ¹¹⁰ Sn	7E+4 -	2E+5 3E+5	9E-5 1E-4	3E-7 4E-7	1E-3 -	1E-2 -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)	
50	Tin-113	D, see ¹¹⁰ Sn	2E+3 LLI wall (2E+3)	1E+3	5E-7	2E-9	-	-
		W, see ¹¹⁰ Sn	-	5E+2	2E-7	8E-10	3E-5	3E-4
50	Tin-117m	D, see ¹¹⁰ Sn	2E+3 LLI wall (2E+3)	1E+3 Bone surf (2E+3)	5E-7	-	-	-
		W, see ¹¹⁰ Sn	-	1E+3	6E-7	3E-9	3E-5	3E-4
50	Tin-119m	D, see ¹¹⁰ Sn	3E+3 LLI wall (4E+3)	2E+3	1E-6	3E-9	-	-
		W, see ¹¹⁰ Sn	-	1E+3	4E-7	1E-9	6E-5	6E-4
50	Tin-121m	D, see ¹¹⁰ Sn	3E+3 LLI wall (4E+3)	9E+2	4E-7	1E-9	-	-
		W, see ¹¹⁰ Sn	-	5E+2	2E-7	8E-10	5E-5	5E-4
50	Tin-121	D, see ¹¹⁰ Sn	6E+3 LLI wall (6E+3)	2E+4	6E-6	2E-8	-	-
		W, see ¹¹⁰ Sn	-	1E+4	5E-6	2E-8	8E-5	8E-4
50	Tin-123m ²	D, see ¹¹⁰ Sn	5E+4	1E+5	5E-5	2E-7	7E-4	7E-3
		W, see ¹¹⁰ Sn	-	1E+5	6E-5	2E-7	-	-
50	Tin-123	D, see ¹¹⁰ Sn	5E+2 LLI wall (6E+2)	6E+2	3E-7	9E-10	-	-
		W, see ¹¹⁰ Sn	-	2E+2	7E-8	2E-10	9E-6	9E-5
50	Tin-125	D, see ¹¹⁰ Sn	4E+2 LLI wall (5E+2)	9E+2	4E-7	1E-9	-	-
		W, see ¹¹⁰ Sn	-	4E+2	1E-7	5E-10	6E-6	6E-5
50	Tin-126	D, see ¹¹⁰ Sn	3E+2	6E+1	2E-8	8E-11	4E-6	4E-5
		W, see ¹¹⁰ Sn	-	7E+1	3E-8	9E-11	-	-
50	Tin-127	D, see ¹¹⁰ Sn	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		W, see ¹¹⁰ Sn	-	2E+4	8E-6	3E-8	-	-
50	Tin-128 ²	D, see ¹¹⁰ Sn	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, see ¹¹⁰ Sn	-	4E+4	1E-5	5E-8	-	-
51	Antimony-115 ²	D, all compounds except those given for W, oxides, hydroxides, halides, sulfides, sulfates, and nitrates	8E+4	2E+5	1E-4	3E-7	1E-3	1E-2
			-	3E+5	1E-4	4E-7	-	-
51	Antimony-116m ²	D, see ¹¹⁵ Sb	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
		W, see ¹¹⁵ Sb	-	1E+5	6E-5	2E-7	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
51	Antimony-116 ²	D, see ¹¹⁵ Sb	7E+4 St wall (9E+4)	3E+5	1E-4	4E-7	-	-
		W, see ¹¹⁵ Sb	-	3E+5	1E-4	5E-7	1E-3	1E-2
51	Antimony-117	D, see ¹¹⁵ Sb	7E+4	2E+5	9E-5	3E-7	9E-4	9E-3
		W, see ¹¹⁵ Sb	-	3E+5	1E-4	4E-7	-	-
51	Antimony-118m	D, see ¹¹⁵ Sb	6E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		W, see ¹¹⁵ Sb	5E+3	2E+4	9E-6	3E-8	-	-
51	Antimony-119	D, see ¹¹⁵ Sb	2E+4	5E+4	2E-5	6E-8	2E-4	2E-3
		W, see ¹¹⁵ Sb	2E+4	3E+4	1E-5	4E-8	-	-
51	Antimony-120 ² (16 min)	D, see ¹¹⁵ Sb	1E+5 St wall (2E+5)	4E+5	2E-4	6E-7	-	-
		W, see ¹¹⁵ Sb	-	5E+5	2E-4	7E-7	2E-3	2E-2
51	Antimony-120 (5.76 d)	D, see ¹¹⁵ Sb	1E+3	2E+3	9E-7	3E-9	1E-5	1E-4
		W, see ¹¹⁵ Sb	9E+2	1E+3	5E-7	2E-9	-	-
51	Antimony-122	D, see ¹¹⁵ Sb	8E+2 LLI wall (8E+2)	2E+3	1E-6	3E-9	-	-
		W, see ¹¹⁵ Sb	7E+2	1E+3	4E-7	2E-9	1E-5	1E-4
51	Antimony-124m ²	D, see ¹¹⁵ Sb	3E+5	8E+5	4E-4	1E-6	3E-3	3E-2
		W, see ¹¹⁵ Sb	2E+5	6E+5	2E-4	8E-7	-	-
51	Antimony-124	D, see ¹¹⁵ Sb	6E+2	9E+2	4E-7	1E-9	7E-6	7E-5
		W, see ¹¹⁵ Sb	5E+2	2E+2	1E-7	3E-10	-	-
51	Antimony-125	D, see ¹¹⁵ Sb	2E+3	2E+3	1E-6	3E-9	3E-5	3E-4
		W, see ¹¹⁵ Sb	-	5E+2	2E-7	7E-10	-	-
51	Antimony-126m ²	D, see ¹¹⁵ Sb	5E+4 St wall (7E+4)	2E+5	8E-5	3E-7	-	-
		W, see ¹¹⁵ Sb	-	2E+5	8E-5	3E-7	9E-4	9E-3
51	Antimony-126	D, see ¹¹⁵ Sb	6E+2	1E+3	5E-7	2E-9	7E-6	7E-5
		W, see ¹¹⁵ Sb	5E+2	5E+2	2E-7	7E-10	-	-
51	Antimony-127	D, see ¹¹⁵ Sb	8E+2 LLI wall (8E+2)	2E+3	9E-7	3E-9	-	-
		W, see ¹¹⁵ Sb	7E+2	9E+2	4E-7	1E-9	1E-5	1E-4
51	Antimony-128 ² (10.4 min)	D, see ¹¹⁵ Sb	8E+4 St wall (1E+5)	4E+5	2E-4	5E-7	-	-
		W, see ¹¹⁵ Sb	-	4E+5	2E-4	6E-7	1E-3	1E-2
51	Antimony-128 (9.01 h)	D, see ¹¹⁵ Sb	1E+3	4E+3	2E-6	6E-9	2E-5	2E-4
		W, see ¹¹⁵ Sb	-	3E+3	1E-6	5E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air	Water	
			ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)	
51	Antimony-129	D, see ¹¹⁵ Sb W, see ¹¹⁵ Sb	3E+3 -	9E+3 9E+3	4E-6 4E-6	1E-8 1E-8	4E-5 -	4E-4 -
51	Antimony-130 ²	D, see ¹¹⁵ Sb W, see ¹¹⁵ Sb	2E+4 -	6E+4 8E+4	3E-5 3E-5	9E-8 1E-7	3E-4 -	3E-3 -
51	Antimony-131 ²	D, see ¹¹⁵ Sb W, see ¹¹⁵ Sb	1E+4 Thyroid (2E+4) - Thyroid -	2E+4 Thyroid (4E+4) 2E+4 (4E+4)	1E-5 - 1E-5 -	- 6E-8 - 6E-8	- 2E-4 - -	- 2E-3 - -
52	Tellurium-116	D, all compounds except those given for W, oxides, hydroxides, and nitrates	8E+3 -	2E+4 3E+4	9E-6 1E-5	3E-8 4E-8	1E-4 -	1E-3 -
52	Tellurium-121m	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	5E+2 Bone surf (7E+2) -	2E+2 Bone surf (4E+2) 4E+2	8E-8 - 2E-7	- 5E-10 6E-10	- 1E-5 -	- 1E-4 -
52	Tellurium-121	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	3E+3 -	4E+3 3E+3	2E-6 1E-6	6E-9 4E-9	4E-5 -	4E-4 -
52	Tellurium-123m	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	6E+2 Bone surf (1E+3) -	2E+2 Bone surf (5E+2) 5E+2	9E-8 - 2E-7	- 8E-10 8E-10	- 1E-5 -	- 1E-4 -
52	Tellurium-123	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	5E+2 Bone surf (1E+3) -	2E+2 Bone surf (5E+2) 4E+2 Bone surf (1E+3)	8E-8 - 2E-7 -	- 7E-10 - 2E-9	- 2E-5 - -	- 2E-4 - -
52	Tellurium-125m	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	1E+3 Bone surf (1E+3) -	4E+2 Bone surf (1E+3) 7E+2	2E-7 - 3E-7	- 1E-9 1E-9	- 2E-5 -	- 2E-4 -
52	Tellurium-127m	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	6E+2 -	3E+2 Bone surf (4E+2) 3E+2	1E-7 - 1E-7	- 6E-10 4E-10	9E-6 - -	9E-5 - -
52	Tellurium-127	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	7E+3 -	2E+4 2E+4	9E-6 7E-6	3E-8 2E-8	1E-4 -	1E-3 -
52	Tellurium-129m	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	5E+2 -	6E+2 2E+2	3E-7 1E-7	9E-10 3E-10	7E-6 -	7E-5 -
52	Tellurium-129 ²	D, see ¹¹⁶ Te W, see ¹¹⁶ Te	3E+4 -	6E+4 7E+4	3E-5 3E-5	9E-8 1E-7	4E-4 -	4E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion (μCi)	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
				ALI (μCi)	DAC (μCi/ml)			
52	Tellurium-131m	D, see ¹¹⁶ Te	3E+2 Thyroid (6E+2)	4E+2 Thyroid (1E+3)	2E-7	-	-	-
		W, see ¹¹⁶ Te	-	4E+2 Thyroid (9E+2)	2E-7	2E-9	8E-6	8E-5
		-	-	-	1E-9	-	-	
52	Tellurium-131 ²	D, see ¹¹⁶ Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6	-	-	-
		W, see ¹¹⁶ Te	-	5E+3 Thyroid (1E+4)	2E-6	2E-8	8E-5	8E-4
		-	-	-	2E-8	-	-	
52	Tellurium-132	D, see ¹¹⁶ Te	2E+2 Thyroid (7E+2)	2E+2 Thyroid (8E+2)	9E-8	-	-	-
		W, see ¹¹⁶ Te	-	2E+2 Thyroid (6E+2)	9E-8	1E-9	9E-6	9E-5
		-	-	-	9E-10	-	-	
52	Tellurium-133m ²	D, see ¹¹⁶ Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6	-	-	-
		W, see ¹¹⁶ Te	-	5E+3 Thyroid (1E+4)	2E-6	2E-8	9E-5	9E-4
		-	-	-	2E-8	-	-	
52	Tellurium-133 ²	D, see ¹¹⁶ Te	1E+4 Thyroid (3E+4)	2E+4 Thyroid (6E+4)	9E-6	-	-	-
		W, see ¹¹⁶ Te	-	2E+4 Thyroid (6E+4)	9E-6	8E-8	4E-4	4E-3
		-	-	-	8E-8	-	-	
52	Tellurium-134 ²	D, see ¹¹⁶ Te	2E+4 Thyroid (2E+4)	2E+4 Thyroid (5E+4)	1E-5	-	-	-
		W, see ¹¹⁶ Te	-	2E+4 Thyroid (5E+4)	1E-5	7E-8	3E-4	3E-3
		-	-	-	7E-8	-	-	
53	Iodine-120m ²	D, all compounds	1E+4 Thyroid (1E+4)	2E+4	9E-6	3E-8	-	2E-3
53	Iodine-120 ²	D, all compounds	4E+3 Thyroid (8E+3)	9E+3 Thyroid (1E+4)	4E-6	-	-	-
53	Iodine-121	D, all compounds	1E+4 Thyroid (3E+4)	2E+4 Thyroid (5E+4)	8E-6	-	-	-
53	Iodine-123	D, all compounds	3E+3 Thyroid (1E+4)	6E+3 Thyroid (2E+4)	3E-6	-	-	-
						2E-8	1E-4	1E-3

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
53	Iodine-124	D, all compounds	5E+1 Thyroid (2E+2)	8E+1 Thyroid (3E+2)	3E-8 -	- 4E-10	- 2E-6	- 2E-5
53	Iodine-125	D, all compounds	4E+1 Thyroid (1E+2)	6E+1 Thyroid (2E+2)	3E-8 -	- 3E-10	- 2E-6	- 2E-5
53	Iodine-126	D, all compounds	2E+1 Thyroid (7E+1)	4E+1 Thyroid (1E+2)	1E-8 -	- 2E-10	- 1E-6	- 1E-5
53	Iodine-128 ²	D, all compounds	4E+4 St wall (6E+4)	1E+5 -	5E-5 -	2E-7 -	- 8E-4	- 8E-3
53	Iodine-129	D, all compounds	5E+0 Thyroid (2E+1)	9E+0 Thyroid (3E+1)	4E-9 -	- 4E-11	- 2E-7	- 2E-6
53	Iodine-130	D, all compounds	4E+2 Thyroid (1E+3)	7E+2 Thyroid (2E+3)	3E-7 -	- 3E-9	- 2E-5	- 2E-4
53	Iodine-131	D, all compounds	3E+1 Thyroid (9E+1)	5E+1 Thyroid (2E+2)	2E-8 -	- 2E-10	- 1E-6	- 1E-5
53	Iodine-132m ²	D, all compounds	4E+3 Thyroid (1E+4)	8E+3 Thyroid (2E+4)	4E-6 -	- 3E-8	- 1E-4	- 1E-3
53	Iodine-132	D, all compounds	4E+3 Thyroid (9E+3)	8E+3 Thyroid (1E+4)	3E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-133	D, all compounds	1E+2 Thyroid (5E+2)	3E+2 Thyroid (9E+2)	1E-7 -	- 1E-9	- 7E-6	- 7E-5
53	Iodine-134 ²	D, all compounds	2E+4 Thyroid (3E+4)	5E+4 -	2E-5 -	6E-8 -	- 4E-4	- 4E-3
53	Iodine-135	D, all compounds	8E+2 Thyroid (3E+3)	2E+3 Thyroid (4E+3)	7E-7 -	- 6E-9	- 3E-5	- 3E-4
54	Xenon-120 ²	Submersion ¹	-	-	1E-5	4E-8	-	-
54	Xenon-121 ²	Submersion ¹	-	-	2E-6	1E-8	-	-
54	Xenon-122	Submersion ¹	-	-	7E-5	3E-7	-	-
54	Xenon-123	Submersion ¹	-	-	6E-6	3E-8	-	-
54	Xenon-125	Submersion ¹	-	-	2E-5	7E-8	-	-

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
54	Xenon-127	Submersion ¹	-	-	1E-5	6E-8	-	-
54	Xenon-129m	Submersion ¹	-	-	2E-4	9E-7	-	-
54	Xenon-131m	Submersion ¹	-	-	4E-4	2E-6	-	-
54	Xenon-133m	Submersion ¹	-	-	1E-4	6E-7	-	-
54	Xenon-133	Submersion ¹	-	-	1E-4	5E-7	-	-
54	Xenon-135m ²	Submersion ¹	-	-	9E-6	4E-8	-	-
54	Xenon-135	Submersion ¹	-	-	1E-5	7E-8	-	-
54	Xenon-138 ²	Submersion ¹	-	-	4E-6	2E-8	-	-
55	Cesium-125 ²	D, all compounds	5E+4 St wall (9E+4)	1E+5	6E-5	2E-7	-	-
				-	-	-	1E-3	1E-2
55	Cesium-127	D, all compounds	6E+4	9E+4	4E-5	1E-7	9E-4	9E-3
55	Cesium-129	D, all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
55	Cesium-130 ²	D, all compounds	6E+4 St wall (1E+5)	2E+5	8E-5	3E-7	-	-
				-	-	-	1E-3	1E-2
55	Cesium-131	D, all compounds	2E+4	3E+4	1E-5	4E-8	3E-4	3E-3
55	Cesium-132	D, all compounds	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
55	Cesium-134m	D, all compounds	1E+5 St wall (1E+5)	1E+5	6E-5	2E-7	-	-
				-	-	-	2E-3	2E-2
55	Cesium-134	D, all compounds	7E+1	1E+2	4E-8	2E-10	9E-7	9E-6
55	Cesium-135m ²	D, all compounds	1E+5	2E+5	8E-5	3E-7	1E-3	1E-2
55	Cesium-135	D, all compounds	7E+2	1E+3	5E-7	2E-9	1E-5	1E-4
55	Cesium-136	D, all compounds	4E+2	7E+2	3E-7	9E-10	6E-6	6E-5
55	Cesium-137	D, all compounds	1E+2	2E+2	6E-8	2E-10	1E-6	1E-5
55	Cesium-138 ²	D, all compounds	2E+4 St wall (3E+4)	6E+4	2E-5	8E-8	-	-
				-	-	-	4E-4	4E-3
56	Barium-126 ²	D, all compounds	6E+3	2E+4	6E-6	2E-8	8E-5	8E-4
56	Barium-128	D, all compounds	5E+2	2E+3	7E-7	2E-9	7E-6	7E-5
56	Barium-131m ²	D, all compounds	4E+5 St wall (5E+5)	1E+6	6E-4	2E-6	-	-
				-	-	-	7E-3	7E-2

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
56	Barium-131	D, all compounds	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
56	Barium-133m	D, all compounds	2E+3 LLI wall (3E+3)	9E+3 - -	4E-6 - -	1E-8 - -	- 4E-5	- 4E-4
56	Barium-133	D, all compounds	2E+3	7E+2	3E-7	9E-10	2E-5	2E-4
56	Barium-135m	D, all compounds	3E+3	1E+4	5E-6	2E-8	4E-5	4E-4
56	Barium-139 ²	D, all compounds	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
56	Barium-140	D, all compounds	5E+2 LLI wall (6E+2)	1E+3 - -	6E-7 - -	2E-9 - -	- 8E-6	- 8E-5
56	Barium-141 ²	D, all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
56	Barium-142 ²	D, all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
57	Lanthanum-131 ²	D, all compounds except those given for W W, oxides and hydroxides	5E+4 -	1E+5 2E+5	5E-5 7E-5	2E-7 2E-7	6E-4 -	6E-3 -
57	Lanthanum-132	D, see ¹³¹ La W, see ¹³¹ La	3E+3 -	1E+4 1E+4	4E-6 5E-6	1E-8 2E-8	4E-5 -	4E-4 -
57	Lanthanum-135	D, see ¹³¹ La W, see ¹³¹ La	4E+4 -	1E+5 9E+4	4E-5 4E-5	1E-7 1E-7	5E-4 -	5E-3 -
57	Lanthanum-137	D, see ¹³¹ La W, see ¹³¹ La	1E+4 -	6E+1 Liver (7E+1) 3E+2 Liver (3E+2)	3E-8 - 1E-7 -	- 1E-10 - 4E-10	2E-4 - -	2E-3 - -
57	Lanthanum-138	D, see ¹³¹ La W, see ¹³¹ La	9E+2 -	4E+0 1E+1	1E-9 6E-9	5E-12 2E-11	1E-5 -	1E-4 -
57	Lanthanum-140	D, see ¹³¹ La W, see ¹³¹ La	6E+2 -	1E+3 1E+3	6E-7 5E-7	2E-9 2E-9	9E-6 -	9E-5 -
57	Lanthanum-141	D, see ¹³¹ La W, see ¹³¹ La	4E+3 -	9E+3 1E+4	4E-6 5E-6	1E-8 2E-8	5E-5 -	5E-4 -
57	Lanthanum-142 ²	D, see ¹³¹ La W, see ¹³¹ La	8E+3 -	2E+4 3E+4	9E-6 1E-5	3E-8 5E-8	1E-4 -	1E-3 -
57	Lanthanum-143 ²	D, see ¹³¹ La W, see ¹³¹ La	4E+4 St wall (4E+4) -	1E+5 - 9E+4	4E-5 - 4E-5	1E-7 - 1E-7	- 5E-4 -	- 5E-3 -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
	ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)			
58	Cerium-134	W, all compounds except those given for Y	5E+2 LLI wall (6E+2)	7E+2	3E-7	1E-9	-	-
		Y, oxides, hydroxides, and fluorides	-	7E+2	3E-7	9E-10	-	8E-6
58	Cerium-135	W, see ¹³⁴ Ce	2E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		Y, see ¹³⁴ Ce	-	4E+3	1E-6	5E-9	-	-
58	Cerium-137m	W, see ¹³⁴ Ce	2E+3 LLI wall (2E+3)	4E+3	2E-6	6E-9	-	-
		Y, see ¹³⁴ Ce	-	4E+3	2E-6	5E-9	3E-5	3E-4
58	Cerium-137	W, see ¹³⁴ Ce	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
		Y, see ¹³⁴ Ce	-	1E+5	5E-5	2E-7	-	-
58	Cerium-139	W, see ¹³⁴ Ce	5E+3	8E+2	3E-7	1E-9	7E-5	7E-4
		Y, see ¹³⁴ Ce	-	7E+2	3E-7	9E-10	-	-
58	Cerium-141	W, see ¹³⁴ Ce	2E+3 LLI wall (2E+3)	7E+2	3E-7	1E-9	-	-
		Y, see ¹³⁴ Ce	-	6E+2	2E-7	8E-10	3E-5	3E-4
58	Cerium-143	W, see ¹³⁴ Ce	1E+3 LLI wall (1E+3)	2E+3	8E-7	3E-9	-	-
		Y, see ¹³⁴ Ce	-	2E+3	7E-7	2E-9	2E-5	2E-4
58	Cerium-144	W, see ¹³⁴ Ce	2E+2 LLI wall (3E+2)	3E+1	1E-8	4E-11	-	-
		Y, see ¹³⁴ Ce	-	1E+1	6E-9	2E-11	3E-6	3E-5
59	Praseodymium-136 ²	W, all compounds except those given for Y	5E+4 St wall (7E+4)	2E+5	1E-4	3E-7	-	-
		Y, oxides, hydroxides, carbides, and fluorides	-	2E+5	9E-5	3E-7	1E-3	1E-2
59	Praseodymium-137 ²	W, see ¹³⁶ Pr	4E+4	2E+5	6E-5	2E-7	5E-4	5E-3
		Y, see ¹³⁶ Pr	-	1E+5	6E-5	2E-7	-	-
59	Praseodymium-138m	W, see ¹³⁶ Pr	1E+4	5E+4	2E-5	8E-8	1E-4	1E-3
		Y, see ¹³⁶ Pr	-	4E+4	2E-5	6E-8	-	-
59	Praseodymium-139	W, see ¹³⁶ Pr	4E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		Y, see ¹³⁶ Pr	-	1E+5	5E-5	2E-7	-	-
59	Praseodymium-142m ²	W, see ¹³⁶ Pr	8E+4	2E+5	7E-5	2E-7	1E-3	1E-2
		Y, see ¹³⁶ Pr	-	1E+5	6E-5	2E-7	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
59	Praseodymium-142	W, see ¹³⁶ Pr Y, see ¹³⁶ Pr	1E+3 -	2E+3 2E+3	9E-7 8E-7	3E-9 3E-9	1E-5 -	1E-4 -
59	Praseodymium-143	W, see ¹³⁶ Pr Y, see ¹³⁶ Pr	9E+2 LLI wall (1E+3) -	8E+2 - 7E+2	3E-7 - 3E-7	1E-9 - 9E-10	- 2E-5 -	- 2E-4 -
59	Praseodymium-144 ²	W, see ¹³⁶ Pr Y, see ¹³⁶ Pr	3E+4 St wall (4E+4) -	1E+5 - 1E+5	5E-5 - 5E-5	2E-7 - 2E-7	- 6E-4 -	- 6E-3 -
59	Praseodymium-145	W, see ¹³⁶ Pr Y, see ¹³⁶ Pr	3E+3 -	9E+3 8E+3	4E-6 3E-6	1E-8 1E-8	4E-5 -	4E-4 -
59	Praseodymium-147 ²	W, see ¹³⁶ Pr Y, see ¹³⁶ Pr	5E+4 St wall (8E+4) -	2E+5 - 2E+5	8E-5 - 8E-5	3E-7 - 3E-7	- 1E-3 -	- 1E-2 -
60	Neodymium-136 ²	W, all compounds except those given for Y Y, oxides, hydroxides, carbides, and fluorides	1E+4 -	6E+4 5E+4	2E-5 2E-5	8E-8 8E-8	2E-4 -	2E-3 -
60	Neodymium-138	W, see ¹³⁶ Nd Y, see ¹³⁶ Nd	2E+3 -	6E+3 5E+3	3E-6 2E-6	9E-9 7E-9	3E-5 -	3E-4 -
60	Neodymium-139m	W, see ¹³⁶ Nd Y, see ¹³⁶ Nd	5E+3 -	2E+4 1E+4	7E-6 6E-6	2E-8 2E-8	7E-5 -	7E-4 -
60	Neodymium-139 ²	W, see ¹³⁶ Nd Y, see ¹³⁶ Nd	9E+4 -	3E+5 3E+5	1E-4 1E-4	5E-7 4E-7	1E-3 -	1E-2 -
60	Neodymium-141	W, see ¹³⁶ Nd Y, see ¹³⁶ Nd	2E+5 -	7E+5 6E+5	3E-4 3E-4	1E-6 9E-7	2E-3 -	2E-2 -
60	Neodymium-147	W, see ¹³⁶ Nd Y, see ¹³⁶ Nd	1E+3 LLI wall (1E+3) -	9E+2 - 8E+2	4E-7 - 4E-7	1E-9 - 1E-9	- 2E-5 -	- 2E-4 -
60	Neodymium-149 ²	W, see ¹³⁶ Nd Y, see ¹³⁶ Nd	1E+4 -	3E+4 2E+4	1E-5 1E-5	4E-8 3E-8	1E-4 -	1E-3 -
60	Neodymium-151 ²	W, see ¹³⁶ Nd Y, see ¹³⁶ Nd	7E+4 -	2E+5 2E+5	8E-5 8E-5	3E-7 3E-7	9E-4 -	9E-3 -
61	Promethium-141 ²	W, all compounds except those given for Y Y, oxides, hydroxides, carbides, and fluorides	5E+4 St wall (6E+4) -	2E+5 - 2E+5	8E-5 - 7E-5	3E-7 - 2E-7	- 8E-4 -	- 8E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
61	Promethium-143	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	5E+3 -	6E+2 7E+2	2E-7 3E-7	8E-10 1E-9	7E-5 -	7E-4 -
61	Promethium-144	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	1E+3 -	1E+2 1E+2	5E-8 5E-8	2E-10 2E-10	2E-5 -	2E-4 -
61	Promethium-145	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	1E+4 -	2E+2 Bone surf (2E+2) 2E+2	7E-8 8E-8	- 3E-10 3E-10	1E-4 -	1E-3 -
61	Promethium-146	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	2E+3 -	5E+1 4E+1	2E-8 2E-8	7E-11 6E-11	2E-5 -	2E-4 -
61	Promethium-147	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	4E+3 LLI wall (5E+3) -	1E+2 Bone surf (2E+2) 1E+2	5E-8 6E-8	- 3E-10 2E-10	- 7E-5 -	- 7E-4 -
61	Promethium-148m	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	7E+2 -	3E+2 3E+2	1E-7 1E-7	4E-10 5E-10	1E-5 -	1E-4 -
61	Promethium-148	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	4E+2 LLI wall (5E+2) -	5E+2 5E+2	2E-7 2E-7	8E-10 7E-10	- 7E-6 -	- 7E-5 -
61	Promethium-149	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	1E+3 LLI wall (1E+3) -	2E+3 2E+3	8E-7 8E-7	3E-9 2E-9	- 2E-5 -	- 2E-4 -
61	Promethium-150	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	5E+3 -	2E+4 2E+4	8E-6 7E-6	3E-8 2E-8	7E-5 -	7E-4 -
61	Promethium-151	W, see ¹⁴¹ Pm Y, see ¹⁴¹ Pm	2E+3 -	4E+3 3E+3	1E-6 1E-6	5E-9 4E-9	2E-5 -	2E-4 -
62	Samarium-141m ²	W, all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
62	Samarium-141 ²	W, all compounds	5E+4 St wall (6E+4)	2E+5 -	8E-5 -	2E-7 -	- 8E-4	- 8E-3
62	Samarium-142 ²	W, all compounds	8E+3	3E+4	1E-5	4E-8	1E-4	1E-3
62	Samarium-145	W, all compounds	6E+3	5E+2	2E-7	7E-10	8E-5	8E-4
62	Samarium-146	W, all compounds	1E+1 Bone surf (3E+1)	4E-2 Bone surf (6E-2)	1E-11 -	- 9E-14	- 3E-7	- 3E-6
62	Samarium-147	W, all compounds	2E+1 Bone surf (3E+1)	4E+2 Bone surf (7E-2)	2E-11 -	- 1E-13	- 4E-7	- 4E-6

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
62	Samarium-151	W, all compounds	1E+4 LLI wall (1E+4)	1E+2 Bone surf (2E+2)	4E-8 -	- 2E-10	- 2E-4	- 2E-3
62	Samarium-153	W, all compounds	2E+3 LLI wall (2E+3)	3E+3 -	1E-6 -	4E-9 -	- 3E-5	- 3E-4
62	Samarium-155 ²	W, all compounds	6E+4 St wall (8E+4)	2E+5 -	9E-5 -	3E-7 -	- 1E-3	- 1E-2
62	Samarium-156	W, all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
63	Europium-145	W, all compounds	2E+3	2E+3	8E-7	3E-9	2E-5	2E-4
63	Europium-146	W, all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
63	Europium-147	W, all compounds	3E+3	2E+3	7E-7	2E-9	4E-5	4E-4
63	Europium-148	W, all compounds	1E+3	4E+2	1E-7	5E-10	1E-5	1E-4
63	Europium-149	W, all compounds	1E+4	3E+3	1E-6	4E-9	2E-4	2E-3
63	Europium-150 (12.62 h)	W, all compounds	3E+3	8E+3	4E-6	1E-8	4E-5	4E-4
63	Europium-150 (34.2 y)	W, all compounds	8E+2	2E+1	8E-9	3E-11	1E-5	1E-4
63	Europium-152m	W, all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
63	Europium-152	W, all compounds	8E+2	2E+1	1E-8	3E-11	1E-5	1E-4
63	Europium-154	W, all compounds	5E+2	2E+1	8E-9	3E-11	7E-6	7E-5
63	Europium-155	W, all compounds	4E+3 -	9E+1 Bone surf (1E+2)	4E-8 -	- 2E-10	5E-5 -	5E-4 -
63	Europium-156	W, all compounds	6E+2	5E+2	2E-7	6E-10	8E-6	8E-5
63	Europium-157	W, all compounds	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4
63	Europium-158 ²	W, all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
64	Gadolinium-145 ²	D, all compounds except those given for W	5E+4 St wall (5E+4)	2E+5 -	6E-5 -	2E-7 -	- 6E-4	- 6E-3
		W, oxides, hydroxides, and fluorides	-	2E+5	7E-5	2E-7	-	-
64	Gadolinium-146	D, see ¹⁴⁵ Gd	1E+3	1E+2	5E-8	2E-10	2E-5	2E-4
		W, see ¹⁴⁵ Gd	-	3E+2	1E-7	4E-10	-	-
64	Gadolinium-147	D, see ¹⁴⁵ Gd	2E+3	4E+3	2E-6	6E-9	3E-5	3E-4
		W, see ¹⁴⁵ Gd	-	4E+3	1E-6	5E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
64	Gadolinium-148	D, see ¹⁴⁵ Gd	1E+1 Bone surf	8E+3 Bone surf	3E-12	-	-	-
		W, see ¹⁴⁵ Gd	(2E+1)	(2E+2)	-	2E-14	3E-7	3E-6
			-	3E-2 Bone surf	1E-11	-	-	-
64	Gadolinium-149	D, see ¹⁴⁵ Gd	3E+3	2E+3	9E-7	3E-9	4E-5	4E-4
		W, see ¹⁴⁵ Gd	-	2E+3	1E-6	3E-9	-	-
			-	-	-	-	-	-
64	Gadolinium-151	D, see ¹⁴⁵ Gd	6E+3	4E+2	2E-7	-	9E-5	9E-4
		W, see ¹⁴⁵ Gd	-	Bone surf (6E+2)	-	9E-10	-	-
			-	1E+3	5E-7	2E-9	-	-
64	Gadolinium-152	D, see ¹⁴⁵ Gd	2E+1 Bone surf	1E-2 Bone surf	4E-12	-	-	-
		W, see ¹⁴⁵ Gd	(3E+1)	(2E-2)	-	3E-14	4E-7	4E-6
			-	4E-2 Bone surf	2E-11	-	-	-
64	Gadolinium-153	D, see ¹⁴⁵ Gd	5E+3	1E+2 Bone surf	6E-8	-	6E-5	6E-4
		W, see ¹⁴⁵ Gd	-	(2E+2)	-	3E-10	-	-
			-	6E+2	2E-7	8E-10	-	-
64	Gadolinium-159	D, see ¹⁴⁵ Gd	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see ¹⁴⁵ Gd	-	6E+3	2E-6	8E-9	-	-
65	Terbium-147 ²	W, all compounds	9E+3	3E+4	1E-5	5E-8	1E-4	1E-3
65	Terbium-149	W, all compounds	5E+3	7E+2	3E-7	1E-9	7E-5	7E-4
65	Terbium-150	W, all compounds	5E+3	2E+4	9E-6	3E-8	7E-5	7E-4
65	Terbium-151	W, all compounds	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
65	Terbium-153	W, all compounds	5E+3	7E+3	3E-6	1E-8	7E-5	7E-4
65	Terbium-154	W, all compounds	2E+3	4E+3	2E-6	6E-9	2E-5	2E-4
65	Terbium-155	W, all compounds	6E+3	8E+3	3E-6	1E-8	8E-5	8E-4
65	Terbium-156m (5.0 h)	W, all compounds	2E+4	3E+4	1E-5	4E-8	2E-4	2E-3
65	Terbium-156m (24.4 h)	W, all compounds	7E+3	8E+3	3E-6	1E-8	1E-4	1E-3
65	Terbium-156	W, all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4
65	Terbium-157	W, all compounds	5E+4	3E+2	1E-7	-	-	-
			LLI wall (5E+4)	Bone surf (6E+2)	-	8E-10	7E-4	7E-3
65	Terbium-158	W, all compounds	1E+3	2E+1	8E-9	3E-11	2E-5	2E-4

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u> ALI (μCi)	<u>Inhalation</u> ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
65	Terbium-160	W, all compounds	8E+2	2E+2	9E-8	3E-10	1E-5	1E-4
65	Terbium-161	W, all compounds	2E+3 LLI wall (2E+3)	2E+3	7E-7	2E-9	- 3E-5	- 3E-4
66	Dysprosium-155	W, all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
66	Dysprosium-157	W, all compounds	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
66	Dysprosium-159	W, all compounds	1E+4	2E+3	1E-6	3E-9	2E-4	2E-3
66	Dysprosium-165	W, all compounds	1E+4	5E+4	2E-5	6E-8	2E-4	2E-3
66	Dysprosium-166	W, all compounds	6E+2 LLI wall (8E+2)	7E+2	3E-7	1E-9	- 1E-5	- 1E-4
67	Holmium-155 ²	W, all compounds	4E+4	2E+5	6E-5	2E-7	6E-4	6E-3
67	Holmium-157 ²	W, all compounds	3E+5	1E+6	6E-4	2E-6	4E-3	4E-2
67	Holmium-159 ²	W, all compounds	2E+5	1E+6	4E-4	1E-6	3E-3	3E-2
67	Holmium-161	W, all compounds	1E+5	4E+5	2E-4	6E-7	1E-3	1E-2
67	Holmium-162m ²	W, all compounds	5E+4	3E+5	1E-4	4E-7	7E-4	7E-3
67	Holmium-162 ²	W, all compounds	5E+5 St wall (8E+5)	2E+6	1E-3	3E-6	- 1E-2	- 1E-1
67	Holmium-164m ²	W, all compounds	1E+5	3E+5	1E-4	4E-7	1E-3	1E-2
67	Holmium-164 ²	W, all compounds	2E+5 St wall (2E+5)	6E+5	3E-4	9E-7	- 3E-3	- 3E-2
67	Holmium-166m	W, all compounds	6E+2	7E+0	3E-9	9E-12	9E-6	9E-5
67	Holmium-166	W, all compounds	9E+2 LLI wall (9E+2)	2E+3	7E-7	2E-9	- 1E-5	- 1E-4
67	Holmium-167	W, all compounds	2E+4	6E+4	2E-5	8E-8	2E-4	2E-3
68	Erbium-161	W, all compounds	2E+4	6E+4	3E-5	9E-8	2E-4	2E-3
68	Erbium-165	W, all compounds	6E+4	2E+5	8E-5	3E-7	9E-4	9E-3
68	Erbium-169	W, all compounds	3E+3 LLI wall (4E+3)	3E+3	1E-6	4E-9	- 5E-5	- 5E-4
68	Erbium-171	W, all compounds	4E+3	1E+4	4E-6	1E-8	5E-5	5E-4
68	Erbium-172	W, all compounds	1E+3 LLI wall (E+3)	1E+3	6E-7	2E-9	- 2E-5	- 2E-4

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
69	Thulium-162 ²	W, all compounds	7E+4 St wall (7E+4)	3E+5	1E-4	4E-7	-	-
69	Thulium-166	W, all compounds	4E+3	1E+4	6E-6	2E-8	6E-5	6E-4
69	Thulium-167	W, all compounds	2E+3 LLI wall (2E+3)	2E+3	8E-7	3E-9	-	-
69	Thulium-170	W, all compounds	8E+2 LLI wall (1E+3)	2E+2	9E-8	3E-10	-	-
69	Thulium-171	W, all compounds	1E+4 LLI wall (1E+4)	3E+2 Bone surf (6E+2)	1E-7	-	-	-
69	Thulium-172	W, all compounds	7E+2 LLI wall (8E+2)	1E+3	5E-7	2E-9	-	-
69	Thulium-173	W, all compounds	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
69	Thulium-175 ²	W, all compounds	7E+4 St wall (9E+4)	3E+5	1E-4	4E-7	-	-
70	Ytterbium-162 ²	W, all compounds except those given for Y, oxides, hydroxides, and fluorides	7E+4	3E+5	1E-4	4E-7	1E-3	1E-2
70	Ytterbium-166	W, see ¹⁶² Yb Y, see ¹⁶² Yb	1E+3 -	2E+3 2E+3	8E-7 8E-7	3E-9 3E-9	2E-5 -	2E-4 -
70	Ytterbium-167 ²	W, see ¹⁶² Yb Y, see ¹⁶² Yb	3E+5 -	8E+5 7E+5	3E-4 3E-4	1E-6 1E-6	4E-3 -	4E-2 -
70	Ytterbium-169	W, see ¹⁶² Yb Y, see ¹⁶² Yb	2E+3 -	8E+2 7E+2	4E-7 3E-7	1E-9 1E-9	2E-5 -	2E-4 -
70	Ytterbium-175	W, see ¹⁶² Yb Y, see ¹⁶² Yb	3E+3 LLI wall (3E+3) -	4E+3 -	1E-6 -	5E-9 -	- 4E-5 -	- 4E-4 -
70	Ytterbium-177 ²	W, see ¹⁶² Yb Y, see ¹⁶² Yb	2E+4 -	5E+4 5E+4	2E-5 2E-5	7E-8 6E-8	2E-4 -	2E-3 -
70	Ytterbium-178 ²	W, see ¹⁶² Yb Y, see ¹⁶² Yb	1E+4 -	4E+4 4E+4	2E-5 2E-5	6E-8 5E-8	2E-4 -	2E-3 -
71	Lutetium-169	W, all compounds except those given for Y, oxides, hydroxides, and fluorides	3E+3	4E+3	2E-6	6E-9	3E-5	3E-4
			-	4E+3	2E-6	6E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
71	Lutetium-170	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	1E+3 -	2E+3 2E+3	9E-7 8E-7	3E-9 3E-9	2E-5 -	2E-4 -
71	Lutetium-171	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	2E+3 -	2E+3 2E+3	8E-7 8E-7	3E-9 3E-9	3E-5 -	3E-4 -
71	Lutetium-172	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	1E+3 -	1E+3 1E+3	5E-7 5E-7	2E-9 2E-9	1E-5 -	1E-4 -
71	Lutetium-173	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	5E+3 - -	3E+2 Bone surf (5E+2) 3E+2	1E-7 - 1E-7	- 6E-10 4E-10	7E-5 - -	7E-4 - -
71	Lutetium-174m	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	2E+3 LLI wall (3E+3) -	2E+2 Bone surf (3E+2) 2E+2	1E-7 - 9E-8	- 5E-10 3E-10	- 4E-5 -	- 4E-4 -
71	Lutetium-174	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	5E+3 - -	1E+2 Bone surf (2E+2) 2E+2	5E-8 - 6E-8	- 3E-10 2E-10	7E-5 - -	7E-4 - -
71	Lutetium-176m	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	8E+3 -	3E+4 2E+4	1E-5 9E-6	3E-8 3E-8	1E-4 -	1E-3 -
71	Lutetium-176	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	7E+2 - -	5E+0 Bone surf (1E+1) 8E+0	2E-9 - 3E-9	- 2E-11 1E-11	1E-5 - -	1E-4 - -
71	Lutetium-177m	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	7E+2 - -	1E+2 Bone surf (1E+2) 8E+1	5E-8 - 3E-8	- 2E-10 1E-10	1E-5 - -	1E-4 - -
71	Lutetium-177	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	2E+3 LLI wall (3E+3) -	2E+3 - 2E+3	9E-7 - 9E-7	3E-9 - 3E-9	- 4E-5 -	- 4E-4 -
71	Lutetium-178m ²	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	5E+4 St. wall (6E+4) -	2E+5 - 2E+5	8E-5 - 7E-5	3E-7 - 2E-7	- 8E-4 -	- 8E-3 -
71	Lutetium-178 ²	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	4E+4 St wall (4E+4) -	1E+5 - 1E+5	5E-5 - 5E-5	2E-7 - 2E-7	- 6E-4 -	- 6E-3 -
71	Lutetium-179	W, see ¹⁶⁹ Lu Y, see ¹⁶⁹ Lu	6E+3 -	2E+4 2E+4	8E-6 6E-6	3E-8 3E-8	9E-5 -	9E-4 -
72	Hafnium-170	D, all compounds except those given for W W, oxides, hydroxides, carbides, and nitrates	3E+3 -	6E+3 5E+3	2E-6 2E-6	8E-9 6E-9	4E-5 -	4E-4 -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
72	Hafnium-172	D, see ¹⁷⁰ Hf	1E+3	9E+0 Bone surf (2E+1)	4E-9	-	2E-5	2E-4
		W, see ¹⁷⁰ Hf	-	4E+1 Bone surf (6E+1)	2E-8	3E-11	-	-
			-			8E-11	-	-
72	Hafnium-173	D, see ¹⁷⁰ Hf	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see ¹⁷⁰ Hf	-	1E+4	5E-6	2E-8	-	-
72	Hafnium-175	D, see ¹⁷⁰ Hf	3E+3	9E+2 Bone surf (1E+3)	4E-7	-	4E-5	4E-4
		W, see ¹⁷⁰ Hf	-	1E+3	5E-7	1E-9	-	-
			-			2E-9	-	-
72	Hafnium-177m ²	D, see ¹⁷⁰ Hf	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
		W, see ¹⁷⁰ Hf	-	9E+4	4E-5	1E-7	-	-
72	Hafnium-178m	D, see ¹⁷⁰ Hf	3E+2	1E+0 Bone surf (2E+0)	5E-10	-	3E-6	3E-5
		W, see ¹⁷⁰ Hf	-	5E+0 Bone surf (9E+0)	-	3E-12	-	-
			-			1E-11	-	-
72	Hafnium-179m	D, see ¹⁷⁰ Hf	1E+3	3E+2 Bone surf (6E+2)	1E-7	-	1E-5	1E-4
		W, see ¹⁷⁰ Hf	-	6E+2	3E-7	8E-10	-	-
			-			8E-10	-	-
72	Hafnium-180m	D, see ¹⁷⁰ Hf	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see ¹⁷⁰ Hf	-	3E+4	1E-5	4E-8	-	-
72	Hafnium-181	D, see ¹⁷⁰ Hf	1E+3	2E+2 Bone surf (4E+2)	7E-8	-	2E-5	2E-4
		W, see ¹⁷⁰ Hf	-	4E+2	2E-7	6E-10	-	-
			-			6E-10	-	-
72	Hafnium-182m ²	D, see ¹⁷⁰ Hf	4E+4	9E+4	4E-5	1E-7	5E-4	5E-3
		W, see ¹⁷⁰ Hf	-	1E+5	6E-5	2E-7	-	-
72	Hafnium-182	D, see ¹⁷⁰ Hf	2E+2	8E-1 Bone surf (2E+0)	3E-10	-	-	-
		W, see ¹⁷⁰ Hf	(4E+2)	3E+0 Bone surf (7E+0)	1E-9	2E-12	5E-6	5E-5
			-			-	-	-
			-			1E-11	-	-
72	Hafnium-183 ²	D, see ¹⁷⁰ Hf	2E+4	5E+4	2E-5	6E-8	3E-4	3E-3
		W, see ¹⁷⁰ Hf	-	6E+4	2E-5	8E-8	-	-
72	Hafnium-184	D, see ¹⁷⁰ Hf	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		W, see ¹⁷⁰ Hf	-	6E+3	3E-6	9E-9	-	-

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)	
73	Tantalum-172 ³	W, all compounds except those given for Y Y, elemental Ta, oxides, hydroxides, halides, carbides, nitrates, and nitrides	4E+4 -	1E+5 1E+5	5E-5 4E-5	2E-7 1E-7	5E-4 -	5E-3 -
73	Tantalum-173	W, see ¹⁷² Ta Y, see ¹⁷² Ta	7E+3 -	2E+4 2E+4	8E-6 7E-6	3E-8 2E-8	9E-5 -	9E-4 -
73	Tantalum-174 ²	W, see ¹⁷² Ta Y, see ¹⁷² Ta	3E+4 -	1E+5 9E+4	4E-5 4E-5	1E-7 1E-7	4E-4 -	4E-3 -
73	Tantalum-175	W, see ¹⁷² Ta Y, see ¹⁷² Ta	6E+3 -	2E+4 1E+4	7E-6 6E-6	2E-8 2E-8	8E-5 -	8E-4 -
73	Tantalum-176	W, see ¹⁷² Ta Y, see ¹⁷² Ta	4E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	5E-5 -	5E-4 -
73	Tantalum-177	W, see ¹⁷² Ta Y, see ¹⁷² Ta	1E+4 -	2E+4 2E+4	8E-6 7E-6	3E-8 2E-8	2E-4 -	2E-3 -
73	Tantalum-178	W, see ¹⁷² Ta Y, see ¹⁷² Ta	2E+4 -	9E+4 7E+4	4E-5 3E-5	1E-7 1E-7	2E-4 -	2E-3 -
73	Tantalum-179	W, see ¹⁷² Ta Y, see ¹⁷² Ta	2E+4 -	5E+3 9E+2	2E-6 4E-7	8E-9 1E-9	3E-4 -	3E-3 -
73	Tantalum-180m	W, see ¹⁷² Ta Y, see ¹⁷² Ta	2E+4 -	7E+4 6E+4	3E-5 2E-5	9E-8 8E-8	3E-4 -	3E-3 -
73	Tantalum-180	W, see ¹⁷² Ta Y, see ¹⁷² Ta	1E+3 -	4E+2 2E+1	2E-7 1E-8	6E-10 3E-11	2E-5 -	2E-4 -
73	Tantalum-182m ²	W, see ¹⁷² Ta St wall (2E+5) Y, see ¹⁷² Ta	2E+5 - -	5E+5 - 4E+5	2E-4 - 2E-4	8E-7 - 6E-7	- 3E-3 -	- 3E-2 -
73	Tantalum-182	W, see ¹⁷² Ta Y, see ¹⁷² Ta	8E+2 -	3E+2 1E+2	1E-7 6E-8	5E-10 2E-10	1E-5 -	1E-4 -
73	Tantalum-183	W, see ¹⁷² Ta LLI wall (1E+3) Y, see ¹⁷² Ta	9E+2 - -	1E+3 - 1E+3	5E-7 - 4E-7	2E-9 - 1E-9	- 2E-5 -	- 2E-4 -
73	Tantalum-184	W, see ¹⁷² Ta Y, see ¹⁷² Ta	2E+3 -	5E+3 5E+3	2E-6 2E-6	8E-9 7E-9	3E-5 -	3E-4 -
73	Tantalum-185 ²	W, see ¹⁷² Ta Y, see ¹⁷² Ta	3E+4 -	7E+4 6E+4	3E-5 3E-5	1E-7 9E-8	4E-4 -	4E-3 -
73	Tantalum-186 ²	W, see ¹⁷² Ta St wall (7E+4) Y, see ¹⁷² Ta	5E+4 - -	2E+5 - 2E+5	1E-4 - 9E-5	3E-7 - 3E-7	- 1E-3 -	- 1E-2 -
74	Tungsten-176	D, all compounds	1E+4	5E+4	2E-5	7E-8	1E-4	1E-3

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
74	Tungsten-177	D, all compounds	2E+4	9E+4	4E-5	1E-7	3E-4	3E-3
74	Tungsten-178	D, all compounds	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
74	Tungsten-179 ²	D, all compounds	5E+5	2E+6	7E-4	2E-6	7E-3	7E-2
74	Tungsten-181	D, all compounds	2E+4	3E+4	1E-5	5E-8	2E-4	2E-3
74	Tungsten-185	D, all compounds	2E+3	7E+3	3E-6	9E-9	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
74	Tungsten-187	D, all compounds	2E+3	9E+3	4E-6	1E-8	3E-5	3E-4
74	Tungsten-188	D, all compounds	4E+2	1E+3	5E-7	2E-9	-	-
			LLI wall (5E+2)	-	-	-	7E-6	7E-5
75	Rhenium-177 ²	D, all compounds except those given for W	9E+4	3E+5	1E-4	4E-7	-	-
			St wall (1E+5)	-	-	-	2E-3	2E-2
		W, oxides, hydroxides, and nitrates	-	4E+5	1E-4	5E-7	-	-
75	Rhenium-178 ²	D, see ¹⁷⁷ Re	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (1E+5)	-	-	-	1E-3	1E-2
		W, see ¹⁷⁷ Re	-	3E+5	1E-4	4E-7	-	-
75	Rhenium-181	D, see ¹⁷⁷ Re	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
		W, see ¹⁷⁷ Re	-	9E+3	4E-6	1E-8	-	-
75	Rhenium-182 (12.7 h)	D, see ¹⁷⁷ Re	7E+3	1E+4	5E-6	2E-8	9E-5	9E-4
		W, see ¹⁷⁷ Re	-	2E+4	6E-6	2E-8	-	-
75	Rhenium-182 (64.0 h)	D, see ¹⁷⁷ Re	1E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W, see ¹⁷⁷ Re	-	2E+3	9E-7	3E-9	-	-
75	Rhenium-184m	D, see ¹⁷⁷ Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see ¹⁷⁷ Re	-	4E+2	2E-7	6E-10	-	-
75	Rhenium-184	D, see ¹⁷⁷ Re	2E+3	4E+3	1E-6	5E-9	3E-5	3E-4
		W, see ¹⁷⁷ Re	-	1E+3	6E-7	2E-9	-	-
75	Rhenium-186m	D, see ¹⁷⁷ Re	1E+3	2E+3	7E-7	-	-	-
			St wall (2E+3)	St wall (2E+3)	-	3E-9	2E-5	2E-4
		W, see ¹⁷⁷ Re	-	2E+2	6E-8	2E-10	-	-
75	Rhenium-186	D, see ¹⁷⁷ Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see ¹⁷⁷ Re	-	2E+3	7E-7	2E-9	-	-
75	Rhenium-187	D, see ¹⁷⁷ Re	6E+5	8E+5	4E-4	-	8E-3	8E-2
			-	St wall (9E+5)	-	1E-6	-	-
		W, see ¹⁷⁷ Re	-	1E+5	4E-5	1E-7	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
75	Rhenium-188m ²	D, see ¹⁷⁷ Re W, see ¹⁷⁷ Re	8E+4 -	1E+5 1E+5	6E-5 6E-5	2E-7 2E-7	1E-3 -	1E-2 -
75	Rhenium-188	D, see ¹⁷⁷ Re W, see ¹⁷⁷ Re	2E+3 -	3E+3 3E+3	1E-6 1E-6	4E-9 4E-9	2E-5 -	2E-4 -
75	Rhenium-189	D, see ¹⁷⁷ Re W, see ¹⁷⁷ Re	3E+3 -	5E+3 4E+3	2E-6 2E-6	7E-9 6E-9	4E-5 -	4E-4 -
76	Osmium-180 ²	D, all compounds except those given for W and Y W, halides and nitrates Y, oxides and hydroxides	1E+5 - -	4E+5 5E+5 5E+5	2E-4 2E-4 2E-4	5E-7 7E-7 6E-7	1E-3 - -	1E-2 - -
76	Osmium-181 ²	D, see ¹⁸⁰ Os W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	1E+4 - -	4E+4 5E+4 4E+4	2E-5 2E-5 2E-5	6E-8 6E-8 6E-8	2E-4 - -	2E-3 - -
76	Osmium-182	D, see ¹⁸⁰ Os W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	2E+3 - -	6E+3 4E+3 4E+3	2E-6 2E-6 2E-6	8E-9 6E-9 6E-9	3E-5 - -	3E-4 - -
76	Osmium-185	D, see ¹⁸⁰ Os W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	2E+3 - -	5E+2 8E+2 8E+2	2E-7 3E-7 3E-7	7E-10 1E-9 1E-9	3E-5 - -	3E-4 - -
76	Osmium-189m	D, see ¹⁸⁰ Os W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	8E+4 - -	2E+5 2E+5 2E+5	1E-4 9E-5 7E-5	3E-7 3E-7 2E-7	1E-3 - -	1E-2 - -
76	Osmium-191m	D, see ¹⁸⁰ Os W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	1E+4 - -	3E+4 2E+4 2E+4	1E-5 8E-6 7E-6	4E-8 3E-8 2E-8	2E-4 - -	2E-3 - -
76	Osmium-191	D, see ¹⁸⁰ Os LLI wall (3E+3) W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	2E+3 - - -	2E+3 - 2E+3 1E+3	9E-7 - 7E-7 6E-7	3E-9 - 2E-9 2E-9	- 3E-5 - -	- 3E-4 - -
76	Osmium-193	D, see ¹⁸⁰ Os LLI wall (2E+3) W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	2E+3 - - -	5E+3 - 3E+3 3E+3	2E-6 - 1E-6 1E-6	6E-9 - 4E-9 4E-9	- 2E-5 - -	- 2E-4 - -
76	Osmium-194	D, see ¹⁸⁰ Os LLI wall (6E+2) W, see ¹⁸⁰ Os Y, see ¹⁸⁰ Os	4E+2 - - -	4E+1 - 6E+1 8E+0	2E-8 - 2E-8 3E-9	6E-11 - 8E-11 1E-11	- 8E-6 - -	- 8E-5 - -
77	Iridium-182 ²	D, all compounds except those given for W and Y St wall (4E+4) W, halides, nitrates, and metallic iridium Y, oxides and hydroxides	4E+4 - - -	1E+5 - 2E+5 1E+5	6E-5 - 6E-5 5E-5	2E-7 - 2E-7 2E-7	- 6E-4 - -	- 6E-3 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
77	Iridium-184	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	8E+3 - -	2E+4 3E+4 3E+4	1E-5 1E-5 1E-5	3E-8 5E-8 4E-8	1E-4 - -	1E-3 - -
77	Iridium-185	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	5E+3 - -	1E+4 1E+4 1E+4	5E-6 5E-6 4E-6	2E-8 2E-8 1E-8	7E-5 - -	7E-4 - -
77	Iridium-186	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	2E+3 - -	8E+3 6E+3 6E+3	3E-6 3E-6 2E-6	1E-8 9E-9 8E-9	3E-5 - -	3E-4 - -
77	Iridium-187	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	1E+4 - -	3E+4 3E+4 3E+4	1E-5 1E-5 1E-5	5E-8 4E-8 4E-8	1E-4 - -	1E-3 - -
77	Iridium-188	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	2E+3 - -	5E+3 4E+3 3E+3	2E-6 1E-6 1E-6	6E-9 5E-9 5E-9	3E-5 - -	3E-4 - -
77	Iridium-189	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	5E+3 LLI wall (5E+3) - -	5E+3 - 4E+3 4E+3	2E-6 - 2E-6 1E-6	7E-9 - 5E-9 5E-9	- 7E-5 - -	- 7E-4 - -
77	Iridium-190m ²	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	2E+5 - -	2E+5 2E+5 2E+5	8E-5 9E-5 8E-5	3E-7 3E-7 3E-7	2E-3 - -	2E-2 - -
77	Iridium-190	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	1E+3 - -	9E+2 1E+3 9E+2	4E-7 4E-7 4E-7	1E-9 1E-9 1E-9	1E-5 - -	1E-4 - -
77	Iridium-192m	D, see ¹⁸² Ir W, see ¹⁸² Ir	3E+3 - -	9E+1 2E+2 2E+1	4E-8 9E-8 6E-9	1E-10 3E-10 2E-11	4E-5 - -	4E-4 - -
77	Iridium-192	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	9E+2 - -	3E+2 4E+2 2E+2	1E-7 2E-7 9E-8	4E-10 6E-10 3E-10	1E-5 - -	1E-4 - -
77	Iridium-194m	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	6E+2 - -	9E+1 2E+2 1E+2	4E-8 7E-8 4E-8	1E-10 2E-10 1E-10	9E-6 - -	9E-5 - -
77	Iridium-194	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	1E+3 - -	3E+3 2E+3 2E+3	1E-6 9E-7 8E-7	4E-9 3E-9 3E-9	1E-5 - -	1E-4 - -
77	Iridium-195m	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	8E+3 - -	2E+4 3E+4 2E+4	1E-5 1E-5 9E-6	3E-8 4E-8 3E-8	1E-4 - -	1E-3 - -
77	Iridium-195	D, see ¹⁸² Ir W, see ¹⁸² Ir Y, see ¹⁸² Ir	1E+4 - -	4E+4 5E+4 4E+4	2E-5 2E-5 2E-5	6E-8 7E-8 6E-8	2E-4 - -	2E-3 - -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III	
			Occupational Values			Effluent Concentrations		Releases to Sewers	
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)	
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC (μCi/ml)		Air (μCi/ml)	Water (μCi/ml)		
78	Platinum-186	D, all compounds	1E+4	4E+4	2E-5	5E-8	2E-4	2E-3	
78	Platinum-188	D, all compounds	2E+3	2E+3	7E-7	2E-9	2E-5	2E-4	
78	Platinum-189	D, all compounds	1E+4	3E+4	1E-5	4E-8	1E-4	1E-3	
78	Platinum-191	D, all compounds	4E+3	8E+3	4E-6	1E-8	5E-5	5E-4	
78	Platinum-193m	D, all compounds	3E+3 LLI wall (3E+4)	6E+3	3E-6	8E-9	- 4E-5	-	4E-4
78	Platinum-193	D, all compounds	4E+4 LLI wall (5E+4)	2E+4	1E-5	3E-8	- 6E-4	-	6E-3
78	Platinum-195m	D, all compounds	2E+3 LLI wall (2E+3)	4E+3	2E-6	6E-9	- 3E-5	-	3E-4
78	Platinum-197m ²	D, all compounds	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3	
78	Platinum-197	D, all compounds	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4	
78	Platinum-199 ²	D, all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3	
78	Platinum-200	D, all compounds	1E+3	3E+3	1E-6	5E-9	2E-5	2E-4	
79	Gold-193	D, all compounds except those given for W and Y W, halides and nitrates Y, oxides and hydroxides	9E+3 - -	3E+4 2E+4 2E+4	1E-5 9E-6 8E-6	4E-8 3E-8 3E-8	1E-4 - -	- -	1E-3 - -
79	Gold-194	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	3E+3 - -	8E+3 5E+3 5E+3	3E-6 2E-6 2E-6	1E-8 8E-9 7E-9	4E-5 - -	- -	4E-4 - -
79	Gold-195	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	5E+3 - -	1E+4 1E+3 4E+2	5E-6 6E-7 2E-7	2E-8 2E-9 6E-10	7E-5 - -	- -	7E-4 - -
79	Gold-198m	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	1E+3 - -	3E+3 1E+3 1E+3	1E-6 5E-7 5E-7	4E-9 2E-9 2E-9	1E-5 - -	- -	1E-4 - -
79	Gold-198	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	1E+3 - -	4E+3 2E+3 2E+3	2E-6 8E-7 7E-7	5E-9 3E-9 2E-9	2E-5 - -	- -	2E-4 - -
79	Gold-199	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	3E+3 LLI wall (3E+3) - -	9E+3 4E+3 4E+3	4E-6 2E-6 2E-6	1E-8 - 6E-9 5E-9	- 4E-5 -	- 4E-4 -	- 4E-4 -
79	Gold-200m	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	1E+3 - -	4E+3 3E+3 2E+4	1E-6 1E-6 1E-6	5E-9 4E-9 3E-9	2E-5 - -	- -	2E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (µCi/ml)
			Oral	Inhalation		Air (µCi/ml)	Water (µCi/ml)	
			Ingestion (µCi)	ALI (µCi)	DAC (µCi/ml)			
79	Gold-2002	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	3E+4 - -	6E+4 8E+4 7E+4	3E-5 3E-5 3E-5	9E-8 1E-7 1E-7	4E-4 - -	4E-3 - -
79	Gold-201 ²	D, see ¹⁹³ Au W, see ¹⁹³ Au Y, see ¹⁹³ Au	7E+4 St wall (9E+4) - -	2E+5 - 2E+5 2E+5	9E-5 - 1E-4 9E-5	3E-7 - 3E-7 3E-7	- 1E-3 - -	- 1E-2 - -
80	Mercury-193m	Vapor Organic D D, sulfates W, oxides, hydroxides, halides, nitrates, and sulfides	- 4E+3 3E+3 -	8E+3 1E+4 9E+3 8E+3	4E-6 5E-6 4E-6 3E-6	1E-8 2E-8 1E-8 1E-8	- 6E-5 4E-5 -	- 6E-4 4E-4 -
80	Mercury-193	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 2E+4 2E+4 -	3E+4 6E+4 4E+4 4E+4	1E-5 3E-5 2E-5 2E-5	4E-8 9E-8 6E-8 6E-8	- 3E-4 2E-4 -	- 3E-3 2E-3 -
80	Mercury-194	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 2E+1 8E+2 -	3E+1 3E+1 4E+1 1E+2	1E-8 1E-8 2E-8 5E-8	4E-11 4E-11 6E-11 2E-10	- 2E-7 1E-5 -	- 2E-6 1E-4 -
80	Mercury-195m	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 3E+3 2E+3 -	4E+3 6E+3 5E+3 4E+3	2E-6 3E-6 2E-6 2E-6	6E-9 8E-9 7E-9 5E-9	- 4E-5 3E-5 -	- 4E-4 3E-4 -
80	Mercury-195	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 2E+4 1E+4 -	3E+4 5E+4 4E+4 3E+4	1E-5 2E-5 1E-5 1E-5	4E-8 6E-8 5E-8 5E-8	- 2E-4 2E-4 -	- 2E-3 2E-3 -
80	Mercury-197m	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 4E+3 3E+3 -	5E+3 9E+3 7E+3 5E+3	2E-6 4E-6 3E-6 2E-6	7E-9 1E-8 1E-8 7E-9	- 5E-5 4E-5 -	- 5E-4 4E-4 -
80	Mercury-197	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 7E+3 6E+3 -	8E+3 1E+4 1E+4 9E+3	4E-6 6E-6 5E-6 4E-6	1E-8 2E-8 2E-8 1E-8	- 9E-5 8E-5 -	- 9E-4 8E-4 -
80	Mercury-199m ²	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 6E+4 St wall (1E+5) 6E+4 -	8E+4 2E+5 - 1E+5 2E+5	3E-5 7E-5 - 6E-5 7E-5	1E-7 2E-7 - 2E-7 2E-7	- - 1E-3 8E-4 -	- - 1E-2 8E-3 -
80	Mercury-203	Vapor Organic D D, see ^{193m} Hg W, see ^{193m} Hg	- 5E+2 2E+3 -	8E+2 8E+2 1E+3 1E+3	4E-7 3E-7 5E-7 5E-7	1E-9 1E-9 2E-9 2E-9	- 7E-6 3E-5 -	- 7E-5 3E-4 -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
81	Thallium-194m ²	D, all compounds	5E+4 St wall (7E+4)	2E+5	6E-5	2E-7	-	-
81	Thallium-194 ²	D, all compounds	3E+5 St wall (3E+5)	6E+5	2E-4	8E-7	-	-
81	Thallium-195 ²	D, all compounds	6E+4	1E+5	5E-5	2E-7	9E-4	9E-3
81	Thallium-197	D, all compounds	7E+4	1E+5	5E-5	2E-7	1E-3	1E-2
81	Thallium-198m ²	D, all compounds	3E+4	5E+4	2E-5	8E-8	4E-4	4E-3
81	Thallium-198	D, all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
81	Thallium-199	D, all compounds	6E+4	8E+4	4E-5	1E-7	9E-4	9E-3
81	Thallium-200	D, all compounds	8E+3	1E+4	5E-6	2E-8	1E-4	1E-3
81	Thallium-201	D, all compounds	2E+4	2E+4	9E-6	3E-8	2E-4	2E-3
81	Thallium-202	D, all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
81	Thallium-204	D, all compounds	2E+3	2E+3	9E-7	3E-9	2E-5	2E-4
82	Lead-195m ²	D, all compounds	6E+4	2E+5	8E-5	3E-7	8E-4	8E-3
82	Lead-198	D, all compounds	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
82	Lead-199 ²	D, all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
82	Lead-200	D, all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
82	Lead-201	D, all compounds	7E+3	2E+4	8E-6	3E-8	1E-4	1E-3
82	Lead-202m	D, all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
82	Lead-202	D, all compounds	1E+2	5E+1	2E-8	7E-11	2E-6	2E-5
82	Lead-203	D, all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
82	Lead-205	D, all compounds	4E+3	1E+3	6E-7	2E-9	5E-5	5E-4
82	Lead-209	D, all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
82	Lead-210	D, all compounds	6E-1 Bone surf (1E+0)	2E-1 Bone surf (4E-1)	1E-10	-	-	-
82	Lead-211 ²	D, all compounds	1E+4	6E+2	3E-7	9E-10	2E-4	2E-3
82	Lead-212	D, all compounds	8E+1 Bone surf (1E+2)	3E+1	1E-8	5E-11	-	-
82	Lead-214 ²	D, all compounds	9E+3	8E+2	3E-7	1E-9	1E-4	1E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
83	Bismuth-200 ²	D, nitrates W, all other compounds	3E+4 -	8E+4 1E+5	4E-5 4E-5	1E-7 1E-7	4E-4 -	4E-3 -
83	Bismuth-201 ²	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	1E+4 -	3E+4 4E+4	1E-5 2E-5	4E-8 5E-8	2E-4 -	2E-3 -
83	Bismuth-202 ²	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	1E+4 -	4E+4 8E+4	2E-5 3E-5	6E-8 1E-7	2E-4 -	2E-3 -
83	Bismuth-203	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	2E+3 -	7E+3 6E+3	3E-6 3E-6	9E-9 9E-9	3E-5 -	3E-4 -
83	Bismuth-205	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	1E+3 -	3E+3 1E+3	1E-6 5E-7	3E-9 2E-9	2E-5 -	2E-4 -
83	Bismuth-206	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	6E+2 -	1E+3 9E+2	6E-7 4E-7	2E-9 1E-9	9E-6 -	9E-5 -
83	Bismuth-207	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	1E+3 -	2E+3 4E+2	7E-7 1E-7	2E-9 5E-10	1E-5 -	1E-4 -
83	Bismuth-210m	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	4E+1 Kidneys (6E+1) -	5E+0 Kidneys (6E+0) 7E-1	2E-9 - 3E-10	- 9E-12 9E-13	- 8E-7 -	- 8E-6 -
83	Bismuth-210	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	8E+2 - -	2E+2 Kidneys (4E+2) 3E+1	1E-7 - 1E-8	- 5E-10 4E-11	1E-5 - -	1E-4 - -
83	Bismuth-212 ²	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	5E+3 -	2E+2 3E+2	1E-7 1E-7	3E-10 4E-10	7E-5 -	7E-4 -
83	Bismuth-213 ²	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	7E+3 -	3E+2 4E+2	1E-7 1E-7	4E-10 5E-10	1E-4 -	1E-3 -
83	Bismuth-214 ²	D, see ²⁰⁰ Bi W, see ²⁰⁰ Bi	2E+4 St wall (2E+4) -	8E+2 - 9E-2	3E-7 - 4E-7	1E-9 - 1E-9	- 3E-4 -	- 3E-3 -
84	Polonium-203 ²	D, all compounds except those given for W W, oxides, hydroxides, and nitrates	3E+4 -	6E+4 9E+4	3E-5 4E-5	9E-8 1E-7	3E-4 -	3E-3 -
84	Polonium-205 ²	D, see ²⁰³ Po W, see ²⁰³ Po	2E+4 -	4E+4 7E+4	2E-5 3E-5	5E-8 1E-7	3E-4 -	3E-3 -
84	Polonium-207	D, see ²⁰³ Po W, see ²⁰³ Po	8E+3 -	3E+4 3E+4	1E-5 1E-5	3E-8 4E-8	1E-4 -	1E-3 -
84	Polonium-210	D, see ²⁰³ Po W, see ²⁰³ Po	3E+0 -	6E-1 6E-1	3E-10 3E-10	9E-13 9E-13	4E-8 -	4E-7 -
85	Astatine-207 ²	D, halides W	6E+3 -	3E+3 2E+3	1E-6 9E-7	4E-9 3E-9	8E-5 -	8E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
85	Astatine-211	D, halides W	1E+2 -	8E+1 5E+1	3E-8 2E-8	1E-10 8E-11	2E-6 -	2E-5 -
86	Radon-220	With daughters removed With daughters present (or 12 working level months) level)	- - working	2E+4 2E+1	7E-6 9E-9	2E-8 3E-11	- -	- -
86	Radon-222	With daughters removed With daughters present (or 4 working level months) level)	- - working	1E+4 1E+2	4E-6 3E-8	1E-8 1E-10	- -	- -
87	Francium-222 ²	D, all compounds	2E+3	5E+2	2E-7	6E-10	3E-5	3E-4
87	Francium-223 ²	D, all compounds	6E+2	8E+2	3E-7	1E-9	8E-6	8E-5
88	Radium-223	W, all compounds	5E+0 Bone surf (9E+0)	7E-1 -	3E-10 -	9E-13 -	- 1E-7	- 1E-6
88	Radium-224	W, all compounds	8E+0 Bone surf (2E+1)	2E+0 -	7E-10 -	2E-12 -	- 2E-7	- 2E-6
88	Radium-225	W, all compounds (2E+1)	8E+0 Bone surf -	7E-1 -	3E-10 -	9E-13 2E-7	- 2E-6	-
88	Radium-226	W, all compounds	2E+0 Bone surf (5E+0)	6E-1 -	3E-10 -	9E-13 -	- 6E-8	- 6E-7
88	Radium-227 ²	W, all compounds	2E+4 Bone surf (2E+4)	1E+4 Bone surf (2E+4)	6E-6 -	- 3E-8	- 3E-4	- 3E-3
88	Radium-228	W, all compounds	2E+0 Bone surf (4E+0)	1E+0 -	5E-10 -	2E-12 -	- 6E-8	- 6E-7
89	Actinium-224	D, all compounds except those given for W and Y	2E+3 LLI wall (2E+3)	3E+1 Bone surf (4E+1)	1E-8 -	- 5E-11	- 3E-5	- 3E-4
		W, halides and nitrates	-	5E+1	2E-8	7E-11	-	-
		Y, oxides and hydroxides	-	5E+1	2E-8	6E-11	-	-
89	Actinium-225	D, see ²²⁴ Ac	5E+1 LLI wall (5E+1)	3E-1 Bone surf (5E-1)	1E-10 -	- 7E-13	- 7E-7	- 7E-6
		W, see ²²⁴ Ac	-	6E-1	3E-10	9E-13	-	-
		Y, see ²²⁴ Ac	-	6E-1	3E-10	9E-13	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral <u>Ingestion</u> ALI (μCi)	<u>Inhalation</u>		Air (μCi/ml)	Water (μCi/ml)	
				ALI (μCi)	DAC (μCi/ml)			
89	Actinium-226	D, see ²²⁴ Ac	1E+2 LLI wall (1E+2)	3E+0 Bone surf (4E+0)	1E-9	-	-	-
		W, see ²²⁴ Ac	-	5E+0	2E-9	5E-12	2E-6	2E-5
		Y, see ²²⁴ Ac	-	5E+0	2E-9	7E-12	-	-
89	Actinium-227	D, see ²²⁴ Ac	2E-1 Bone surf (4E-1)	4E-4 Bone surf (8E-4)	2E-13	-	-	-
		W, see ²²⁴ Ac	-	2E-3 Bone surf (3E-3)	-	1E-15	5E-9	5E-8
		Y, see ²²⁴ Ac	-	4E-3	2E-12	-	-	-
89	Actinium-228	D, see ²²⁴ Ac	2E+3	9E+0 Bone surf (2E+1)	4E-9	-	3E-5	3E-4
		W, see ²²⁴ Ac	-	4E+1 Bone surf (6E+1)	-	2E-11	-	-
		Y, see ²²⁴ Ac	-	4E+1	2E-8	-	-	-
90	Thorium-226 ²	W, all compounds except those given for Y	5E+3 St wall (5E+3)	2E+2	6E-8	2E-10	-	-
		Y, oxides and hydroxides	-	1E+2	6E-8	-	7E-5	7E-4
90	Thorium-227	W, see ²²⁶ Th	1E+2	3E-1	1E-10	5E-13	2E-6	2E-5
		Y, see ²²⁶ Th	-	3E-1	1E-10	5E-13	-	-
90	Thorium-228	W, see ²²⁶ Th	6E+0 Bone surf (1E+1)	1E-2 Bone surf (2E-2)	4E-12	-	-	-
		Y, see ²²⁶ Th	-	2E-2	7E-12	3E-14	2E-7	2E-6
90	Thorium-229	W, see ²²⁶ Th	6E-1 Bone surf (1E+0)	9E-4 Bone surf (2E-3)	4E-13	-	-	-
		Y, see ²²⁶ Th	-	2E-3 Bone surf (3E-3)	1E-12	3E-15	2E-8	2E-7
90	Thorium-230	W, see ²²⁶ Th	4E+0 Bone surf (9E+0)	6E-3 Bone surf (2E-2)	3E-12	-	-	-
		Y, see ²²⁶ Th	-	2E-2 Bone surf (2E-2)	6E-12	2E-14	1E-7	1E-6
90	Thorium-231	W, see ²²⁶ Th	4E+3	6E+3	3E-6	9E-9	5E-5	5E-4
		Y, see ²²⁶ Th	-	6E+3	3E-6	9E-9	-	-
90	Thorium-232	W, see ²²⁶ Th	7E-1 Bone surf (2E+0)	1E-3 Bone surf (3E-3)	5E-13	-	-	-
		Y, see ²²⁶ Th	-	3E-3 Bone surf (4E-3)	1E-12	4E-15	3E-8	3E-7
						6E-15	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
92	Uranium-233	D, see ²³⁰ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10	-	-	-
		W, see ²³⁰ U	-	7E-1	3E-10	3E-12	3E-7	3E-6
		Y, see ²³⁰ U	-	4E-2	2E-11	1E-12	-	-
92	Uranium-234 ³	D, see ²³⁰ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10	-	-	-
		W, see ²³⁰ U	-	7E-1	3E-10	3E-12	3E-7	3E-6
		Y, see ²³⁰ U	-	4E-2	2E-11	1E-12	-	-
92	Uranium-235 ³	D, see ²³⁰ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	6E-10	-	-	-
		W, see ²³⁰ U	-	8E-1	3E-10	3E-12	3E-7	3E-6
		Y, see ²³⁰ U	-	4E-2	2E-11	1E-12	-	-
92	Uranium-236	D, see ²³⁰ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10	-	-	-
		W, see ²³⁰ U	-	8E-1	3E-10	3E-12	3E-7	3E-6
		Y, see ²³⁰ U	-	4E-2	2E-11	1E-12	-	-
92	Uranium-237	D, see ²³⁰ U	2E+3 LLI wall (2E+3)	3E+3	1E-6	4E-9	-	-
		W, see ²³⁰ U	-	2E+3	7E-7	-	3E-5	3E-4
		Y, see ²³⁰ U	-	2E+3	6E-7	2E-9	-	-
92	Uranium-238 ³	D, see ²³⁰ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	6E-10	-	-	-
		W, see ²³⁰ U	-	8E-1	3E-10	3E-12	3E-7	3E-6
		Y, see ²³⁰ U	-	4E-2	2E-11	1E-12	-	-
92	Uranium-239 ²	D, see ²³⁰ U	7E+4	2E+5	8E-5	3E-7	9E-4	9E-3
		W, see ²³⁰ U	-	2E+5	7E-5	2E-7	-	-
		Y, see ²³⁰ U	-	2E+5	6E-5	2E-7	-	-
92	Uranium-240	D, see ²³⁰ U	1E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		W, see ²³⁰ U	-	3E+3	1E-6	4E-9	-	-
		Y, see ²³⁰ U	-	2E+3	1E-6	3E-9	-	-
92	Uranium-natural ³	D, see ²³⁰ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10	-	-	-
		W, see ²³⁰ U	-	8E-1	3E-10	3E-12	3E-7	3E-6
		Y, see ²³⁰ U	-	5E-2	2E-11	9E-13	-	-
93	Neptunium-232 ²	W, all compounds	1E+5	2E+3 Bone surf (5E+2)	7E-7	-	2E-3	2E-2
93	Neptunium-233 ²	W, all compounds	8E+5	3E+6	1E-3	4E-6	1E-2	1E-1
93	Neptunium-234	W, all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			ALI (μCi)	ALI (μCi)	DAC (μCi/ml)			
93	Neptunium-235	W, all compounds	2E+4 LLI wall (2E+4)	8E+2 Bone surf (1E+3)	3E-7 -	- 2E-9	- 3E-4	- 3E-3
93	Neptunium-236 (1.15E+5 y)	W, all compounds	3E+0 Bone surf (6E+0)	2E-2 Bone surf (5E-2)	9E-12 -	- 8E-14	- 9E-8	- 9E-7
93	Neptunium-236 (22.5 h)	W, all compounds	3E+3 Bone surf (4E+3)	3E+1 Bone surf (7E+1)	1E-8 -	- 1E-10	- 5E-5	- 5E-4
93	Neptunium-237	W, all compounds	5E-1 Bone surf (1E+0)	4E-3 Bone surf (1E-2)	2E-12 -	- 1E-14	- 2E-8	- 2E-7
93	Neptunium-238	W, all compounds	1E+3 Bone surf -	6E+1 (2E+2)	3E-8 -	- 2E-10	2E-5 -	2E-4 -
93	Neptunium-239	W, all compounds	2E+3 LLI wall (2E+3)	2E+3 -	9E-7 -	3E-9 -	- 2E-5	- 2E-4
93	Neptunium-240 ²	W, all compounds	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
94	Plutonium-234	W, all compounds except PuO ₂ Y, PuO ₂	8E+3 -	2E+2 2E+2	9E-8 8E-8	3E-10 3E-10	1E-4 -	1E-3 -
94	Plutonium-235 ²	W, see ²³⁴ Pu Y, see ²³⁴ Pu	9E+5 -	3E+6 3E+6	1E-3 1E-3	4E-6 3E-6	1E-2 -	1E-1 -
94	Plutonium-236	W, see ²³⁴ Pu Y, see ²³⁴ Pu	2E+0 Bone surf (4E+0) -	2E-2 Bone surf (4E-2) 4E-2	8E-12 -	- 5E-14 6E-14	- 6E-8 -	- 6E-7 -
94	Plutonium-237	W, see ²³⁴ Pu Y, see ²³⁴ Pu	1E+4 -	3E+3 3E+3	1E-6 1E-6	5E-9 4E-9	2E-4 -	2E-3 -
94	Plutonium-238	W, see ²³⁴ Pu Y, see ²³⁴ Pu	9E-1 Bone surf (2E+0) -	7E-3 Bone surf (1E-2) 2E-2	3E-12 -	- 2E-14 2E-14	- 2E-8 -	- 2E-7 -
94	Plutonium-239	W, see ²³⁴ Pu Y, see ²³⁴ Pu	8E-1 Bone surf (1E+0) -	6E-3 Bone surf (1E-2) 2E-2 Bone surf (2E-2)	3E-12 -	- 2E-14 -	- 2E-8 -	- 2E-7 -
94	Plutonium-240	W, see ²³⁴ Pu Y, see ²³⁴ Pu	8E-1 Bone surf (1E+0) -	6E-3 Bone surf (1E-2) 2E-2 Bone surf (2E-2)	3E-12 -	- 2E-14 -	- 2E-8 -	- 2E-7 -

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Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion ALI (μCi)	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
				ALI (μCi)	DAC (μCi/ml)			
94	Plutonium-241	W, see ²³⁴ Pu	4E+1 Bone surf (7E+1)	3E-1 Bone surf (6E-1)	1E-10	-	-	-
		Y, see ²³⁴ Pu	-	8E-1 Bone surf (1E+0)	3E-10	8E-13	1E-6	1E-5
		-	-	-	1E-12	-	-	-
94	Plutonium-242	W, see ²³⁴ Pu	8E-1 Bone surf (1E+0)	7E-3 Bone surf (1E-2)	3E-12	-	-	-
		Y, see ²³⁴ Pu	-	-	2E-2	2E-14	2E-8	2E-7
		-	Bone surf (2E-2)	-	2E-14	-	-	-
94	Plutonium-243	W, see ²³⁴ Pu	2E+4	4E+4	2E-5	5E-8	2E-4	2E-3
		Y, see ²³⁴ Pu	-	4E+4	2E-5	5E-8	-	-
94	Plutonium-244	W, see ²³⁴ Pu	8E-1 Bone surf (2E+0)	7E-3 Bone surf (1E-2)	3E-12	-	-	-
		Y, see ²³⁴ Pu	-	2E-2 Bone surf (2E-2)	7E-12	2E-14	2E-8	2E-7
		-	-	-	2E-14	-	-	-
94	Plutonium-245	W, see ²³⁴ Pu	2E+3	5E+3	2E-6	6E-9	3E-5	3E-4
		Y, see ²³⁴ Pu	-	4E+3	2E-6	6E-9	-	-
94	Plutonium-246	W, see ²³⁴ Pu	4E+2 LLI wall (4E+2)	3E+2	1E-7	4E-10	-	-
		Y, see ²³⁴ Pu	-	3E+2	1E-7	4E-10	6E-6	6E-5
95	Americium-237 ²	W, all compounds	8E+4	3E+5	1E-4	4E-7	1E-3	1E-2
95	Americium-238 ²	W, all compounds	4E+4	3E+3 Bone surf (6E+3)	1E-6	-	5E-4	5E-3
95	Americium-239	W, all compounds	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
95	Americium-240	W, all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
95	Americium-241	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	-
95	Americium-242m	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	-
95	Americium-242	W, all compounds	4E+3	8E+1 Bone surf (9E+1)	4E-8	-	5E-5	5E-4
95	Americium-243	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	-
						2E-14	2E-8	2E-7

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
95	Americium-244m ²	W, all compounds	6E+4 St wall (8E+4)	4E+3 Bone surf (7E+3)	2E-6 -	- 1E-8	- 1E-3	- 1E-2
95	Americium-244	W, all compounds	3E+3 -	2E+2 Bone surf (3E+2)	8E-8 -	- 4E-10	4E-5 -	4E-4 -
95	Americium-245	W, all compounds	3E+4	8E+4	3E-5	1E-7	4E-4	4E-3
95	Americium-246m ²	W, all compounds	5E+4 St wall (6E+4)	2E+5 -	8E-5 -	3E-7 -	- 8E-4	- 8E-3
95	Americium-246 ²	W, all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
96	Curium-238	W, all compounds	2E+4	1E+3	5E-7	2E-9	2E-4	2E-3
96	Curium-240	W, all compounds	6E+1 Bone surf (8E+1)	6E-1 Bone surf (6E-1)	2E-10 -	- 9E-13	- 1E-6	- 1E-5
96	Curium-241	W, all compounds	1E+3 -	3E+1 Bone surf (4E+1)	1E-8 -	- 5E-11	2E-5 -	2E-4 -
96	Curium-242	W, all compounds	3E+1 Bone surf (5E+1)	3E-1 Bone surf (3E-1)	1E-10 -	- 4E-13	- 7E-7	- 7E-6
96	Curium-243	W, all compounds	1E+0 Bone surf (2E+0)	9E-3 Bone surf (2E-2)	4E-12 -	- 2E-14	- 3E-8	- 3E-7
96	Curium-244	W, all compounds	1E+0 Bone surf (3E+0)	1E-2 Bone surf (2E-2)	5E-12 -	- 3E-14	- 3E-8	- 3E-7
96	Curium-245	W, all compounds	7E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
96	Curium-246	W, all compounds	7E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
96	Curium-247	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
96	Curium-248	W, all compounds	2E-1 Bone surf (4E-1)	2E-3 Bone surf (3E-3)	7E-13 -	- 4E-15	- 5E-9	- 5E-8
96	Curium-249 ²	W, all compounds	5E+4 -	2E+4 Bone surf (3E+4)	7E-6 -	- 4E-8	7E-4 -	7E-3 -

Atomic No.	Radionuclide	Class	Table I			Table II		Table III
			Occupational Values			Effluent Concentrations		Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			<u>Ingestion</u>	<u>Inhalation</u>		Air	Water	
ALI (μCi)	ALI (μCi)	DAC (μCi/ml)	(μCi/ml)	(μCi/ml)				
96	Curium-250	W, all compounds	4E-2 Bone surf (6E-2)	3E-4 Bone surf (5E-4)	1E-13 -	- 8E-16	- 9E-10	- 9E-9
97	Berkelium-245	W, all compounds	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
97	Berkelium-246	W, all compounds	3E+3	3E+3	1E-6	4E-9	4E-5	4E-4
97	Berkelium-247	W, all compounds	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12 -	- 1E-14	- 2E-8	- 2E-7
97	Berkelium-249	W, all compounds	2E+2 Bone surf (5E+2)	2E+0 Bone surf (4E+0)	7E-10 -	- 5E-12	- 6E-6	- 6E-5
97	Berkelium-250	W, all compounds	9E+3 -	3E+2 Bone surf (7E+2)	1E-7 -	- 1E-9	1E-4 -	1E-3 -
98	Californium-244 ²	W, all compounds except those given for Y	3E+4 St wall (3E+4)	6E+2 -	2E-7 -	8E-10 -	- 4E-4	- 4E-3
		Y, oxides and hydroxides	-	6E+2	2E-7	8E-10	-	-
98	Californium-246	W, see ²⁴⁴ Cf Y, see ²⁴⁴ Cf	4E+2 -	9E+0 9E+0	4E-9 4E-9	1E-11 1E-11	5E-6 -	5E-5 -
98	Californium-248	W, see ²⁴⁴ Cf Y, see ²⁴⁴ Cf	8E+0 Bone surf (2E+1) -	6E-2 Bone surf (1E-1) 1E-1	3E-11 - 4E-11	- 2E-13 1E-13	- 2E-7 -	- 2E-6 -
98	Californium-249	W, see ²⁴⁴ Cf Y, see ²⁴⁴ Cf	5E-1 Bone surf (1E+0) -	4E-3 Bone surf (9E-3) 1E-2 Bone surf (1E-2)	2E-12 - 4E-12 -	- 1E-14 - 2E-14	- 2E-8 - -	- 2E-7 - -
98	Californium-250	W, see ²⁴⁴ Cf Y, see ²⁴⁴ Cf	1E+0 Bone surf (2E+0) -	9E-3 Bone surf (2E-2) 3E-2	4E-12 - 1E-11	- 3E-14 4E-14	- 3E-8 -	- 3E-7 -
98	Californium-251	W, see ²⁴⁴ Cf Y, see ²⁴⁴ Cf	5E-1 Bone surf (1E+0) -	4E-3 Bone surf (9E-3) 1E-2 Bone surf (1E-2)	2E-12 - 4E-12 -	- 1E-14 - 2E-14	- 2E-8 - -	- 2E-7 - -
98	Californium-252	W, see ²⁴⁴ Cf Y, see ²⁴⁴ Cf	2E+0 Bone surf (5E+0) -	2E-2 Bone surf (4E-2) 3E-2	8E-12 - 1E-11	- 5E-14 5E-14	- 7E-8 -	- 7E-7 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (µCi/ml)
			Oral Ingestion	Inhalation		Air (µCi/ml)	Water (µCi/ml)	
			ALI (µCi)	ALI (µCi)	DAC (µCi/ml)			
98	Californium-253	W, see ²⁴⁴ Cf	2E+2 Bone surf (4E+2)	2E+0	8E-10	3E-12	-	-
		Y, see ²⁴⁴ Cf	-	2E+0	7E-10	2E-12	5E-6	5E-5
98	Californium-254	W, see ²⁴⁴ Cf Y, see ²⁴⁴ Cf	2E+0 -	2E-2 2E-2	9E-12 7E-12	3E-14 2E-14	3E-8 -	3E-7 -
99	Einsteinium-250	W, all compounds	4E+4 -	5E+2 Bone surf (1E+3)	2E-7 -	- 2E-9	6E-4 -	6E-3 -
99	Einsteinium-251	W, all compounds	7E+3 -	9E+2 Bone surf (1E+3)	4E-7 -	- 2E-9	1E-4 -	1E-3 -
99	Einsteinium-253	W, all compounds	2E+2	1E+0	6E-10	2E-12	2E-6	2E-5
99	Einsteinium-254m	W, all compounds	3E+2 LLI wall (3E+2)	1E+1 -	4E-9 -	1E-11 -	- 4E-6	- 4E-5
99	Einsteinium-254	W, all compounds	8E+0 Bone surf (2E+1)	7E-2 Bone surf (1E-1)	3E-11 -	- 2E-13	- 2E-7	- 2E-6
100	Fermium-252	W, all compounds	5E+2	1E+1	5E-9	2E-11	6E-6	6E-5
100	Fermium-253	W, all compounds	1E+3	1E+1	4E-9	1E-11	1E-5	1E-4
100	Fermium-254	W, all compounds	3E+3	9E+1	4E-8	1E-10	4E-5	4E-4
100	Fermium-255	W, all compounds	5E+2	2E+1	9E-9	3E-11	7E-6	7E-5
100	Fermium-257	W, all compounds	2E+1 Bone surf (4E+1)	2E-1 Bone surf (2E-1)	7E-11 -	- 3E-13	- 5E-7	- 5E-6
101	Mendelevium-257	W, all compounds	7E+3 -	8E+1 Bone surf (9E+1)	4E-8 -	- 1E-10	1E-4 -	1E-3 -
101	Mendelevium-258	W, all compounds	3E+1 Bone surf (5E+1)	2E-1 Bone surf (3E-1)	1E-10 -	- 5E-13	- 6E-7	- 6E-6
	Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life less than 2 hours	Submersion ¹	-	2E+2	1E-7	1E-9	-	-
	Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours	-	2E-1	1E-10	1E-12	1E-8	1E-7

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion (μCi)	ALI (μCi)	DAC (μCi/ml)			
	Any single radionuclide not listed above that decays by alpha emission or spontaneous fission, or any mixture for which either the identity or the concentration of any radionuclide in the mixture is not known		-	4E-4	2E-13	1E-15	2E-9	2E-8

FOOTNOTES:

- ¹ "Submersion" means that values given are for submersion in a hemispherical semi-infinite cloud of airborne material.
- ² These radionuclides have radiological half-lives of less than 2 hours. The total effective dose equivalent received during operations with these radionuclides might include a significant contribution from external exposure. The DAC values for all radionuclides, other than those designated Class "Submersion," are based upon the committed effective dose equivalent due to the intake of the radionuclide into the body and do NOT include potentially significant contributions to dose equivalent from external exposures. The licensee may substitute 1E-7 μCi/ml for the listed DAC to account for the submersion dose prospectively, but should use individual monitoring devices or other radiation measuring instruments that measure external exposure to demonstrate compliance with the limits.
- ³ For soluble mixtures of U-238, U-234, and U-235 in air, chemical toxicity may be the limiting factor. If the percent by weight (enrichment) of U-235 is not greater than 5, the concentration value for a 40-hour workweek is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40-hour workweek shall not exceed 8E-3 (SA) μCi-hr/ml, where SA is the specific activity of the uranium inhaled. The specific activity for natural uranium is 6.77E-7 curies per gram U. The specific activity for other mixtures of U-238, U-235, and U-234, if not known, shall be:

$$SA = 3.6E-7 \text{ curies/gram U } \quad \text{U-depleted}$$

$$SA = [0.4 + 0.38 (\text{enrichment}) + 0.0034 (\text{enrichment})^2] E-6, \text{ enrichment} > 0.72$$

where enrichment is the percentage by weight of U-235, expressed as percent.

NOTE:

- If the identity of each radionuclide in a mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture shall be the most restrictive DAC of any radionuclide in the mixture.
- If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in this appendix are not present in the mixture, the inhalation ALI, DAC, and effluent and sewage concentrations for the mixture are the lowest values specified in this appendix for any radionuclide that is not known to be absent from the mixture; or

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
			Ingestion (μCi)	ALI (μCi)	DAC (μCi/ml)			
	If it is known that Ac-227-D and Cm-250-W are not present		-	7E-4	3E-13	-	-	-
	If, in addition, it is known that Ac-227-W,Y, Th-229-W,Y, Th-230-W, Th-232-W,Y, Pa-231-W,Y, Np-237-W, Pu-239-W, Pu-240-W, Pu-242-W, Am-241-W, Am-242m-W, Am-243-W, Cm-245-W, Cm-246-W, Cm-247-W, Cm-248-W, Bk-247-W, Cf-249-W, and Cf-251-W are not present		-	7E-3	3E-12	-	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration (μCi/ml)
			Oral Ingestion	Inhalation		Air (μCi/ml)	Water (μCi/ml)	
				ALI (μCi)	ALI (μCi)			

If, in addition, it is known that Sm-146-W, Sm-147-W, Gd-148-D,W, Gd-152-D,W, Th-228-W,Y, Th-230-Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, Np-236-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-Y, Pu-240-Y, Pu-242-Y, Pu-244-W,Y, Cm-243-W, Cm-244-W, Cf-248-W, Cf-249-Y, Cf-250-W,Y, Cf-251-Y, Cf-252-W,Y, and Cf-254-W,Y are not present

- 7E-2 3E-11 - - -

If, in addition, it is known that Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-Y, Es-254-W, Fm-257-W, and Md-258-W are not present

- 7E-1 3E-10 - - -

If, in addition, it is known that Si-32-Y, Ti-44-Y, Fe-60-D, Sr-90-Y, Zr-93-D, Cd-113m-D, Cd-113-D, In-115-D,W, La-138-D, Lu-176-W, Hf-178m-D,W, Hf-182-D,W, Bi-210m-D, Ra-224-W, Ra-228-W, Ac-226-D,W,Y, Pa-230-W,Y, U-233-D,W, U-234-D,W, U-235-D,W, U-236-D,W, U-238-D,W, Pu-241-Y, Bk-249-W, Cf-253-W,Y, and Es-253-W are not present

- 7E+0 3E-9 - - -

If it is known that Ac-227-D,W,Y, Th-229-W,Y, Th-232-W,Y, Pa-231-W,Y, Cm-248-W, and Cm-250-W are not present

- - - 1E-14 - -

If, in addition, it is known that Sm-146-W, Gd-148-D,W, Gd-152-D, Th-228-W,Y, Th-230-W,Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, U-Nat-Y, Np-236-W, Np-237-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-W,Y, Pu-240-W,Y, Pu-242-W,Y, Pu-244-W,Y, Am-241-W, Am-242m-W, Am-243-W, Cm-243-W, Cm-244-W, Cm-245-W, Cm-246-W, Cm-247-W, Bk-247-W, Cf-249-W,Y, Cf-250-W,Y, Cf-251-W,Y, Cf-252-W,Y, and Cf-254-W,Y are not present

- - - 1E-13 - -

If, in addition, it is known that Sm-147-W, Gd-152-W, Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, U-Nat-W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-W,Y, Es-254-W, Fm-257-W, and Md-258-W are not present

- - - 1E-12 - -

If, in addition it is known that Fe-60, Sr-90, Cd-113m, Cd-113, In-115, I-129, Cs-134, Sm-145, Sm-147, Gd-148, Gd-152, Hg-194 (organic), Bi-210m, Ra-223, Ra-224, Ra-225, Ac-225, Th-228, Th-230, U-233, U-234, U-235, U-236, U-238, U-Nat, Cm-242, Cf-248, Es-254, Fm-257, and Md-258 are not present

- - - - 1E-6 1E-5

3. If a mixture of radionuclides consists of uranium and its daughters in ore dust (10 μm AMAD particle distribution assumed) prior to chemical separation of the uranium from the ore, the following values may be used for the DAC of the mixture: 6E-11 μCi of gross alpha activity from uranium-238, uranium-234, thorium-230, and radium-226 per milliliter of air; 3E-11 μCi of natural uranium per milliliter of air; or 45 micrograms of natural uranium per cubic meter of air.

4. If the identity and concentration of each radionuclide in a mixture are known, the limiting values should be derived as follows: determine, for each radionuclide in the mixture, the ratio between the concentration present in the mixture and the concentration otherwise established in this subsection for the specific radionuclide when not in a mixture. The sum of such ratios for all of the radionuclides in the mixture may not exceed "1" (i.e., "unity").

Example: If radionuclides "A," "B," and "C" are present in concentrations CA, CB, and CC, and if the applicable DACs are DACA, DACB, and DACC, respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_A}{DAC_A} + \frac{C_B}{DAC_B} + \frac{C_C}{DAC_C} \leq 1$$

APPENDIX

Rule	Statute Implemented
He-P 4090.01	RSA 125-F:5, V

~~Readopt with corrections He-P 4092, effective 9-20-03 (document #7961), cited and to read as follows:~~

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

~~Statutory Authority RSA 125-F:5, V; and RSA 125-F:7~~

PART He-P 4092 QUANTITIES OF ~~RADIOACTIVE-LICENSED~~ MATERIAL REQUIRING LABELING

He-P 4092.01 Quantities of ~~Radioactive-Licensed~~ Material Requiring Labeling. The limits of quantities of ~~radioactive-licensed~~ material which shall be labeled shall be in compliance with Table 4092.1 below:

Table 4092.1 Quantities^{1 (a)} of ~~Radioactive-Licensed~~ Material Requiring Labeling

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
1	Hydrogen-3	1000
4	Beryllium-10	1
4	Beryllium-7	1000
6	Carbon-11	1000
6	Carbon-14	1000 100
9	Fluorine-18	1000
11	Sodium-22	10
11	Sodium-24	100 10
12	Magnesium-28	100
13	Aluminum-26	10
14	Silicon-31	1000 100
14	Silicon-32	1
15	Phosphorus-32	10
15	Phosphorus-33	100
16	Sulfur-35	100
17	Chlorine-36	10
17	Chlorine-38	1000 10
17	Chlorine-39	1000
18	Argon-39	1000
18	Argon-41	1000
19	Potassium-40	100
19	Potassium-42	1000 10
19	Potassium-43	1000 10
19	Potassium-44	1000
19	Potassium-45	1000
20	Calcium-41	100
20	Calcium-45	100 10
20	Calcium-47	100 10
21	Scandium-43	1000
21	Scandium-44	100
21	Scandium-44m	100
21	Scandium-46	10
21	Scandium-47	100
21	Scandium-48	100 10

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
21	Scandium-49	1000
22	Titanium-44	1
22	Titanium-45	1000
23	Vanadium-47	1000
23	Vanadium-48	100 10
23	Vanadium-49	1000
24	Chromium-48	1000
24	Chromium-49	1000
24	Chromium-51	1000
25	Manganese-51	1000
25	Manganese-52	100
25	Manganese-52m	1000
25	Manganese-53	1000
25	Manganese-54	100 10
25	Manganese-56	1000 10
26	Iron-52	100 10
26	Iron-55	100
26	Iron-59	10
26	Iron-60	1
27	Cobalt-55	100
27	Cobalt-56	10
27	Cobalt-57	100
27	Cobalt-58	100 10
27	Cobalt-58m	1000 10
27	Cobalt-60	1
27	Cobalt-60m	1000
27	Cobalt-61	1000
27	Cobalt-62m	1000
28	Nickel-56	100
28	Nickel-57	100
28	Nickel-59	100
28	Nickel-63	100 10
28	Nickel-65	1000 100
28	Nickel-66	10
29	Copper-60	1000
29	Copper-61	1000
29	Copper-64	1000 100
29	Copper-67	1000
30	Zinc-62	100
30	Zinc-63	1000
30	Zinc-65	10
30	Zinc-69	1000
30	Zinc-69m	100
30	Zinc-71m	1000
30	Zinc-72	100
31	Gallium-65	1000
31	Gallium-66	100
31	Gallium-67	1000 100
31	Gallium-68	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
31	Gallium-70	1000
31	Gallium-72	100 10
31	Gallium-73	1000
32	Germanium-66	1000
32	Germanium-67	1000
32	Germanium-68	10
32	Germanium-69	1000
32	Germanium-71	1000 100
32	Germanium-75	1000
32	Germanium-77	1000
32	Germanium-78	1000
33	Arsenic-69	1000
33	Arsenic-70	1000
33	Arsenic-71	100
33	Arsenic-72	100
33	Arsenic-73	100
33	Arsenic-74	100 10
33	Arsenic-76	100 10
33	Arsenic-77	100
33	Arsenic-78	1000
34	Selenium-70	1000
34	Selenium-73	100
34	Selenium-73m	1000
34	Selenium-75	100 10
34	Selenium-79	100
34	Selenium-81	1000
34	Selenium-81m	1000
34	Selenium-83	1000
35	Bromine-74	1000
35	Bromine-74m	1000
35	Bromine-75	1000
35	Bromine-76	100
35	Bromine-77	1000
35	Bromine-80	1000
35	Bromine-80m	1000
35	Bromine-82	100 10
35	Bromine-83	1000
35	Bromine-84	1000
36	Krypton-74	1000
36	Krypton-76	1000
36	Krypton-77	1000
36	Krypton-79	1000
36	Krypton-81	1000
36	Krypton-83m	1000
36	Krypton-85	1000 100
36	Krypton-85m	1000
36	Krypton-87	1000 10
36	Krypton-88	1000
37	Rubidium-79	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
37	Rubidium-81	1000 10
37	Rubidium-81m	1000 10
37	Rubidium-82m	1000
37	Rubidium-83	100
37	Rubidium-84	100
37	Rubidium-86	100 10
37	Rubidium-87	100 10
37	Rubidium-88	1000
37	Rubidium-89	1000
38	Strontium-80	100
38	Strontium-81	1000
38	Strontium-83	100
38	Strontium-85m	1000
38	Strontium-85	100 10
38	Strontium-87m	1000
38	Strontium-89	10 1
38	Strontium-90	0.1
38	Strontium-91	100 10
38	Strontium-92	100 10
39	Yttrium-86	100
39	Yttrium-86m	1000
39	Yttrium-87	100 10
39	Yttrium-88	10
39	Yttrium-90	10
39	Yttrium-90m	1000
39	Yttrium-91	10
39	Yttrium-91m	1000
39	Yttrium-92	100
39	Yttrium-93	100
39	Yttrium-94	1000
39	Yttrium-95	1000
40	Zirconium-86	100
40	Zirconium-88	10
40	Zirconium-89	100
40	Zirconium-93	10 1
40	Zirconium-95	10
40	Zirconium-97	100 10
41	Niobium-88	1000
41	Niobium-89 (122 min)	1000
41	Niobium-89m (66 min)	1000
41	Niobium-90	100
41	Niobium-93m	10
41	Niobium-94	1
41	Niobium-95	100 10
41	Niobium-95m	100
41	Niobium-96	100
41	Niobium-97	1000 10
41	Niobium-98	1000
42	Molybdenum-101	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
42	Molybdenum-90	100
42	Molybdenum-93	10
42	Molybdenum-93m	100
42	Molybdenum-99	100
43	Technetium-101	1000
43	Technetium-104	1000
43	Technetium-93	1000
43	Technetium-93m	1000
43	Technetium-94	1000
43	Technetium-94m	1000
43	Technetium-96	100 10
43	Technetium-96m	1000
43	Technetium-97	1000 100
43	Technetium-97m	100
43	Technetium-98	10
43	Technetium-99	100 10
43	Technetium-99m	1000 100
44	Ruthenium-103	100 10
44	Ruthenium-105	1000 10
44	Ruthenium-106	1
44	Ruthenium-94	1000
44	Ruthenium-97	1000 100
45	Rhodium-100	100
45	Rhodium-101	10
45	Rhodium-101m	1000
45	Rhodium-102	10
45	Rhodium-102m	10
45	Rhodium-103m	1000 100
45	Rhodium-105	100
45	Rhodium-106m	1000
45	Rhodium-107	1000
45	Rhodium-99	100
45	Rhodium-99m	1000
46	Palladium-100	100
46	Palladium-101	1000
46	Palladium-103	100
46	Palladium-107	10
46	Palladium-109	100
47	Silver-102	1000
47	Silver-103	1000
47	Silver-104	1000
47	Silver-104m	1000
47	Silver-105	100 10
47	Silver-106	1000
47	Silver-106m	100
47	Silver-108m	1
47	Silver-111	100
47	Silver-112	100
47	Silver-115	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
47	Silver-110m	+01
48	Cadmium-104	1000
48	Cadmium-107	1000
48	Cadmium-109	+10
48	Cadmium-113	100
48	Cadmium-113m	0.1
48	Cadmium-115	100
48	Cadmium-115m	10
48	Cadmium-117	1000
48	Cadmium-117m	1000
49	Indium-109	1000
49	Indium-110 m (69.1 min)	1000
49	Indium-111	100
49	Indium-112	1000
49	Indium-113m	+000100
49	Indium-114m	10
49	Indium-115	+0010
49	Indium-115m	+000100
49	Indium-116m	1000
49	Indium-117	1000
49	Indium-117m	1000
49	Indium-119m	1000
49	Indium-110 (4.9 h)	1000
50	Tin-110	100
50	Tin-111	1000
50	Tin-113	+0010
50	Tin-117m	100
50	Tin-119m	100
50	Tin-121	1000
50	Tin-121m	100
50	Tin-123	10
50	Tin-123m	1000
50	Tin-125	10
50	Tin-126	10
50	Tin-127	1000
50	Tin-128	1000
51	Antimony-115	1000
51	Antimony-116	1000
51	Antimony-116m	1000
51	Antimony-117	1000
51	Antimony-118m	1000
51	Antimony-119	1000
51	Antimony-120 (5076-5.76 d)	100
51	Antimony-120 (16 min)	1000
51	Antimony-122	100
51	Antimony-124	10
51	Antimony-124m	1000
51	Antimony-125	+0010
51	Antimony-126	100

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
51	Antimony-126m	1000
51	Antimony-127	100
51	Antimony-128 (10.4 min)	1000
51	Antimony-128 (9.01 h)	100
51	Antimony-129	100
51	Antimony-130	1000
51	Antimony-131	1000
52	Tellurium-116	1000
52	Tellurium-121	100
52	Tellurium-121m	10
52	Tellurium-123	100
52	Tellurium-123m	10
52	Tellurium-125m	10
52	Tellurium-127	1000 100
52	Tellurium-127m	10
52	Tellurium-129	1000 100
52	Tellurium-129m	10
52	Tellurium-131	100
52	Tellurium-131m	10
52	Tellurium-132	10
52	Tellurium-133	1000
52	Tellurium-133m	100
52	Tellurium-134	1000
53	Iodine-120	100
53	Iodine-120m	1000
53	Iodine-121	1000
53	Iodine-123	100
53	Iodine-124	10
53	Iodine-125	1
53	Iodine-126	1
53	Iodine-128	1000
53	Iodine-129	10 1
53	Iodine-130	10
53	Iodine-131	1
53	Iodine-132	100 10
53	Iodine-132m	100
53	Iodine-133	10 1
53	Iodine-134	1000 10
53	Iodine-135	100 10
54	Xenon-120	1000
54	Xenon-121	1000
54	Xenon-122	1000
54	Xenon-123	1000
54	Xenon-125	1000
54	Xenon-127	1000
54	Xenon-129m	1000
54	Xenon-131m	1000
54	Xenon-133	1000 100
54	Xenon-133m	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
54	Xenon-135	1000 100
54	Xenon-135m	1000
54	Xenon-138	1000
55	Cesium-125	1000
55	Cesium-127	1000
55	Cesium-129	1000 100
55	Cesium-130	1000
55	Cesium-131	1000
55	Cesium-132	100
55	Cesium-134	10 1
55	Cesium-134m	1000 100
55	Cesium-135	100 10
55	Cesium-135m	1000
55	Cesium-136	10
55	Cesium-137	10
55	Cesium-138	1000
56	Barium-126	1000
56	Barium-128	100
56	Barium-131	100 10
56	Barium-131m	1000
56	Barium-133	100 10
56	Barium-133m	100
56	Barium-135m	100
56	Barium-139	1000
56	Barium-140	100 10
56	Barium-141	1000
56	Barium-142	1000
57	Lanthanum-131	1000
57	Lanthanum-132	100
57	Lanthanum-135	1000
57	Lanthanum-137	10
57	Lanthanum-138	100
57	Lanthanum-140	100 10
57	Lanthanum-141	100
57	Lanthanum-142	1000
57	Lanthanum-143	1000
58	Cerium-134	100
58	Cerium-135	100
58	Cerium-137	1000
58	Cerium-137m	100
58	Cerium-139	100
58	Cerium-141	100
58	Cerium-143	100
58	Cerium-144	1
59	Praseodymium-136	1000
59	Praseodymium-137	1000
59	Praseodymium-138m	1000
59	Praseodymium-139	1000
59	Praseodymium-142	100

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
59	Praseodymium-142m	1000
59	Praseodymium-143	100
59	Praseodymium-144	1000
59	Praseodymium-145	100
59	Praseodymium-147	1000 10
60	Neodymium-136	1000
60	Neodymium-138	100
60	Neodymium-139	1000
60	Neodymium-139m	1000
60	Neodymium-141	1000
60	Neodymium-147	100
60	Neodymium-149	1000 100
60	Neodymium-151	1000
61	Promethium-141	1000
61	Promethium-143	100
61	Promethium-144	10
61	Promethium-145	10
61	Promethium-146	1
61	Promethium-147	10
61	Promethium-148	10
61	Promethium-148m	10
61	Promethium-149	100 10
61	Promethium-150	1000
61	Promethium-151	100
62	Samarium-141	1000
62	Samarium-141m	1000
62	Samarium-142	1000
62	Samarium-145	100
62	Samarium-146	1
62	Samarium-147	100
62	Samarium-151	10
62	Samarium-153	100
62	Samarium-155	1000
62	Samarium-156	1000
63	Europium-145	100
63	Europium-146	100
63	Europium-147	100
63	Europium-148	10
63	Europium-149	100
63	Europium-150 (12.62 h)	100
63	Europium-150 (32.4 34.2 y)	1
63	Europium-152 (9.2 h)	100
63	Europium-152m (13 y)	100 1
63	Europium-154	1
63	Europium-155	10
63	Europium-156	100
63	Europium-157	100
63	Europium-158	1000
64	Gadolinium-145	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
64	Gadolinium-146	10
64	Gadolinium-147	100
64	Gadolinium-148	0.001
64	Gadolinium-149	100
64	Gadolinium-151	10
64	Gadolinium-152	100
64	Gadolinium-153	10
64	Gadolinium-159	100
65	Terbium-147	1000
65	Terbium-149	100
65	Terbium-150	1000
65	Terbium-151	100
65	Terbium-153	1000
65	Terbium-154	100
65	Terbium-155	1000
65	Terbium-156	100
65	Terbium-156m (24.4 h)	1000
65	Terbium-156m (5.0 h)	1000
65	Terbium-157	10
65	Terbium-158	1
65	Terbium-160	10
65	Terbium-161	100
66	Dysprosium-155	1000
66	Dysprosium-157	1000
66	Dysprosium-159	100
66	Dysprosium-165	1000 10
66	Dysprosium-166	100
67	Holmium-155	1000
67	Holmium-157	1000
67	Holmium-159	1000
67	Holmium-161	1000
67	Holmium-162	1000
67	Holmium-162m	1000
67	Holmium-164	1000
67	Holmium-164m	1000
67	Holmium-166	100
67	Holmium-166m	1
67	Holmium-167	1000
68	Erbium-161	1000
68	Erbium-165	1000
68	Erbium-169	100
68	Erbium-171	100
68	Erbium-172	100
69	Thulium-162	1000
69	Thulium-166	100
69	Thulium-167	100
69	Thulium-170	10
69	Thulium-171	10
69	Thulium-172	100

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
69	Thulium-173	100
69	Thulium-175	1000
70	Ytterbium-175	100
70	Ytterbium-162	1000
70	Ytterbium-166	100
70	Ytterbium-167	1000
70	Ytterbium-169	100
70	Ytterbium-177	1000
70	Ytterbium-178	1000
71	Lutetium-169	100
71	Lutetium-170	100
71	Lutetium-171	100
71	Lutetium-172	100
71	Lutetium-173	10
71	Lutetium-174	10
71	Lutetium-174m	10
71	Lutetium-176	100
71	Lutetium-176m	1000
71	Lutetium-177	100
71	Lutetium-177m	10
71	Lutetium-178	1000
71	Lutetium-178m	1000
71	Lutetium-179	1000
72	Hafnium-170	100
72	Hafnium-172	1
72	Hafnium-173	1000
72	Hafnium-175	100
72	Hafnium-177m	1000
72	Hafnium-178m	0.1
72	Hafnium-179m	10
72	Hafnium-180m	1000
72	Hafnium-181	10
72	Hafnium-182	0.1
72	Hafnium-182m	1000
72	Hafnium-183	1000
72	Hafnium-184	100
73	Tantalum-172	1000
73	Tantalum-173	1000
73	Tantalum-174	1000
73	Tantalum-175	1000
73	Tantalum-176	100
73	Tantalum-177	1000
73	Tantalum-178	1000
73	Tantalum-179	100
73	Tantalum-180	100
73	Tantalum-180m	1000
73	Tantalum-182	10
73	Tantalum-182m	1000
73	Tantalum-183	100

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
73	Tantalum-184	100
73	Tantalum-185	1000
73	Tantalum-186	1000
74	Tungsten-176	1000
74	Tungsten-177	1000
74	Tungsten-178	1000
74	Tungsten-179	1000
74	Tungsten-181	1000 10
74	Tungsten-185	100 10
74	Tungsten-187	100
74	Tungsten-188	10
75	Rhenium-177	1000
75	Rhenium-178	1000
75	Rhenium-181	1000
75	Rhenium-182 (12.7 h)	1000
75	Rhenium-182 (64.0 h)	100
75	Rhenium-184	100
75	Rhenium-184m	10
75	Rhenium-186	100
75	Rhenium-186m	10
75	Rhenium-187	1000
75	Rhenium-188	100
75	Rhenium-188m	1000
75	Rhenium-189	100
76	Osmium-180	1000
76	Osmium-181	1000
76	Osmium-182	100
76	Osmium-185	100 10
76	Osmium-189m	1000
76	Osmium-191	100
76	Osmium-191m	1000 100
76	Osmium-193	100
76	Osmium-194	1
77	Iridium-182	1000
77	Iridium-184	1000
77	Iridium-185	1000
77	Iridium-186	100
77	Iridium-187	1000
77	Iridium-188	100
77	Iridium-189	100
77	Iridium-190	100
77	Iridium-190m	1000
77	Iridium-192	10 10
77	Iridium-192m (1.4 m)	100
77	Iridium-194	100
77	Iridium-194m	10
77	Iridium-195	1000
77	Iridium-195m	1000
78	Platinum-186	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
78	Platinum-188	100
78	Platinum-189	1000
78	Platinum-191	100
78	Platinum-193	1000 100
78	Platinum-193m	100
78	Platinum-195m	100
78	Platinum-197	100
78	Platinum-197m	1000 100
78	Platinum-199	1000
78	Platinum-200	100
79	Gold-193	1000
79	Gold-194	100
79	Gold-195	10
79	Gold-198	100
79	Gold-198m	100
79	Gold-199	100
79	Gold-200	1000
79	Gold-200m	100
79	Gold-201	1000
80	Mercury-193	1000
80	Mercury-193m	100
80	Mercury-194	1
80	Mercury-195	1000
80	Mercury-195m	100
80	Mercury-197	1000 100
80	Mercury-197m	100
80	Mercury-199m	1000
80	Mercury-203	100 10
81	Thallium-194	1000
81	Thallium-194m	1000
81	Thallium-195	1000
81	Thallium-197	1000
81	Thallium-198	1000
81	Thallium-198m	1000
81	Thallium-199	1000
81	Thallium-200	1000 100
81	Thallium-201	1000 100
81	Thallium-202	100
81	Thallium-204	100 10
82	Lead-195m	1000
82	Lead-198	1000
82	Lead-199	1000
82	Lead-200	100
82	Lead-201	1000
82	Lead-202	10
82	Lead-202m	1000
82	Lead-203	1000
82	Lead-205	100
82	Lead-209	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
82	Lead-210	0.01
82	Lead-211	100
82	Lead-212	1
82	Lead-214	100
83	Bismuth-200	1000
83	Bismuth-201	1000
83	Bismuth-202	1000
83	Bismuth-203	100
83	Bismuth-205	100
83	Bismuth-206	100
83	Bismuth-207	10
83	Bismuth-210	1
83	Bismuth-210m	0.1
83	Bismuth-212	10
83	Bismuth-213	10
83	Bismuth-214	100
84	Polonium-203	1000
84	Polonium-205	1000
84	Polonium-207	1000
84	Polonium-210	0.1
85	Astatine-207	100
85	Astatine-211	10
86	Radon-220	1
86	Radon-222	1
87	Francium-222	100
87	Francium-223	100
88	Radium-223	0.1
88	Radium-224	0.1
88	Radium-225	0.1
88	Radium-226	0.1
88	Radium-227	1000
88	Radium-228	0.1
89	Actinium-224	1
89	Actinium-225	0.01
89	Actinium-226	0.1
89	Actinium-227	0.001
89	Actinium-228	1
90	Thorium-226	10
90	Thorium-227	0.01
90	Thorium-228	0.001
90	Thorium-229	0.001
90	Thorium-230	0.001
90	Thorium-231	100
90	Thorium-232	100
90	Thorium-234	10
90	Thorium-natural	100
91	Protactinium-227	10
91	Protactinium-228	1
91	Protactinium-230	0.01

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
91	Protactinium-231	0.001
91	Protactinium-232	1
91	Protactinium-233	100
91	Protactinium-234	100
92	Uranium-230	0.01
92	Uranium-231	100
92	Uranium-232	0.001
92	Uranium-233	0.001
92	Uranium-234	0.001
92	Uranium-235	0.001
92	Uranium-236	0.001
92	Uranium-237	100
92	Uranium-238	100
92	Uranium-239	1000
92	Uranium-240	100
92	Uranium-natural	100
93	Neptunium 236 (22.5 h)	1
93	Neptunium-232	100
93	Neptunium-233	1000
93	Neptunium-234	100
93	Neptunium-235	100
93	Neptunium-236 (1.15E+5 y)	0.001
93	Neptunium-237	0.001
93	Neptunium-238	10
93	Neptunium-239	100
93	Neptunium-240	1000
94	Plutonium-234	10
94	Plutonium-235	1000
94	Plutonium-236	0.001
94	Plutonium-237	100
94	Plutonium-238	0.001
94	Plutonium-239	0.001
94	Plutonium-240	0.001
94	Plutonium-241	0.01
94	Plutonium-242	0.001
94	Plutonium-243	1000
94	Plutonium-244	0.001
94	Plutonium-245	100
95	Americium-237	1000
95	Americium-238	100
95	Americium-239	1000
95	Americium-240	100
95	Americium-241	0.001
95	Americium-242	10
95	Americium-242m	0.001
95	Americium-243	0.001
95	Americium-244	10
95	Americium-244m	100
95	Americium-245	1000

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
95	Americium-246	1000
95	Americium-246m	1000
96	Curium-238	100
96	Curium-240	0.1
96	Curium-241	1
96	Curium-242	0.01
96	Curium-243	0.001
96	Curium-244	0.001
96	Curium-245	0.001
96	Curium-246	0.001
96	Curium-247	0.001
96	Curium-248	0.001
96	Curium-249	1000
97	Berkelium-245	100
97	Berkelium-246	100
97	Berkelium-247	0.001
97	Berkelium-249	0.1
97	Berkelium-250	10
98	Californium-244	100
98	Californium-246	1
98	Californium-248	0.01
98	Californium-249	0.001
98	Californium-250	0.001
98	Californium-251	0.001
98	Californium-252	0.001
98	Californium-253	0.1
98	Californium-254	0.001
99	Einsteinium-250	100
99	Einsteinium-251	100
99	Einsteinium-253	0.1
99	Einsteinium-254	0.01
99	Einsteinium-254m	1
100	Fermium-252	1
100	Fermium-253	1
100	Fermium-254	10
100	Fermium-255	1
100	Fermium-257	0.01
101	Mendelevium-257	10
101	Mendelevium-258	0.01
	Any alpha-emitting radionuclide byproduct material not listed above or mixtures of alpha emitters of unknown composition	0.001
	Any radionuclide byproduct material other than alpha	0.01

Atomic Number	Radionuclide	Quantity (μCi) ^(b)
	emitting <u>radionuclides byproduct materials</u> not listed above, or mixtures of beta emitters of unknown composition	

Note :1 For purposes of He-P 4022.11(e), He-P 4022.14(a), and He-P 4021.12(b), where there is involved a combination of radionuclides byproduct materials in known amounts, the limit for the combination shall be derived by determining for each radionuclide byproduct material in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific radionuclide byproduct material when not in combination. The sum of such ratios for all radionuclides byproduct material in the combination may not exceed "one".

^(a) The quantities listed above were derived by taking 1/10th of the most restrictive ALI listed in He-P 4090, Table 4090.1, Table I, Columns 1 and 2, of He-P 4090, rounding to the nearest factor of 10, and constraining the values listed between 37 Bq and 37 MBq (0.001 and 1000 μCi). Values of 3.7 MBq (100 μCi) have been assigned for radionuclides having a radioactive half-life in excess of E+9 years, except rhenium, 37 MBq (1000 μCi), to take into account their low specific activity.

^(b) To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX

<u>Rule</u>	<u>Statute Implemented</u>
He-P 4092.01	RSA 125-F:5, V

CHAPTER He-P 4000 NEW HAMPSHIRE RULES FOR THE CONTROL OF RADIATION

PART He-P 4097 NATIONALLY TRACKED SOURCE THRESHOLDS

He-P 4097.01 Nationally Tracked Source Thresholds. The threshold quantities tracked in this chapter shall be as stated in Table 4097.1 below.

Table 4097.1 Threshold Quantities

Radioactive Material	Category 1 (TBq)	Category 1 (Ci)	Category 2 (TBq)	Category 2 (Ci)
Actinium-227	20	540	0.2	5.4
Americium-241	60	1,600	0.6	16
Americium-241 /Be	60	1,600	0.6	16
Californium-252	20	540	0.2	5.4
Cobalt-60	30	810	0.3	8.1
Curium-244	50	1,400	0.5	14
Cesium-137	100	2,700	1	27
Gadolinium-153	1,000	27,000	10	270
Iridium-192	80	2,200	0.8	22
Plutonium-238	60	1,600	0.6	16
Plutonium-239 /Be	60	1,600	0.6	16
Polonium-210	60	1,600	0.6	16
Promethium-147	40,000	1,100,000	400	11,000
Radium-226	40	1,100	0.4	11
Selenium-75	200	5,400	2	54
Strontium-90	1,000	27,000	10	270
Thorium-228	20	540	0.2	5.4
Thorium-229	20	540	0.2	5.4

Thulium-170	20,000	540,000	200	5,400
Ytterbium-169	300	8100	3	81

He-P 4097.02 Conversion Between Units. The terabecquerel (TBq) values in Table 4097.1 shall be the regulatory standards. The curie (Ci) values specified are obtained by converting from the TBq value. The curie values are provided for practical usefulness only and are rounded after conversion.