

**CHAPTER 28**

**RADIATION PROTECTION PROGRAMS**

**Authority**

N.J.S.A. 26:2D-1 et seq., specifically 26:2D-7, 26:2D-9, 26:2D-21 and 26:2D-76.

**Source and Effective Date**

R.2000 d.120, effective February 25, 2000.  
See: 31 N.J.R. 3007(a), 32 N.J.R. 1016(a).

**Chapter Expiration Date**

In accordance with N.J.S.A. 52:14B-5.1c, Chapter 28, Radiation Protection Programs, expires on August 24, 2005. See: 37 N.J.R. 8(a).

**Chapter Historical Note**

Chapter 28, Bureau of Radiation Protection, was filed and became effective prior to September 1, 1969.

Subchapter 19, Excessive Exposure to Ionizing Radiation, was adopted as R.1972 d.102, effective July 17, 1972. See: 4 N.J.R. 4(c).

Subchapter 25, Radiation Laboratory Fee Schedule, was adopted as R.1978 d.47, effective February 8, 1978. See: 9 N.J.R. 560(a), 10 N.J.R. 101(b).

Subchapter 24, Nuclear Medicine Technology, was adopted as R.1978 d.101, effective March 20, 1978. See: 9 N.J.R. 213(b), 10 N.J.R. 146(c).

Subchapter 21, Analytical X-Ray Installations, was adopted as R.1979 d.64, effective May 1, 1979. See: 10 N.J.R. 321(a), N.J.R. 123(a).

Subchapter 41, Mercury Vapor Lamps, was adopted as R.1981 d.464, effective December 7, 1981. See: 13 N.J.R. 9(b), 13 N.J.R. 887(c).

Subchapter 1, General Provisions, and Subchapter 2, Use of Sources of Radiation and Special Exemptions, were repealed and Subchapter 1, General Provisions, and Subchapter 2, Use of Sources of Ionizing Radiation and Special Exemptions, were adopted as new rules by R.1983 d.592, effective December 19, 1983. See: 15 N.J.R. 391(a), 15 N.J.R. 2160(a).

Subchapter 42, Radio Frequency Radiation, was adopted as R.1984 d.337, effective August 6, 1984. See: 16 N.J.R. 7(a), 16 N.J.R. 2120(a).

Pursuant to Executive Order No. 66(1978), Subchapter 21, Analytical X-Ray Installations, was readopted as R.1984 d.353, effective August 6, 1984. See: 16 N.J.R. 1310(a), 16 N.J.R. 2276(a).

Subchapter 19, Medical Exposure to Ionizing Radiation by Radiologists, was adopted as R.1984 d.349, effective August 20, 1984. See: 16 N.J.R. 797(a), 16 N.J.R. 2271(a).

Pursuant to Executive Order No. 66(1978), Subchapter 24, Nuclear Medicine Technology, expired February 14, 1985.

Subchapter 24, Nuclear Medicine Technology, was adopted as new rules by R.1985 d.140, effective March 18, 1985. See: 17 N.J.R. 22(a), 17 N.J.R. 699(a).

Pursuant to Executive Order No. 66(1978), Subchapter 12, Transportation, was readopted as R.1985 d.387, effective August 5, 1985. See: 17 N.J.R. 1369(a), 17 N.J.R. 1884(a).

Subchapter 14, Therapeutic Installations, was repealed and Subchapter 14, Therapeutic Installations, was adopted as new rules by R.1987 d.258, effective July 6, 1987. See: 18 N.J.R. 1157(a), 19 N.J.R. 1196(c).

Subchapter 3, Registration: Radiation Protection Fee Schedule, was repealed and Subchapter 3, Registration of Ionizing Radiation-Producing Machines and Radioactive Materials, was adopted as new rules by R.1987 d.485, effective November 16, 1987. See: 19 N.J.R. 836(a), 19 N.J.R. 2167(a).

Subchapter 4, Licensing, was repealed and Subchapter 4, Licensing of Naturally Occurring and Accelerator Produced Radioactive Materials, was adopted as new rules by R.1987 d.483, effective November 16, 1987. See: 19 N.J.R. 1041(a), 19 N.J.R. 2171(a).

Subchapter 5, Controlled Areas, was repealed and Subchapter 5, Controlled Areas, was adopted as new rules by R.1987 d.484, effective November 16, 1987. See: 19 N.J.R. 839(a), 19 N.J.R. 2180(a).

Subchapter 25, Radiation Laboratory Fee Schedule, was repealed and Subchapter 25, Radiation Laboratory Fee Schedule, was adopted as new rules by R.1989 d.349, effective July 3, 1989. See: 21 N.J.R. 826(a), 21 N.J.R. 1904(a).

Pursuant to Executive Order No. 66(1978), Chapter 28, Bureau of Radiation Protection, was readopted as R.1990 d.427, effective July 30, 1990. See: 22 N.J.R. 890(a), 22 N.J.R. 2570(a).

Subchapter 16, Dental Radiographic Installations, was adopted as R.1990 d.538, effective November 5, 1990. See: 22 N.J.R. 894(a), 22 N.J.R. 3367(a).

Subchapter 27, Certification of Radon Testers and Mitigators, was adopted as R.1990 d.559, effective November 19, 1990 (operative January 13, 1991). See: 21 N.J.R. 3369(a), 22 N.J.R. 3516(a).

Subchapter 20, Particle Accelerators for Industrial and Research Use, was adopted as R.1992 d.52, effective February 3, 1992. See: 23 N.J.R. 1401(c), 24 N.J.R. 416(a).

Subchapter 15, Medical Diagnostic X-Ray Installations, was repealed and Subchapter 15, Medical Diagnostic X-Ray Installations, was adopted as new rules by R.1993 d.510, effective October 18, 1993. See: 25 N.J.R. 7(a), 25 N.J.R. 1039(a), 25 N.J.R. 4770(a), 25 N.J.R. 5148(a).

Subchapter 48, Fees for the Registration of Nonionizing Radiation Producing Sources, was adopted as R.1995 d.6, effective January 3, 1995. See: 25 N.J.R. 5422(a), 26 N.J.R. 793(b), 27 N.J.R. 99(a).

Pursuant to Executive Order No. 66(1978), Chapter 28, Bureau of Radiation Protection, was readopted as R.1995 d.457, effective July 28, 1995, and Subchapter 12, Transportation, was repealed by R.1995 d.457, effective August 21, 1995. See: 26 N.J.R. 4942(a), 27 N.J.R. 3157(b).

Pursuant to Executive Order No. 66(1978), Chapter 28, Radiation Protection Programs, was readopted as R.2000 d.120, effective February 25, 2000, and Subchapter 25, Radiation Laboratory Fee Schedule, was repealed by R.2000 d.120, effective March 20, 2000. See: 31 N.J.R. 3007(a), 32 N.J.R. 1016(a). See, also, section annotations.

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**SUBCHAPTER 1. GENERAL PROVISIONS**

**7:28-1.1 Purpose and scope**

(a) The purpose of this chapter is to prohibit and prevent the use or presence of unnecessary radiation in such manner as to be, or tend to be, injurious or dangerous to the health of the people or the industrial or agriculture potentials of the State, or to the ecology of the State and its wildlife.

(b) Unless otherwise provided by statute or codes, rules or regulations promulgated by the Commission on Radiation Protection, this chapter shall constitute the rules of the Radiation Protection Programs, Department of Environmental Protection, and shall govern all persons installing, using, handling, transporting or storing sources of radiation.

Amended by R.2000 d.120, effective March 20, 2000.

See: 31 N.J.R. 3007(a), 32 N.J.R. 1016(a).

In (b), substituted a reference to the Radiation Protection Programs for a reference to the Bureau of Radiation Protection.

#### 7:28-1.2 Construction

These rules shall be liberally construed to permit the Department, the Radiation Protection Programs and its various agencies to discharge their statutory functions.

Amended by R.2000 d.120, effective March 20, 2000.

See: 31 N.J.R. 3007(a), 32 N.J.R. 1016(a).

Substituted a reference to the Radiation Protection Programs for a reference to the Bureau of Radiation Protection.

#### 7:28-1.3 Practice where rules do not govern

The Commission may rescind, amend or expand these rules from time to time, in accordance with N.J.S.A. 26:2D-7, Chapter 116, Public Laws of 1958, as amended.

#### 7:28-1.4 Definitions

The following words and terms, when used in this chapter shall have the following meanings unless the context clearly indicates otherwise. Additional words and terms, applicable to a specific subchapter only, will be found in that subchapter.

##### (a) General Terms:

“Absorbed dose” means the energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The special unit for absorbed dose is the rad. (See “Rad” under (b) below.)

“Act” means the New Jersey Radiation Protection Act, Chapter 116, Public Laws of New Jersey 1958, as amended, cited as N.J.S.A. 26:2D-1 et seq.

“Agreement state” means any state with which the United States Nuclear Regulatory Commission has entered into an effective agreement under subsection 274b of the Atomic Energy Act of 1954, as amended.

"ALARA" means "as low as is reasonably achievable", taking into account the state of technology and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of radiation in the public interest.

"Area" means a bounded space such as a room, floor, building, plant or any designated geographical entity having physical or imaginary boundaries.

"Average dose rate" means an integrated or accumulated dose of radiation divided by the time over which the integration or accumulation took place or by a specified length of time.

"Calendar quarter" means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be so arranged that no day in any year is omitted from inclusion within a calendar quarter. For purposes of this chapter, no licensee or registrant shall change the method observed by him of determining calendar quarters except at the beginning of a calendar year.

"Commission" means the New Jersey Commission on Radiation Protection.

"Controlled area" means any area to which the access, occupancy and activity of those within are subject to control and supervision for the purpose of radiation protection.

"Dead-man switch" means a switch which can be kept closed only when the operator applies continuous pressure.

"Department" means the New Jersey Department of Environmental Protection.

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

"Dose rate" means dose per unit time.

"Emergency exposure" means an exposure to radiation of an emergency worker during rescue or other emergency operations.

"Emergency worker" means a member of the owner's staff or of a public voluntary or governmental agency engaged in safety or other emergency operations.

"Exemption" means the administrative relief from the requirements of a substantive rule.

"Healing art" means the practice of any branch of medicine or surgery, any method of diagnosis of human ailment, disease, pain, injury, deformity, mental or physical condition.

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

"Installation" means a radiation source, with its associated equipment, and the area in which it is housed.

"Instructed individual" means an individual who has received appropriate instructions as to the safe means and methods of performing work with or near radiation sources.

"Ionizing radiation" means any form of radiation which has the capability of ionizing the medium through which it is passing.

"Maximum permissible dose" means the maximum dose to which the body or a particular part of the body of a person shall be permitted to be exposed continuously or intermittently in a stated period of time.

"Nonionizing radiation" means any form of radiation which does not have the capability of ionizing the medium through which it is passing.

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

"Owner" means a person who has title to a radiation source or who possesses a radiation source as a lessee, bailee or pursuant to the terms of a license issued by the Department, by a Federal agency, or by any other state.

"Person" includes an individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, municipality, any state, or other legal entity; and any legal successor, representative agent, or agency of the foregoing.

"Personnel-monitoring equipment" means devices designed to be worn or carried by an individual for the purpose of measuring the dose received; for example, film badges, pocket chambers, pocket dosimeters, and thermoluminescent dosimeters.

"Qualified individual" means an individual suited by training and experience to perform dependable radiation surveys and to determine the degree of radiation hazard.

"Radiation" includes any or all of the following: electromagnetic radiation including radiofrequency, microwave, in-

frared, visible, ultraviolet, x-ray, or gamma ray; sonic, infrasonic, or ultrasonic waves; and particle radiation including alphas, betas, high energy electrons, neutrons, protons, and other atomic or nuclear particles.

“Radiation area” means an area which is accessible to a worker and in which there exists ionizing radiation at such levels that a major portion of the body would receive in any one hour a dose equivalent in excess of five millirems or in any workweek a dose equivalent in excess of 100 millirems; or levels of nonionizing radiation which exceed the maximum permissible levels of such radiation as specified in the rules and standards established by the Commission.

“Research and development” means theoretical analysis, exploration, or experimentation; or the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental production and testing of models, devices, equipment, materials and processes. “Research and development” does not include the internal or external administration of radioactive material, or of radiation, to human beings.

“Shielding” means any material introduced into the path of radiation to reduce the radiation level.

“Source of radiation” means a material, equipment or machine emitting or capable of emitting radiation.

“State” means the State of New Jersey.

“State license” means a license issued by the Department. See also “License” under (b) below.

“Survey” means evaluation for a specific set of conditions or actual or potential radiation or contamination levels by or under the supervision of a qualified individual.

“Unnecessary radiation” means the use of nonionizing or ionizing radiation in such a manner as to be, or tend to be, injurious or dangerous to the health of the people or the industrial or agricultural potentials of the State, as defined in the Radiation Protection Act.

“User” means any individual who personally utilizes or manipulates a source of radiation.

(b) Ionizing radiation terms:

“Airborne-radioactivity area” means an area accessible to workers, in which airborne radioactive materials are present in concentrations such that the values at any time are in excess of the respective values stated in N.J.A.C. 7:28-6.5(a) (Average concentrations) Column B, or prorated values if more than one isotope is present; or values if averaged over the hours of occupancy in any week are in excess of 25 percent of the respective foregoing values.

“Beam-monitoring device” means a device in the useful beam to indicate the relative output of a radiation-producing machine.

“Byproduct material” means any radioactive material except special nuclear material yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or utilizing special nuclear material.

“Contamination” means radioactive contamination.

“Curie” means that amount of a specific radionuclide which disintegrates at the rate of 37 billion atoms per second.

- i. The new International System of Units replaces “curie” with the “becquerel”, which means that amount of a specific radionuclide which disintegrates at the rate of one atom per second. One curie equals  $3.7 \times 10^{10}$  becquerel.

“Diagnostic-type protective tube housing” means x-ray tube housing so constructed that the leakage radiation at a distance of one meter from the target cannot exceed 100 milliroentgen in one hour when the tube is operated at any of its specified ratings.

“High radiation area” means an area which is accessible to workers and in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

“Human use” means the deliberate internal and external administration of radiation or radioactive material to human beings.

“Ionizing radiation-producing machine” means a machine or device capable of generating radiation, such as x-ray producing machines, particle accelerators, high-voltage rectifiers, high-voltage projection equipment, electron microscopes and other types of high-voltage machines.

“Leakage radiation” means all radiation coming from within an ionizing radiation-producing machine except the useful beam.

“License”, except where otherwise specified, means a license issued by the United States Nuclear Regulatory Commission or any state for possession and use of radioactive material. See also “State license” under (a) above.

“Medical radiographer” means any individual who, under the supervision of a licensed practitioner, uses medical radiographic equipment on human beings for diagnostic or therapeutic purposes.

“Monitoring” means a periodic or continuous determination of ionizing radiation levels or of radioactive contamination.

“Protective barrier” means a barrier of radiation-absorbing material used to reduce radiation exposure. The types of protective barriers are as follows:

1. “Primary protective barrier” means the material, excluding filters, intercepting the useful beam for protection purposes to reduce the radiation exposure so that it does not exceed two millirems per hour;
2. “Secondary protective barrier” means a barrier sufficient to attenuate the stray radiation to reduce radiation exposure so that it does not exceed two millirems per hour.

“Rad” means the dose corresponding to the absorption of 100 ergs per gram: a measure of the dose of any radiation to body tissues in terms of the energy absorbed per unit mass of the tissue.

- i. The new International System of Units replaces the “rad” with the “gray”, which means the dose corresponding to the absorption of one joule per kilogram. One rad equals  $1 \times 10^{-2}$  gray.

“Radioactive material” means a natural or artificially produced substance, solid, liquid or gas which emits ionizing radiation spontaneously.

“Radiographer” means any individual who is in attendance at a site where ionizing radiation sources are being used and who uses or supervises their use in industrial radiographic operations and who is responsible to the owner for assuring compliance with the requirements of this chapter.

“Radiographer’s assistant” means any individual who, under the personal supervision of a radiographer, uses sources of ionizing radiation including ionizing radiation-producing machines, radiographic-exposure devices, sealed sources or related handling tools, or survey instruments in industrial radiography.

“Radiographic-exposure device” means any instrument containing a sealed source fastened or contained therein which the sealed source or shielding thereof may be moved or otherwise changed from a shielded to unshielded position for purposes of making a radiographic exposure.

“Radiography” means the examination of humans or animals, or of the structure of materials by non-destructive methods, utilizing sealed sources or ionizing radiation-producing machines. This term is not intended to apply to techniques such as electron microscopy or x-ray diffraction.

“Registrant” means a person who is required to register a source of radiation with the Department pursuant to this chapter.

“Rem” means a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of one rad of x-rays. For the

purpose of this chapter, any of the following are considered to be equivalent to a dose of one rem:

- i. A dose of one rad due to x, gamma, or beta radiation;
- ii. A dose of 0.1 rad due to neutrons or high-energy protons;
- iii. A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye.

(1) The new International System of Units replaces the “rem” with the “sievert”, which means a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of one gray of x-rays. One rem equals  $1 \times 10^{-2}$  sievert.

(2) If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, as provided in ii above, one rem of neutron radiation may, for purposes of this chapter, be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there exists sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to one rem may be estimated from the following table:

Neutron energy (MeV)	Number of neutrons per square centimeter equivalent to a dose of 1 rem (neutron/cm <sup>2</sup> )	Average flux to deliver 100 millirem in 40 hours (neutrons/cm <sup>2</sup> per sec.)
Thermal	$970 \times 10^6$	670
0.001	$720 \times 10^6$	500
0.005	$820 \times 10^6$	570
0.02	$400 \times 10^6$	280
0.1	$120 \times 10^6$	80
0.5	$43 \times 10^6$	30
1.0	$26 \times 10^6$	18
2.5	$29 \times 10^6$	20
5.0	$26 \times 10^6$	18
7.5	$24 \times 10^6$	17
10	$24 \times 10^6$	17
10 to 30	$14 \times 10^6$	10

“Roentgen” means the quantity of x or gamma radiation such that the associated corpuscular emission per .001293 grams of air produces, in air, ions carrying one electrostatic unit of quantity of electricity of either sign.

“Sealed source” means a 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.

“Secondary protective barrier” means a barrier intended to attenuate ionizing radiation (other than the useful beam) to the required degree.

“Shielded position” means the location within the radiographic-exposure device or storage container which by manufacturer’s design, is the proper location for storage of the sealed source.

“Source material” means uranium or thorium, or any combination thereof, in any physical or chemical form, or ores which contain by weight  $\frac{1}{20}$  of one percent (0.05 percent) or more of uranium, thorium or any combination thereof. Source material does not include special nuclear material.

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

175 grams Contained	50 grams	50 grams	
U-235 350	+ U-233 200	+ Pu 200	= 1

“Storage container” means a device in which radioactive materials or sources are transported or stored.

“Total filtration” means the filtration produced by all materials inserted in the useful beam including the materials comprising the tube and its housing, any measured devices in the beam which act as a filter, and any material purposely placed in the beam as filters.

“Unrefined and unprocessed ore” means ore in its natural form prior to any processing, such as grinding, roasting, beneficiating, or refining.

“Useful beam” means that part of the radiation beam which passes through the window, aperture cone or other collimating device of the tube housing.

“X-ray tube” means an electron tube which is designed for the conversion of electrical energy into x-ray energy.

(c) Non-ionizing radiation terms:

“Electric field strength” means a field vector quantity that represents the force on an infinitesimal unit positive test charge at a point divided by that charge. The electric field strength is expressed in units of volts per meter (V/m).

“Far field” means a region associated with a radiating source or structure in which the field per unit solid angle is constant. In this region, the field has a predominantly plane wave character, that is, locally very uniform distributions of electric field strength and magnetic field strength in planes perpendicular to the direction of propagation. Generally, the far field region begins several wavelengths distant from the source.

“Fixed radio frequency device” means a device operating at a specific location for a period of 30 days or more.

“Magnetic field strength” means a field vector that is equal to the product of the magnetic flux density and the reciprocal of the permeability. Magnetic field strength is expressed in units of amperes per meter (A/m).

“Microwave oven” means an oven which is designed to heat, cook or dry food through the applications of radio frequency electromagnetic energy, and which is designed to operate at a frequency of 916 MHz or 2.45 GHz.

“Near field” means a region near a radiating source or structure in which the electric and magnetic fields do not have a substantially plane wave character, but vary considerably from point to point. The extent of the near field is only vaguely defined and depends on several factors the most important of which is the size of the radiating structure with respect to the wavelength of the emitted electromagnetic energy. In general, this distance extends to at least five wavelengths from the radiating device.

“Power density” means the rate of energy transported into a small sphere divided by the cross-sectional area of that sphere. Power density is expressed in units of watts per meter squared ( $W/m^2$ ), or for convenience milliwatts per centimeter squared ( $mW/cm^2$ ).

“Power density, plane wave equivalent” means a quantity that is associated with any electromagnetic wave that is equal in magnitude to the power density of a plane wave that has the same electric or magnetic field strength.

“Radiating device” means the antenna, leakage port, or any other part of a device that emits radio frequency electromagnetic energy.

“Radio frequency” means the frequency range of 300 kilohertz (kHz) to 100 gigahertz (GHz).

“Radio frequency device” means any stationary device, machine, equipment or installation which is capable of generating a radio frequency electromagnetic field. This does not include devices which are marketed as consumer products, including, but not limited to citizens band radios, remote controlled toys, remote controlled garage door openers, mobile radio transmitter under authorization of the Federal Communications Commission or any other device specifically exempted by the Commission on Radiation Protection as not presenting a potential hazard or harm to a worker or the public.

“Radio frequency protection guide (RFPG)” means the mean squared electric field strength, the mean squared magnetic field strength, and the equivalent plane wave power density which shall not be exceeded. The RFPG is an upper limit of exposure. Exposure to levels slightly in excess of the RFPG is not harmful, however, such exposure is not desirable. In all cases the exposure shall be reduced to values that are as low as reasonably achievable.

“Specific absorption rate (SAR)” means the time derivative of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ).

$$\text{SAR} = \frac{dW}{dt \, dm} \quad \frac{dW}{dt \, \rho dV}$$

The specific absorption rate is expressed in units of watts per kilogram (W/kg). In view of the proliferation of terms for describing the electromagnetic radiation conditions in biological materials and the discipline oriented interpretation of these terms, it is recommended that the name “specific absorption rate” be used for the quantity defined here, rather than such a name as “absorbed power density per unit mass”.

Amended by R.1984 d.337, effective August 6, 1984.  
See: 16 N.J.R. 7(a), 16 N.J.R. 2120(a).

“Fixed radio frequency device” added.

Amended by R.1985 d.502, effective October 7, 1985.  
See: 17 N.J.R. 1626(a), 17 N.J.R. 2389(a).

Added definitions “shielded position” and “x-ray tube” in (b).

Amended by R.1992 d.52, effective February 3, 1992.

See: 23 N.J.R. 1401(c), 24 N.J.R. 416(a).

Added definitions “registrant” and “protective barrier”; deleted old definitions for “primary and secondary barriers” and replaced with new definitions.

Administrative Correction.

See: 25 N.J.R. 5665(a).

#### Authority

N.J.S.A. 13:1D-1 et seq., and specifically N.J.S.A. 26:2D-1 et seq.

### 7:28-1.5 Communications

(a) Communications concerning this chapter, or matters relating to radiation protection, may be addressed to the New Jersey Department of Environmental Protection, Radiation Protection Programs, PO Box 415, Trenton, New Jersey 08625-0415. The physical location of the office is 25 Arctic Parkway, Ewing, New Jersey 08638.

(b) All emergency notification of incidents involving sources of radiation in this State shall be immediately reported to either one of the following agencies:

1. Radiation Protection Programs  
New Jersey Department of Environmental Protection  
25 Arctic Parkway  
Ewing, NJ 08638  
Telephone: 609-984-5555  
Hours: 8:00 A.M. to 5:00 P.M. daily, except Saturday, Sunday, and Holidays

2. After hours and weekends: 609-292-7172  
Communications Officer  
New Jersey State Police Office of Emergency Management  
West Trenton, NJ 08628  
Telephone: 609-882-2000  
Hours: 24 hours, seven days.

Amended by R.2000 d.120, effective March 20, 2000.

See: 31 N.J.R. 3007(a), 32 N.J.R. 1016(a).

Rewrote the section.

## SUBCHAPTER 2. USE OF SOURCES OF IONIZING RADIATION AND SPECIAL EXEMPTIONS

### 7:28-2.1 Authorized use of sources of ionizing radiation

(a) No person shall use, operate, receive, possess, dispose, transfer, install, transport or store sources of ionizing radiation in a manner other than prescribed in this chapter.

(b) No person shall cause, suffer, allow or permit any person to use, operate, receive, possess, dispose, transfer, install, transport or store sources of ionizing radiation in a manner other than prescribed in this chapter.

### 7:28-2.2 Supervision

(a) All sources of radiation, except those specifically exempted by other sections of this chapter, shall be under the supervision of at least one person who has demonstrated to the Department, or to any agency recognized by the Department, that the person's training and experience satisfies the Department requirements in the following areas of radiation protection:

1. Principles and practices of radiation protection;
2. X-ray and/or radioactivity measurements and monitoring techniques and instruments;
3. Mathematics and calculations basic to the use of radiation;
4. Biological effects of radiation; and
5. Any additional information, qualifications or experience as may be required by the Department.

(b) Any person applying to the Department for a license, registration or certificate pursuant to this chapter, shall include in his application the name of at least one person who has satisfied the requirements of (a) above.

### 7:28-2.3 Instruction

(a) All persons working in or frequenting the vicinity of radiation-producing machines or radioactive material shall be instructed in the operation and/or use of the sources of radiation and the function and need of any applicable

safeguards for the sources of radiation, in accordance with preestablished procedures that have been documented and are on file for review and inspection.

(b) All visitors to controlled areas shall be instructed or escorted to prevent unnecessary exposure to radiation. See N.J.A.C. 7:28-7.4(a)4 (Use of personnel monitoring equipment for visitors).

#### 7:28-2.4 Unattended radiation sources

No person shall cause, suffer, allow or permit any source of radiation to remain unattended and accessible to unauthorized use.

#### 7:28-2.5 Protective devices, systems or mechanisms

(a) No person shall operate a radiation-producing machine or utilize radioactive material whenever shielding for the source of radiation, permits levels of radiation that exceed or have the potential to exceed the radiation limits specified in N.J.A.C. 7:28-6.2 (Radiation levels outside controlled areas).

(b) No person shall operate a radiation-producing machine or utilize radioactive material whenever any device, system or mechanism designed for the protection against radiation required by this chapter has not been installed or is operating improperly.

#### 7:28-2.6 Intentional human irradiation

(a) Only persons licensed or otherwise permitted by law shall arrange for irradiation, application or administration of radiation to a human being or any part thereof, for the purpose of medical diagnosis or treatment.

(b) No provision in N.J.A.C. 7:28 regarding the treatment of human beings in the healing arts is intended to conflict with, supplant or supersede any requirement of the Medical Practices Act of New Jersey.

#### 7:28-2.7 Exemptions for prevention or control of diseases

Rules contained in N.J.A.C. 7:28-6 or 7 and 7:28-13.2 (Reportable radiation incidents) shall not apply insofar as they relate to the intentional exposure of human beings to radiation for the purpose of diagnosis, treatment or investigation for the prevention or control of disease.

#### 7:28-2.8 Special exemptions

The Department, upon application and a showing of hardship or compelling need, with the approval of the Commission, may grant an exemption from any requirement of these rules should it determine that such exemption will not result in any exposure to radiation in excess of the limits permitted by N.J.A.C. 7:28-6 (Permissible Dose Rates, Radiation Levels and Concentrations).

#### 7:28-2.9 Prohibited use

- (a) Hand-held fluoroscopic screens shall not be used.
- (b) Shoe-fitting fluoroscopic devices shall not be used.

#### 7:28-2.10 Emergency precautions

(a) All owners of radioactive materials shall make a study of potential radiation hazards which may arise from radiation incidents, theft of radioactive materials, fires, floods, windstorms and other disasters within and near the installation with regard to the protection of the following:

1. Tenants and employees;
2. Emergency workers;
3. General public; and
4. Fire fighters and police.

(b) Such studies shall be made for radioactive materials on hand and shall be made in advance of the receipt of additional radioactive materials.

(c) An emergency operational plan, prepared from these studies, shall inform all persons concerned of their duties and responsibilities. This plan shall be made available to the Department on request.

#### 7:28-2.11 Inspections

(a) All persons shall afford the Department an opportunity to inspect any source of radiation and the operation associated with the source of radiation as well as the facilities and premises where the source of radiation is being used or stored.

(b) Upon request of the Department all persons shall make available for inspection by the Department records kept pursuant to the rules in N.J.A.C. 7:28.

**7:28-2.12 Tests**

Upon request of the Department, all persons shall perform, and/or permit the Department to perform if it so desires, such tests as the Department deems appropriate or necessary for the administration of this chapter.

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**SUBCHAPTER 3. REGISTRATION OF IONIZING RADIATION-PRODUCING MACHINES AND RADIOACTIVE MATERIALS****7:28-3.1 Registration for possession of ionizing radiation-producing machines and radioactive by-product material, source material and special nuclear material**

(a) Any person, manufacturer, dealer or State, county or local government shall register with the Department all radioactive by-product material, source material, special nuclear material and every ionizing radiation-producing machine possessed within the State of New Jersey except as exempted by N.J.A.C. 7:28-3.2.

(b) Any person, manufacturer, dealer or State, county or local government shall apply for such registration within 30 days after taking possession, custody or control of radioactive by-product material, source material, special nuclear material and ionizing radiation-producing machines on forms available from the Department.

(c) Any person, manufacturer, dealer or State, county or local government shall retain a copy of the registration at the facility for inspection by employees and the Department.

**7:28-3.2 Exemptions from registration for possession of ionizing radiation-producing machines and radioactive by-product material, source material and special nuclear material**

(a) Ionizing radiation-producing machines not being used in such a manner as to produce radiation, such as equipment in storage or on display, are exempt from registration. Machines that are operated while on display must meet the requirements of N.J.A.C. 7:28-3.1.

(b) Electrical equipment that is not primarily intended to produce radiation and that does not produce radiation greater than 0.5 millirem per hour at any readily accessible point five centimeters from its surface is exempt from registration. Production-testing facilities for such equipment shall not be exempt if any individual might receive a radiation dose exceeding the limits established in N.J.A.C. 7:28-6.2.

(c) Ionizing radiation-producing machines possessed, stored or used by agencies of the United States Government are exempt from registration.

(d) Those radioactive materials covered in specific and general state licenses issued by the Department in accordance with N.J.A.C. 7:28-4 are exempt from registration.

(e) Those radioactive materials contained in devices which are covered under general license issued by the United States Nuclear Regulatory Commission or have been granted an exemption from licensing requirements by the United States Nuclear Regulatory Commission are exempt from registration.

(f) Quantities of radioactive material equal to or less than those listed in N.J.A.C. 7:28-3.11 are exempt from registration requirements provided that no individual user of radioactive material shall have more than 10 such quantities of any material or materials at any one time.

**7:28-3.3 Registration of ionizing radiation-producing machines**

(a) Registration of ionizing radiation-producing machines shall pertain to each x-ray tube and its accompanying transformer, generator and control panel. If more than one x-ray tube operates off the same control panel, a separate registration is required for each tube.

(b) All registrations issued for ionizing radiation-producing machines shall expire on May 19 of each renewal year or shall expire one year from the date of initial application as determined by the Department. Registrations are renewable by the registrant for a period of one year upon payment of the fee provided in N.J.A.C. 7:28-3.12.

(c) Applications for new registrations for ionizing radiation producing machines will be accepted throughout the calendar year. The annual registration fee set forth in N.J.A.C. 7:28-3.12 shall be either prorated from the date the registration is issued until its expiration date on May 19 following the date of application, except that the Department may issue a registration for an additional year when an application is initially filed during the last three months of the registration year, or shall be assessed in full from the date of application until its expiration date one year later as determined by the Department.

**7:28-3.4 Temporary registration of ionizing radiation-producing machines**

(a) Any person, manufacturer, dealer or State, county or local government having temporary possession, custody or control of any ionizing radiation-producing machine for the purpose of replacing a registered machine that is out of service for a period longer than 60 days or for evaluation prior to purchase for a period longer than 60 days shall obtain a registration for temporary possession, custody or control of said machine.

(b) Application for temporary registration shall be submitted, on forms available from the Department, within 30 days after taking temporary possession, custody or control.

No registration fee will be charged if the period of temporary possession, custody or control does not exceed 60 days. If the period exceeds 60 days, the annual registration fee for said machine set forth in N.J.A.C. 7:28-3.12 will be charged as of the date of application for the temporary registration.

(c) Within 30 days after relinquishment of temporary possession, custody or control of an ionizing radiation-producing machine, the registrant shall notify the Department in writing to terminate the temporary registration. The Department shall continue to charge a registration fee until a written notice of termination is received from the registrant.

**7:28-3.5 Registration of radioactive by-product material, source material and special nuclear material**

(a) Any person having within his possession, custody or control any radioactive by-product material, source material or special nuclear material pursuant to a specific license issued by the United States Nuclear Regulatory Commission shall apply for and obtain a registration for possession, custody or control of the specified type(s) and amount(s) of such material as authorized by the license issued by the Nuclear Regulatory Commission. Application forms for the registration of radioactive material are available from the Department. When submitting an application, the applicant shall attach to the application a copy of the license issued by the Nuclear Regulatory Commission.

(b) A registrant does not have to apply for a new or amended registration for receipt of each shipment of a type of radioactive material for which it has a valid current registration provided that the total amount of such type of radioactive material in the registrant's possession, custody or control does not exceed the amount authorized in its registration for such type of material.

(c) Fees in the amounts indicated in N.J.A.C. 7:28-3.13 shall be paid for each initial registration application, each registration amendment and each annual registration renewal.

(d) Any registration issued for radioactive materials pursuant to this subchapter shall be valid for so long as the license issued by the United States Nuclear Regulatory Commission is in full force and effect.

Amended by R.1991 d.417, effective August 5, 1991.  
See: 22 N.J.R. 3300(a), 23 N.J.R. 2362(a).

(a) Added specific to a "specific" license; (c) deleted old text pertaining to fees and added new.

**7:28-3.6 Transfer of registration for possession of radioactive by-product material, source material, special nuclear material and ionizing radiation-producing machines**

Registrations for possession of radioactive by-product material, source material, special nuclear material and ionizing radiation-producing machines are not transferable.

**7:28-3.7 Amendments to registration of ionizing radiation-producing machines**

(a) A registrant must notify the Department in writing within 30 days after any change in the following information on the application for registration of an ionizing radiation-producing machine:

1. Trade name;
2. X-ray tube capacity;
3. Type of housing;
4. Generator power;
5. Owner;
6. Co-owner;
7. Location of machine including address (number, street, city, zip code, county) and room number;
8. Machine category;
9. Manufacturer;
10. Control panel model number; and
11. Control console serial number.

**7:28-3.8 Amendments to registration of radioactive by-product material, source material or special nuclear material**

A registrant shall notify the Department in writing within 30 days of any change in the license issued by the Nuclear Regulatory Commission for possession, custody or control of any type of radioactive by-product material, source material or special nuclear material when there is a change in the type and/or quantity of such material or when there is a change in the designated licensed user(s) or radiation safety officer.

**7:28-3.9 Sale, installation, relocation or disposal of ionizing radiation-producing machines**

(a) Whenever a manufacturer or dealer sells, installs, relocates or disposes of an ionizing radiation-producing machine, said manufacturer, agent or dealer shall give written notification thereof to the Department within 30 days of such sale, installation, relocation or disposal. Said notification shall include the manufacturer, model and serial number of each component, name and address of the new owner(s), address of the relocated machine or details of the final disposition of the machine. Notification shall be submitted on a form available from the Department. The Department may accept the current form used by the United States Food and Drug Administration for Report of Assembly of a Diagnostic X-ray System if the Department determines that the information is complete and accurate.

(b) Whenever an owner sells, relocates or disposes of an ionizing radiation-producing machine, said owner shall:

1. Give written notification to the Department on forms available from the Department within 30 days of such sale, relocation or disposal;
2. Include the New Jersey registration number, manufacturer, model and serial number of each component;
3. Include the name and address of the new owner(s); and
4. Include the address of the relocated machine, or details of the final disposition of the machine; and
5. Be responsible for all fees until the written notification is received by the Department.

**7:28-3.10 Denial of an application for registration, and suspension, modification, or revocation of registration of ionizing radiation-producing machines, radioactive by-product material, source material or special nuclear material**

(a) The Department, in addition to any penalties authorized by the Act, may deny an application for registration or suspend, modify or revoke a registration of ionizing radiation-producing machines, radioactive by-product material, source material or special nuclear material by reason of amendments to the Act, adoption of rules, orders issued by the Department pursuant to said Act or if the applicant or registrant:

1. Fails to comply with any provisions of the Act or any rules promulgated pursuant thereto including the timely payment of registration fees;
2. Falsifies or makes misleading statements in the application for registration;
3. Falsifies or makes misleading statements in any documents which were utilized to obtain a registration;
4. Alters registration documents;
5. Falsifies required records;
6. Aids, abets, combines with, or conspires with any person for any purpose which will evade or be in violation of the provisions of the Act or any rules promulgated pursuant thereto; or
7. Allows a registration to be used by any person for any purpose which will evade or be in violation of the provisions of the Act or any rules promulgated pursuant thereto.

(b) Except as provided in N.J.S.A. 26:2D-12 in cases of emergency, no registration shall be denied, modified, suspended or revoked prior to a hearing conducted by the Office of Administrative Law pursuant to N.J.S.A. 52:14B-1 et seq., the Administrative Procedure Act, and N.J.A.C. 1:1-1 et seq., the Uniform Administrative Practice Rules, on the basis of a Notice of Intent filed by the Department stating the grounds for denial, suspension, modification or revocation of a registration.

(c) The Department may terminate a registration upon request submitted by the registrant to the Department in writing.

**7:28-3.11 Table of radioactive materials and quantities exempt from registration**

(a) The following radioactive materials, in quantities less than or equal to those specified below, are exempt from registration:

Radioactive Material	Column A Not as a sealed source (microcuries)	Column B As a sealed source (microcuries)
Antimony (Sb 124)	1	10
Arsenic 76 (As 76)	10	10
Arsenic 77 (As 77)	10	10
Barium 140 + Lanthanum 140 (Ba 140 + La 140)	1	10
Beryllium (Be 7)	50	50
Cadmium 109 + Silver 109 (Cd 109 + Ag 109)	10	10
Calcium 45 (Ca 45)	10	10
Carbon 14 (C 14)	50	50
Cerium 144 + Praseodymium 144 (Ce 144 + Pr 144)	1	10
Cesium 137 + Barium 137 (Ce 137 + Ba 137)	1	10
Chlorine 36 (Cl 36)	1	10
Chromium 51 (Cr 51)	50	50
Cobalt 60 (Co 60)	1	10
Copper 64 (Cu 64)	50	50
Europium 154 (Eu 154)	1	10
Fluorine 18 (F 18)	50	50
Gallium 72 (Ga 72)	10	10
Germanium 71 (Ge 71)	50	50
Gold 198 (Au 198)	10	10
Gold 199 (Au 199)	10	10
Hydrogen 3 (Tritium H 3)	250	250
Indium 114 (In 114)	1	10
Iodine 131 (I 131)	10	10
Iridium 192 (Ir 192)	10	10
Iron 55 (Fe 55)	50	50
Iron 59 (Fe 59)	1	10
Lanthanum 140 (La 140)	10	10
Manganese 52 (Mn 52)	1	10
Manganese 56 (Mn 56)	50	50
Molybdenum 99 (Mo 99)	10	10
Nickel 59 (Ni 59)	1	10
Nickel 63 (Ni 63)	1	10
Niobium 95 (Nb 95)	10	10
Palladium 109 (Pd 109)	10	10
Palladium 103 + Rhodium 103 (Pd 103 + Rh 103)	50	50
Phosphorus 32 (P 32)	10	10
Polonium 210 (Po 210)	0.1	1
Potassium 42 (K 42)	10	10
Praseodymium 143 (Pr 143)	10	10
Promethium 147 (Pm 147)	10	10
Rhenium 186 (Re 186)	10	10
Rhodium 105 (Rh 105)	10	10
Rubidium 86 (Rb 86)	10	10
Ruthenium 106 + Rhodium 106 (Ru 106 + Rh 106)	1	10
Samarium 153 (Sm 153)	10	10

Radioactive Material	Column A Not as a sealed source (microcuries)	Column B As a sealed source (microcuries)
Scandium 46 (Sc 46)	1	10
Silver 105 (Ag 105)	1	10
Silver 111 (Ag 111)	10	10
Sodium 22 (Na 22)	10	10
Sodium 24 (Na 24)	10	10
Strontium 89 (Sr 89)	1	10
Strontium 90 + Yttrium 90 (Sr 90 + Y 90)	0.1	1
Sulfur 35 (S 35)	50	50
Tantalum 182 (Ta 182)	10	10
Technetium 96 (Tc 96)	1	10
Technitium 99 (Tc 99)	1	10
Tellurium 127 (Te 127)	10	10
Tellurium 129 (Te 129)	1	10
Thallium 204 (Tl 204)	50	50
Tin 113 (Sn 113)	10	10
Tungsten 185 (W 185)	10	10
Vanadium 48 (V 48)	1	10
Yttrium 90 (Y 90)	1	10
Yttrium 91 (Y 91)	1	10
Zinc 65 (Zn 65)	10	10
Beta and/or Gamma emitting radioactive material not listed above	1	10

**7:28-3.12 Application and annual registration renewal fees for ionizing-radiation-producing machines**

(a) On initial registration of each x-ray tube, each registrant shall pay an application fee of \$40.00 plus the prorated portion of the applicable annual registration renewal fee set forth in (b), (c), (d) or (e) below for the remainder of the first year of registration.

(b) Each registrant of an ionizing-radiation-producing machine used in a dental facility shall pay:

1. The initial application and registration fees for each x-ray tube pursuant to (a) above, and
2. In each year after the expiration of the first year of registration established pursuant to (f) below, the annual registration renewal fee per x-ray tube as follows:

**DENTAL FACILITIES**

Machine Category and Description	Annual Registration Renewal Fee Per X-Ray Tube
01D Dental Machine	\$92

(c) Each registrant of an ionizing-radiation-producing machine used in a hospital facility shall pay:

1. The initial application and registration fees for each X-ray tube pursuant to (a) above; and
2. In each year after the expiration of the first year of registration establish pursuant to (f) below, the annual registration renewal fee per X-ray tube follows:

**HOSPITAL FACILITIES**

Machine Category and Description	Annual Registration Renewal Fee Per X-Ray Tube
01H Dental Machine	\$140.00
02H Fixed Medical Radiographic Machine	208.00
03H Mobile Medical Radiographic Machine	208.00
31H Portable Medical Radiographic Machine (hand carried)	208.00
06H Motor Vehicle Mounted Medical Radiographic Machine	208.00
04H Fixed Medical Fluoroscopic Machine	163.00
05H Mobile Medical Fluoroscopic Machine	163.00
32H Portable Medical Fluoroscopic Machine (hand carried)	163.00
33H Motor Vehicle Mounted Medical Fluoroscopic Machine	163.00
07H Fixed Medical Radiographic Fluoroscopic Machine	253.00
08H Mobile Medical Radiographic Fluoroscopic Machine	253.00
34H Portable Medical Radiographic Fluoroscopic Machine (hand carried)	253.00
35H Motor Vehicle Mounted Medical Radiographic Fluoroscopic Machine	253.00
09H CT Scan Machine	163.00
10H Mammography Machine	298.00
36H Motor Vehicle Mounted Mammography Machine	298.00
37H Mobile Mammography Machine	298.00
44H MQSA Mammography Machine	73.00
45H MQSA Motor Vehicle Mounted Mammography Machine	73.00
46H MQSA Mobile Mammography Machine	73.00
11H Medical Therapeutic Machine 60 kVp	253.00
12H Medical Therapeutic Machine 61 kVp to 999 kVp	253.00
14H Medical Therapeutic Machine 1 MeV and above	343.00
30H Radiation Therapy Simulator Machine	208.00
38H Biomedical (non-human) Research Machine	140.00
21H Electron Microscope Machine	140.00
22H Cabinet X-ray Machine	140.00
28H Bone Densitometer Machine	118.00

(d) Each registrant of an ionizing-radiation-producing machine used in a non-hospital facility (including but not limited to doctors' offices, medical facilities, industrial facilities, schools, and government facilities) shall pay:

1. The initial application and registration fees for each X-ray tube pursuant to (a) above; and

2. In each year after the expiration of the first year of registration established pursuant to (f) below, the annual registration renewal fee per X-ray tube as follows:

NON-HOSPITAL FACILITIES

Machine Category and Description	Annual Registration Renewal Fee Per X-Ray Tube
01N Dental Machine	\$106.00
02N Fixed Medical Radiographic Machine	140.00
03N Mobile Medical Radiographic Machine	140.00
31N Portable Medical Radiographic Machine (hand carried)	140.00
06N Motor Vehicle Mounted Medical Radiographic Machine	140.00
04N Fixed Medical Fluoroscopic Machine	118.00
05N Mobile Medical Fluoroscopic Machine	118.00
32N Portable Medical Fluoroscopic Machine (hand carried)	118.00
33N Motor Vehicle Mounted Medical Fluoroscopic Machine	118.00
07N Fixed Medical Radiographic Fluoroscopic Machine	163.00
08N Mobile Medical Radiographic Fluoroscopic Machine	163.00
34N Portable Medical Radiographic Fluoroscopic Machine (hand carried)	163.00
35N Motor Vehicle Mounted Medical Radiographic Fluoroscopic Machine	163.00
09N CT Scan Machine	118.00
10N Mammography Machine	298.00
36N Motor Vehicle Mounted Mammography Machine	298.00
37N Mobile Mammography Machine	298.00
44N MQSA Mammography Machine	73.00
45N MQSA Motor Vehicle Mounted Mammography Machine	73.00
46N MQSA Mobile Mammography Machine	73.00
11N Medical Therapeutic Machine ≤60 kVp	118.00
12N Medical Therapeutic Machine >61 kVp to 999 kVp	253.00
14N Medical Therapeutic Machine 1 MeV and above	343.00
30N Radiation Therapy Simulator Machine	208.00
38N Biomedical (non-Human) Research Machine	140.00
17N Industrial/Research Radiography Machine	151.00
39N Portable Industrial Radiography Machine	151.00
40N Shielded Room Radiography Machine	151.00
18N Electron Beam Welder/Furnace Machine	129.00

Machine Category and Description	Annual Registration Renewal Fee Per X-Ray Tube
19N Analytical X-ray Machine ≤16 kVp	118.00
20N Analytical X-ray Machine >16 kVp	118.00
21N Electron Microscope Machine	106.00
22N Cabinet X-ray Machine	106.00
23N X-ray Baggage Machine	106.00
24N Particle Accelerator Machine (non-medical use) ≤30 kVp	196.00
25N Particle Accelerator Machine (non-medical use) >30 kVp	185.00
28N Bone Densitometer Machine	95.00
41N Machine not specifically listed above, ≤50 kVp	118.00
42N Machine not specifically listed above, 51 kVp to 999 kVp	118.00
43N Machine not specifically listed above, 1 MeV and above	140.00

(e) Each registrant of an ionizing-radiation-producing machine used in a veterinary facility shall pay:

1. The initial application and registration fees for each X-ray tube pursuant to (a) above, and

2. In each year after the expiration of the first year of registration established pursuant to (f) below, the annual registration renewal fee per X-ray tube as follows:

VETERINARY FACILITIES

Machine Source Category and Description	Annual Registration Renewal Fee Per X-Ray Tube
01V Dental Machine	\$ 86.00
02V Fixed Medical Radiographic Machine	100.00
03V Mobile Medical Radiographic Machine	100.00
31V Portable Medical Radiographic Machine (hand carried)	100.00
04V Fixed Medical Fluoroscopic Machine	91.00
05V Mobile Medical Fluoroscopic Machine	91.00
32V Portable Medical Fluoroscopic Machine (hand carried)	91.00
07V Fixed medical Radiographic Fluoroscopic Machine	109.00
08V Mobile Medical Radiographic Fluoroscopic Machine	109.00

(f) The expiration date of each year of registration shall be specified by the Department on the billing invoice sent to each registrant. The registration expiration date shall be based on the first letter of the registrant name as follows:

1. For a registrant whose name begins with A through F, the registration expiration date shall be August 31 of each calendar year;

2. For a registrant whose name begins with G through L, the registration expiration date shall be September 30 of each calendar year;

3. For a registrant whose name begins with M through R, the registration expiration date shall be October 31 of each calendar year; and

4. For a registrant whose name begins with S through Z, the registration expiration date shall be November 30 of each calendar year.

(g) Each registrant shall pay the initial registration application fee and annual registration renewal fee within 60 days of the date of the invoice billing issued by the Department. Any fee payment postmarked or handcarried to the Department after the invoice due date will be subject to a \$25.00 per month late charge. If necessary, the Department will issue a second invoice. Late charges must be paid within 30 days of the second invoice. If a registrant fails to pay a fee by the original invoice due date, the registration of the ionizing-radiation-producing machine shall be deemed expired.

(h) When two or more X-ray tubes are operated from the same generator, the registrant shall pay an application fee and an annual registration renewal fee for each tube.

(i) Each registrant shall make payment only by check or money order made payable to "Treasurer, State of New Jersey." Each payment shall be accompanied by the invoice issued by the Department and shall be submitted to the address specified on the invoice: Bureau of Revenue, PO Box 417, Trenton, New Jersey 08625-0417.

(j) An application fee will not be charged for any machine registered pursuant to the Radiation Protection Code prior to November 16, 1987. However, the registrant shall pay the applicable annual registration renewal fee for any such machine.

Amended by R.1990 d.400, effective August 6, 1990.  
See: 22 N.J.R. 1653(a), 22 N.J.R. 2302(a), 22 N.J.R. 2830(a).  
Fees increased.

Repeal and New Rule, R.1995 d.49, effective January 17, 1995.  
See: 26 N.J.R. 3797(a), 27 N.J.R. 336(a).

Formerly "Fees for initial registration application and annual registration of ionizing radiation-producing machines".

Amended by R.1999 d.369, effective October 18, 1999.  
See: 31 N.J.R. 1130(a), 31 N.J.R. 3087(c).

In (c)2 and (d)2, inserted references to MQSA Mammography Machines, MQSA Motor Vehicle Mounted Mammography Machines and MQSA Mobile Mammography Machines.

### **7:28-3.13 Fees for registration of radioactive by-product material, source material and special nuclear material**

(a) Fees for initial registration, annual registration renewal and each registration amendment for possession of radioactive by-product material, source material and special nuclear material as provided below shall be paid in full by the applicant/registrant.

1. Initial Registration Fee: \$150.00;
2. Annual Registration Renewal: \$100.00;

3. Each Amendment to Registration: \$100.00.

(b) Payment for each initial registration shall be made only by check or money order payable to "Treasurer, State of New Jersey" and shall be submitted with each initial registration application to the Department.

(c) Annual registration renewal fees payable to "Treasurer, State of New Jersey" shall be submitted to the Department annually no later than August 1 of each year.

(d) In the event that registration renewal fees are paid later than 30 days after August 1, a delinquency fee equal to one-half of the annual license fee will be imposed. Failure to pay a registration renewal fee, including any accrued delinquency fees for longer than 90 days after August 1 shall constitute grounds for suspension or revocation & of the registration pursuant to N.J.A.C. 7:28-3.10.

(e) Registration amendment fees shall be submitted with the amended registration.

(f) The initial registration fee, the annual renewal fee and registration amendment fee shall be mailed to:

State of New Jersey  
Department of Environmental Protection  
Bureau of Revenue  
428 East State Street  
Trenton, New Jersey 08625-0402

(g) The registration year shall be July 1 of each year to June 30 of the following year.

New Rule, R.1991 d.417, effective August 5, 1991.  
See: 23 N.J.R. 3300(a), 23 N.J.R. 2362(a).

## **SUBCHAPTER 4. LICENSING OF NATURALLY OCCURRING AND ACCELERATOR PRODUCED RADIOACTIVE MATERIALS**

### **7:28-4.1 License required for production, transfer, receipt, acquisition, ownership, possession or use of all naturally occurring and accelerator produced radioactive materials**

(a) This subchapter shall apply to persons who produce, transfer, receive, acquire, own, possess or use any naturally occurring or accelerator produced radioactive materials in this State.

(b) No person shall produce, transfer, receive, acquire, own, possess or use any radioactive substance obtained from naturally occurring materials or produced by an accelerator unless authorized by a specific State license issued by the Department, a general State license as provided in N.J.A.C. 7:28-4.5, or an exemption as provided in N.J.A.C. 7:28-4.3. Excepted from this provision are byproduct source materials and special nuclear materials.

**7:28-4.2 Recognition of licenses from other jurisdictions**

(a) Any person who possesses a specific license or equivalent licensing document issued by a Federal agency or any other state may, pursuant to such document, transport,

receive, possess, or use the radioactive materials specified in such license within this State for a period not in excess of 20 days in any period of 12 consecutive months without obtaining a specific license from the Department provided that:



1. The license does not limit the activity to specified installations or locations;

2. The licensee notifies the Department in writing at least two days prior to the time that such radioactive material is brought into this State. Such notification shall indicate the location, period, and type of proposed possession and use within this State, and shall be accompanied by a copy of the pertinent licensing document. If in a specific case the two-day period would impose an undue hardship on the user, he may, upon application to the Department, obtain permission to proceed sooner;

3. The licensee complies with all the terms and conditions of the license;

4. The licensee provides such other information as the Department may request; and

(b) The Department may withdraw, limit or qualify its acceptance of such licenses issued by another agency, or any produce distributed pursuant to such licensing documents, upon determining that such action is necessary in order to prevent undue hazard to public health and safety or property.

**7:28-4.3 Exemption from requirement for a license for production, transfer, receipt, acquisition, ownership, possession or use of all naturally occurring and accelerator produced radioactive materials**

(a) Any person is exempt from the requirement for a license for the production, transfer, receipt, acquisition, ownership, possession or use of all naturally occurring and accelerator produced radioactive materials as follows:

1. The person is a plant or laboratory owned by or operated on behalf of a Federal agency;

2. The person is a common or contract carrier and is transporting or storing radioactive materials covered by N.J.A.C. 7:28-4.7 in the regular course of carriage for another, or storage incident thereto;

3. To the extent that such person receives, possesses, uses, transfers, owns or acquires products or materials containing naturally occurring or accelerator produced radioactive substances in concentrations not in excess of those exempted in N.J.A.C. 7:28-4.3(b);

4. To the extent that such person receives, possesses, uses, transfers, owns or acquires luminous timepieces or parts thereof containing radium. However, any person who desires to apply radium to luminous timepieces or parts thereof is not exempt and must obtain a specific State license;

5. Naturally occurring radioactive materials of an equivalent specific radioactivity not exceeding that of natural potassium ( $10^{-9}$  curies per gram of potassium);

6. If the Department, upon request by an owner or on its own initiative with the approval of the Commission, grants a specific exemption from any requirements of this subchapter should it determine that such exemption is not likely to result in unnecessary radiation.

(b) The following concentrations of radioactive substances when obtained from naturally occurring materials or when produced by an accelerator are exempt from the requirement for a license for the production, transfer, receipt, acquisition, ownership or use of all naturally occurring and accelerator produced radioactive materials:

Element (Atomic Number)	Isotope	Gas Concentrations uCi/cc*	Liquid & Solid Concentrations uCi/cc**
Beryllium (4)	Be 7	—	$2 \times 10^{-2}$
Cadmium (48)	Cd 109	—	$2 \times 10^{-3}$
Carbon (6)	C 14	$1 \times 10^{-6}$	$8 \times 10^{-3}$
Chromium (24)	Cr 51	—	$2 \times 10^{-2}$
Cobalt (27)	Co 57	—	$5 \times 10^{-3}$
Hydrogen (1)	H 3	$5 \times 10^{-6}$	$3 \times 10^{-2}$
Iron (26)	Fe 55	—	$8 \times 10^{-3}$
Manganese (25)	Mn 52	—	$3 \times 10^{-4}$
Manganese (25)	Mn 54	—	$1 \times 10^{-3}$
Tungsten (74)	W 181	—	$4 \times 10^{-3}$
Vanadium (23)	V 48	—	$3 \times 10^{-4}$
Zinc (30)	Zn 65	—	$1 \times 10^{-3}$

Beta and/or gamma emitting radioactive material not listed above with half life less than 3 years —  $1 \times 10^{-10}$   $1 \times 10^{-6}$

\* Values are given only for those materials normally used as gases.

\*\* uCi/gm for solid.

1. Many radioisotopes disintegrate into isotopes which are also radioactive. In expressing the concentrations in this section, the value given is that of the parent isotope and takes into account the radioactivity of the daughters.

2. For purposes of N.J.A.C. 7:8-4.3(a)4, where a combination of isotopes is involved, the limit for the combination shall be computed as follows:

i. Determine for each isotope in the product the ratio between the concentration present in the product and the exempt concentration established in this section for the specific isotope when not in combination. The sum of such ratios may not exceed "1" (unity).

Example:

Prod. Conc. of Isotope A	+	Prod. Conc. of Isotope B	+	Prod. Conc. of Isotope C	1
Exempt Conc. of Isotope A		Exempt Conc. of Isotope B		Exempt Conc. of Isotope C	

**7:28-4.4 Types of licenses for production, transfer, receipt, acquisition, ownership, possession or use of all naturally occurring and accelerator produced radioactive materials**

(a) General State licenses described in N.J.A.C. 7:28-4.5 are effective without the filing of an application with the

Department or the issuance of licensing documents to particular persons.

(b) Specific State licenses are issued to named persons upon application filed pursuant to the requirements of this subchapter.

**7:28-4.5 General licenses for the transfer, receipt, acquisition, ownership, possession or use of naturally occurring and accelerator produced radioactive materials and certain devices and equipment**

(a) Any person who uses, transfers, receives, acquires, owns or possesses the following devices and equipment incorporating naturally occurring and/or accelerator produced radioactive material, when manufactured, tested and labeled by the manufacturer in accordance with the specifications contained in a specific license issued by the Department, or a specific license of a Federal agency or any other state, shall be deemed to have a general State license:

1. Devices designed for use as static eliminators and which contain, as a sealed source or sources, radioactive material consisting of a total of not more than 500 microcuries of Polonium 210 or 50 microcuries of Radium 226 per device;

2. Spark gap tubes and electronic tubes which contain radioactive material consisting of not more than one microcurie of Radium per tube;

3. Devices designed for ionizing of air and which contain, as a sealed source or sources, radioactive material consisting of a total of not more than 500 microcuries of Polonium 210 or 50 microcuries of Radium 226 per device.

(b) The devices described in (a) above shall not be transferred, abandoned or disposed of except by transfer to a person duly authorized to receive such device by a specific State license issued by the Department, a Federal agency, or any other state.

(c) The following quantities of radioactive substances, when obtained from naturally occurring materials or when produced by an accelerator, are generally licensed provided that no person shall at any one time possess or use more than a total of 10 such quantities:

Radioactive Material	Column A Not as a Sealed Source (microcuries)	Column B As a Sealed Source (microcuries)
Beryllium (Be-7)	50	50
Bismuth 207 (Bi-207)	1	10
Cadmium 109-Silver 109 (Cd 109 + Ag 109)	10	10
Cerium 141 (Ce-141)	1	10
Chromium 51 (Cr-51)	50	50
Cobalt 57 (Co-57)	20	20
Germanium 68 (Ge-68)	1	10
Iron 55 (Fe-55)	50	50

Radioactive Material	Column A Not as a Sealed Source (microcuries)	Column B As a Sealed Source (microcuries)
Manganese 52 (Mn-52)	1	10
Polonium 210 (Po-210)	0.1	1
Radium and daughters	0.1	1
Sodium 22 (Na-22)	10	10
Vanadium 48 (V-48)	1	10
Zinc 65 (Zn-65)	10	10
Beta and/or gamma emitting radioactive material not listed above	1	10

(d) There are no generally licensed quantities for alpha-emitting materials other than those set forth in N.J.A.C. 7:28-4.5(c).

(e) Any person who owns, receives, acquires, possesses or uses radioactive material when contained in a 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, when such devices are manufactured in accordance with the specifications contained in a specific license authorizing distribution under a general license issued to the supplier by the Department, a Federal agency, or any other state, is deemed to have a general State license, provided that:

1. The device is labeled in accordance with the provisions of the specific license which authorizes the distribution of the devices;

2. The device bears a label containing the following or a substantially similar statement:

“This device contains radioactive material and has been manufactured for distribution as a generally licensed device pursuant to

\_\_\_\_\_ (identify appropriate section of the rules)

\_\_\_\_\_ (name of licensing agency and state)

License No. \_\_\_\_\_ by \_\_\_\_\_ (name of supplier)

This device shall not be transferred, abandoned or disposed of except by transfer to a person duly authorized to receive such device by a specific license issued by the Department, a Federal agency, or any other state.

Removal of this label is prohibited.”; and

3. The devices requiring special installation shall be installed on the premises of the general licensee by a person authorized to install the devices under a specific license issued to the installer by the Department, a Federal agency, or any other state.

(f) Persons who transfer, receive, acquire, own, possess or use items and quantities of radioactive materials set forth in N.J.A.C. 7:28-4.5(a) and (c) pursuant to a general State license shall not:

1. Effect an increase in the radioactivity of such scheduled items or quantities by adding other radioactive material thereto, by combining radioactive material from two or more such items or quantities, or by altering them in any other manner so as to increase the rate of radiation emission;
2. Administer or direct the administration of the scheduled items or quantities or any part thereof to a human being, either externally or internally, for any purpose, including, but not limited to, diagnostic, therapeutic and research purposes;
3. Add or direct the addition of the scheduled items or quantities or any part thereof to any food, beverage, cosmetic, drug or other product designed for ingestion or inhalation by, or application to, a human being; or
4. Include the scheduled items or quantities or any part thereof in any device, instrument, apparatus, including component parts and accessories intended for use in diagnosis, treatment or prevention of disease in human beings or animals or otherwise intended to affect the structure or any function of the body of human beings or animals.

(g) Persons who receive, acquire, possess or use a device pursuant to a general license specified in N.J.A.C. 7:28-4.5(a):

1. Shall not transfer, abandon or dispose of the device except by transfer to a person duly authorized to receive such device by a specific license issued by the Department, a Federal agency, or any other state;
2. Shall assure that all labels affixed to the device at the time of receipt and bearing the statement, "Removal of this label is prohibited", are maintained thereon and shall comply with the instructions contained in such labels;
3. Shall have the device tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at intervals not to exceed six months except that devices containing only tritium need not be tested for any purpose and devices containing only krypton need not be tested for leakage;
4. Shall have the tests required by N.J.A.C. 7:28-4.5(g)3 and all other services involving the radioactive material, its shielding and containment, performed by the supplier or other person duly authorized by a specific license issued by the Department, a Federal agency, or any other state to manufacture, install or service such devices;
5. Shall maintain records of all tests performed on the devices as required under N.J.A.C. 7:28-4.5(g)3, including

the dates and results of the tests and the names and addresses of the persons conducting the tests;

6. Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding or containment of the radioactive material or the on-off mechanism or indicator, shall immediately suspend operation of the device until it has been either:

- i. Repaired by a supplier, manufacturer, or other person holding a specific license issued by the Department, a Federal agency, or any other state to manufacture, install or service such devices; or
- ii. Disposed of by transfer to a person holding a specific license issued by the Department, a Federal agency, or any other state to receive the radioactive material contained in the device; and

7. Shall be exempt from the requirements of this subchapter, except the provisions of N.J.A.C. 7:28-4.4(a), 4.9, 4.14, 4.18, 8.2, 8.4, and 13.

**7:28-4.6 Application for and renewal of specific State licenses for the transfer, receipt, acquisition, ownership, possession or use of naturally occurring and accelerator produced radioactive materials**

(a) Upon approval of an initial or renewal application, a specific State license may be issued by the Department for a period of five years commencing on the date the license is issued.

(b) Application for specific State licenses and renewals shall be filed with the Department, on forms available from the Department.

(c) All applications shall contain the following signature and certification:

1. "I certify under penalty of law that the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties for submitting false, inaccurate or incomplete information, including fines and/or imprisonment."

2. The certification shall be signed by the highest ranking corporate, partnership, or governmental officer or official at the facility or the individual for which or for whom the specific State license is requested.

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

(e) Subject to the provisions of N.J.A.C. 7:28-4.7 and 4.8, an application for a specific State license for any human use or uses of radioactive material specified in one or more of the Human Use activity Groups I to VI inclusive listed in N.J.A.C. 7:28-4.7(b) may be approved for all of the uses

within the group or groups which include the use or uses specified in the application.

(f) Information included in the specific State license application will be incorporated in and made a part of the terms and conditions of such license by reference.

(g) All applicants for initial and renewal applications for specific State licenses shall complete the application in its entirety with no reference to previously filed documents. The Department may accept photocopies of previous relevant applications.

(h) No initial or renewal specific State licenses shall be issued unless the appropriate annual license fee required by N.J.A.C. 7:28-4.18 is paid.

(i) Except as provided in N.J.A.C. 7:28-4.20, applications and documents submitted to the Department will be made available for public inspection.

(j) Upon the request of the Department at any time after the filing of the original or renewal specific State license application, and before the expiration of the license, the applicant shall submit further information to enable the Department to determine whether the application should be granted or denied or whether a license should be modified or revoked.

(k) All applications for license or amendment shall be signed by the applicant or licensee or a person duly authorized to act for and on his behalf.

(l) The Department may deny an application for a specific State license if the applicant:

1. Fails to comply with any provisions of the Act or any rules promulgated thereunder;
2. Falsifies or makes misleading statements in the application for license; or
3. Falsifies or makes misleading statements in any documents which were utilized to obtain a license.

**7:28-4.7 General requirements for approval of an application for an initial specific State license or renewal of a specific State license for use of naturally occurring and accelerator produced materials**

(a) If the Department determines that an applicant meets the requirements of this subchapter and the Act, it may issue an initial specific State license or renew a specific State license for non-human use of radioactive materials provided:

1. The applicant is qualified by reason of training and experience to use the radioactive material for the purpose requested in such manner as to protect health, minimize danger to life or property and prevent unnecessary radiation;

2. The applicant's proposed equipment, facilities and procedures are adequate to protect health, minimize danger to life or property and prevent unnecessary radiation; and

3. The applicant satisfies special requirements as may be applicable in N.J.A.C. 7:28-4.8.

(b) If the Department determines that an applicant meets the requirements of this subchapter and the Act, it may issue an initial specific State license or renew a specific State license for human use of radioactive materials for one or more of the following Human Use Groups of activities:

1. Group I: Use of prepared radiopharmaceuticals for certain diagnostic studies involving measurements of uptake, dilution and excretion. This group does not include imaging or localization studies;

2. Group II: Use of prepared radiopharmaceuticals for diagnostic imaging and localization studies;

3. Group III: Use of generators and reagent kits for the preparation and use of radiopharmaceuticals for certain diagnostic studies;

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

5. Group V: Use of prepared radiopharmaceuticals for certain therapeutic uses that normally require hospitalization for purposes of radiation safety; and

6. Group VI: Use of sources and devices containing radionuclides for certain medical uses.

(c) To qualify for an initial specific State license or renewal of a specific State license for human use of radioactive materials for any purpose described in Groups I through VI in (b), above the applicant must demonstrate qualification by reason of training and experience to use the radioactive material for the purpose requested and in such manner as to protect health, minimize danger to life or property, and prevent unnecessary radiation, by satisfying the training and experience requirements for the appropriate Human Use Group of activities as follows:

1. The training and experience must have been obtained within a five year period preceding the date of the application for an initial or renewal specific State license or must be supplemented by continuing education or experience. The original training and experience should have been received in a formal residency program in an accredited medical institution. Each applicant's training and experience are examined on a case-by-case basis. If an applicant wishes to use radiopharmaceuticals but does not have the training and experience described, the applicant may submit an application listing specific qualifications and these will be considered by the Department.

2. To qualify as adequately trained to use or directly supervise the use of radioactive material listed in Human Use Groups I, II, and/or III, an applicant shall have all the training and experience specified in (c)2i, ii and iii below;

i. Two hundred hours training in basic radioisotope handling techniques applicable to the use of unsealed sources. This training shall consist of lectures, laboratory sessions, discussion groups, or supervised experience in a nuclear medicine laboratory (that is, on-the-job training in a formalized training program) in the following areas and for the specific hours of class, laboratory or clinical experience:

- (1) Radiation physics and instrumentation (100 hours);
- (2) Radiation protection (30 hours);
- (3) Mathematics pertaining to the use and measurement of radioactivity (20 hours);
- (4) Radiation biology (20 hours); and
- (5) Radiopharmaceutical chemistry (30 hours);

ii. Five hundred hours of experience with the types and quantities of radioactive material for which the application is being made. For authorization of Human Use Group III (generators and reagent kits), this experience shall include personal participation in five elution procedures, including testing of eluate, and in five procedures to prepare radiopharmaceuticals from Human Use Group III reagent kits; and

iii. Five hundred hours of supervised clinical training in an institutional nuclear medicine program. The clinical training shall cover all appropriate types of diagnostic procedures and shall include:

- (1) Supervise examination of patients to determine the suitability for radioisotope diagnosis and recommendation on dosage to be prescribed;
- (2) Collaboration in calibration of the dose and the actual administration of the dose to the patient, including calculation of the radiation dose, related measurement, and plotting data;
- (3) Follow-up of patients when required; and
- (4) Study and discussion with preceptor of case histories to establish most appropriate diagnostic procedures, limitation, contraindication, etc.

3. The requirements specified in (c)2i, ii and iii above may be satisfied concurrently in a three month training program if all three areas are integrated into the program.

4. Certification by the American Board of Nuclear Medicine, or the American Board of Radiology in Diagnostic Radiology with Special Competence in Nuclear Radiology, will be accepted as evidence that an applicant has had adequate training and experience to use Human

Use Groups I, II, and III as specified in (c)2i, ii and iii above.

5. An applicant who wishes to be authorized for only one or two specific diagnostic procedures shall have training in basic radioisotope handling techniques and clinical procedures commensurate with the procedures and quantities of radioactive material being requested. Such requests will be examined on a case-by-case basis by the Department.

6. To qualify as adequately trained to use or directly supervise the use of radioactive material listed in Groups IV and or V, an applicant shall have:

i. Eighty hours training in basic radioisotope handling techniques applicable to the use of unsealed sources for therapy procedures, consisting of lectures, laboratory sessions, discussion groups or supervised experience in the following areas and for the following specific hours:

- (1) Radiation physics and instrumentation (25 hours);
- (2) Radiation protection (25 hours);
- (3) Mathematics pertaining to the use and measurement of radioactivity (10 hours); and
- (4) Radiation biology (20 hours);

7. To qualify as adequately trained to use or directly supervise the use of radioactive material listed in Group VI an applicant shall have:

i. Two hundred hours training in basic radioisotope handling techniques applicable to the use of sealed sources for therapy procedures, consisting of lectures, laboratory sessions, discussion groups, or supervised experience in the following areas and for the following specified hours:

- (1) Radiation physics and instrumentation (110 hours);
- (2) Radiation protection (40 hours);
- (3) Mathematics pertaining to the use and measurements of radioactivity (25 hours); and
- (4) Radiation biology (25 hours);

ii. Five hundred hours experience with the types and quantities of radioactive material for which the application is made;

iii. Clinical training in Group VI procedures consisting of active practice in therapeutic radiology with a minimum of three years experience of which at least one year shall have been spent in a formal training program accredited by the Residency Review Committee of Radiology and the Liaison Committee on Graduate Medical Education; and

iv. Evidence of certification by the American Board of Radiology in Radiology or Therapeutic Radiology, certification as a British "Fellow of the Faculty of Radiology" (FFR) or "Fellow of the Royal College of Radiology" (FRCR), or Canadian certification from the Royal College of Physicians and Surgeons (RCPS) in therapeutic radiology may be submitted in lieu of the training required in (c)7i and iii above.

8. In addition to the training required by (c)7 above, an applicant for a license for Human Use Group VI activities shall demonstrate that its proposed equipment, facilities and procedures are adequate to protect health, minimize danger to life or property and prevent unnecessary radiation; and

9. An applicant for a license for Human Use Group VI activities shall satisfy special requirements as may be applicable in N.J.A.C. 7:28-4.8.

**7:28-4.8 Special requirements for approval of an application for an initial specific State license or renewal of a specific State license for use of naturally occurring and accelerator produced radioactive materials**

(a) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license may be issued for human use of radioactive materials by an institution provided:

1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;

2. The applicant has appointed a medical isotopes committee to evaluate all proposals for research, diagnosis, and therapeutic use of radioactive material within that institution. Membership of the committee shall include one authorized user for each type of use permitted by the license, the radiation safety officer, a representative of the nursing service, and a representative of management who is neither an authorized user nor a radiation safety officer;

3. The applicant possesses adequate facilities for the clinical care of patients;

4. The physician(s) designated on the application as the individual user(s) has considerable pertinent training and experience in the use, handling and administration of radioactive material and, where applicable, the clinical management of radioactive patients; and

5. If the application is for a specific State license to use unspecified quantities of multiple types of radioactive materials, the applicant's staff has had substantial pertinent experience in using a variety of radioactive materials for various human uses.

(b) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license may be issued for human use of radioactive materials by a physician or dentist provided:

1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;

2. The applicant has access to a hospital possessing adequate facilities to hospitalize and monitor the applicant's radioactive patient whenever it is advisable; and

3. The applicant has had extensive training and supervised experience in the proposed use, the handling and administration of radioisotopes and, where applicable, the clinical management of radioactive patients. The applicant shall furnish suitable evidence of such experience with his application. A statement from the institution where the applicant acquired the training and experience, indicating its amount and nature, may be submitted as evidence of such experience.

(c) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license may be issued for human use of a sealed source of radioactive materials provided:

1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;

2. The applicant or, if the application is made by an institution, the individual user(s) has specialized training in therapeutic use of the radioactive device considered or has experience equivalent to such training; and

3. The individual user is a physician or dentist.

(d) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license may be issued for use of multiple quantities or types of radioactive material in research and development provided:

1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;

2. The applicant's staff has had substantial training and experience with a variety of radioisotopes for various research and development uses;

3. The applicant has established an isotope committee, composed of a radiological safety officer, a representative of management and one or more persons trained or experienced in the safe use of radioactive materials, which will review and approve or disapprove proposals for use of radioactive materials in the advance of purchase of such materials; and

4. The applicant has appointed a radiological safety officer who shall be responsible for rendering advice and assistance on radiological safety.

(e) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license may be issued for use of multiple quantities or types of radioactive material in processing for distribution to other authorized persons provided:

1. The applicant satisfies the general requirements for approval of specific State license application in N.J.A.C. 7:28-4.7;

2. The applicant's staff has had training and experience in the processing and distribution of a variety of radioisotopes; and

3. The applicant has appointed a radiological safety officer who shall be responsible for rendering advice and assistance on radiological safety.

(f) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license may be issued to distribute certain devices to persons generally licensed under N.J.A.C. 7:28-4.5(a) and (e) provided:

1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;

2. The applicant submits sufficient information relating to the design, manufacturer prototype testing, quality control procedures, labeling, proposed uses and potential hazards of the device to provide reasonable assurance that:

i. The radioactive material contained in the device cannot be easily removed from the device;

ii. No person possessing, using, transporting or exposed to the device will receive a radiation dose to a major portion of his body in excess of 0.5 rem in any one year under ordinary circumstances of use;

iii. The device can be safely operated by persons not having training in radiological protection; and

iv. The radioactive material within the device would not be accessible to unauthorized persons; and

3. In describing the label or labels and contents thereon to be affixed to the device, the applicant shall separately indicate those instructions and precautions which are necessary to assure safe operation of the device. Such instructions and precautions shall be contained on labels as described in N.J.A.C. 7:28-4.5(e).

(g) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license

may be issued for use of a sealed source or sources of radioactive materials in industrial and nonmedical radiography provided:

1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;

2. The applicant has an adequate program for training radiographers and radiographers' assistants and submits to the Department a schedule or description of such program which specifies the following:

i. Initial training;

ii. Periodic training;

iii. On-the-job training;

iv. Means to be used by the licensee to determine the radiographer's knowledge and understanding of and ability to comply with the requirements of this subchapter, the specific licensing requirements, and the operating and emergency instructions of the applicant; and

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

3. The applicant has established and submitted to the Department satisfactory written operating and emergency instructions as prescribed by N.J.A.C. 7:28-17;

4. The applicant will have an adequate internal inspection system, or other management control, providing assurance that the requirements of this chapter, the specific State license provisions, and the applicant's operating and emergency instructions are followed by radiographers and radiographers' assistants;

5. The applicant submits a description of its overall organizational structure pertaining to the radiography program, including specified delegation of authority and responsibility for operation of the program; and

6. The applicant who desires to conduct his own leak tests has established adequate procedures to be followed in leak testing sealed sources for possible leakage and contamination and submits to the Department a description of such procedures, including:

i. Instrumentation to be used;

ii. Method of performing test (for example, points on equipment from where wipe samples will be taken and method of obtaining the wipe sample); and

iii. Pertinent experience of the person who will perform the test.

(h) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license will be issued to transfer, possess, or control products or

materials containing exempt concentrations of radioactive material specified in N.J.A.C. 7:28-4.3(b) which the transferor has introduced into the product or material provided:

1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;
2. The applicant submits:
  - i. A description of the product or material into which the radioactive material will be introduced;
  - ii. The intended use of the radioactive material and the product into which it is introduced;
  - iii. The method of introduction;
  - iv. The initial concentration of the radioactive material in the product or material;
  - v. The control methods to assure that no more than the specified concentration is introduced into the product or material;
  - vi. The estimated time interval between introduction and transfer of the product or material; and
  - vii. The estimated concentration of the radioisotope in the product or material at the time of proposed transfer by the applicant;
3. The applicant provides:
  - i. Reasonable assurance that the concentrations of the radioactive material at the time of transfer will not exceed the exempt concentrations listed in N.J.A.C. 7:28-4.3(b);
  - ii. That reconcentration of the radioactive material in concentrations exceeding those exempted under N.J.A.C. 7:28-4.3(b) is not likely;
  - iii. That the product or material is not likely to be inhaled or ingested; and
  - iv. That use of the lower concentration(s) is not feasible; and
4. Within 30 days subsequent to the end of the reporting period, each licensee shall file an annual report with the Department describing the kinds and quantities of products transferred, the concentration of radioactive material contained and the quantity of radioactive material transferred during the reporting period which shall be the 12 month period ending June 30 of each calendar year.
  - (i) If the Department determines that an applicant meets the requirements of this subchapter and the Act, an initial specific State license or renewal of a specific State license may be issued to distribute certain devices to persons specifically licensed under N.J.A.C. 7:28-4.7 provided:
    1. The applicant satisfies the general requirements for approval of specific State license applications in N.J.A.C. 7:28-4.7;

2. The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control procedures, labeling, proposed uses and potential hazards of the device to provide reasonable assurance that:
  - i. The radioactive material contained in the device cannot be easily removed;
  - ii. The device can be safely operated by persons having trained in radiological protection; and
  - iii. The radioactive material within the device would not be accessible to unauthorized persons; and

3. Each device distributed as authorized by such license is to bear a label containing the following or substantially similar statements:
  - i. "Caution: Radioactive Materials";
  - ii. The isotope name;
  - iii. The isotope quantity and date; and
  - iv. The following statement:

"This device contains radioactive material and has been manufactured for distribution as a specifically licensed device pursuant to

- (identify appropriate section of the regulation)
  - (name of licensing agency and state)
- License No. \_\_\_\_\_ by \_\_\_\_\_ (name of supplier)
- Disposal of this device shall conform to the requirements listed in N.J.A.C. 7:28-4.5(g)6ii of the Radiation Protection Code. Removal of this label is prohibited."

License No. \_\_\_\_\_ by \_\_\_\_\_ (name of supplier)

Disposal of this device shall conform to the requirements listed in N.J.A.C. 7:28-4.5(g)6ii of the Radiation Protection Code. Removal of this label is prohibited."

(identify appropriate section of the regulation)

(name of licensing agency and state)

License No. \_\_\_\_\_ by \_\_\_\_\_ (name of supplier)

Disposal of this device shall conform to the requirements listed in N.J.A.C. 7:28-4.5(g)6ii of the Radiation Protection Code. Removal of this label is prohibited."

#### 7:28-4.9 Terms and conditions of general and specific State licenses

(a) Each State license issued pursuant to this subchapter shall be subject to all the provisions of the Act, now or hereafter in effect, and to this chapter and orders of the Department.

(b) No license to possess or utilize radioactive material pursuant to this subchapter shall be transferred or assigned.

(c) Each person licensed by the Department pursuant to this subchapter shall confine his/her possession and use of radioactive material to the locations and purposes authorized by such license, and shall not use or permit the use of radioactive materials contrary to the applicable requirements of this chapter. Persons licensed under the provisions of this subchapter may transfer radioactive material within the State only to the persons licensed to receive such material or as otherwise authorized by the Department in writing.

(d) The Department may incorporate in any State license at the time of issuance, or thereafter, all such additional requirements and conditions with respect to the licensee's receipt, possession, use or transfer of radioactive material as it deems appropriate or necessary in order to assure compliance with this chapter and the Act.

(e) Each licensee authorized under N.J.A.C. 7:28-4.8(f) to distribute certain devices to generally licensed persons shall:

1. Report to the Department all transfers of such devices to persons in New Jersey generally licensed under N.J.A.C. 7:28-4.5(a) and (c). Such report shall identify each general licensee by name and address, the type and number of device(s) transferred, and the quantity and kind of radioactive material contained in each device. The report shall be submitted within 30 days after the end of each calendar quarter in which such a device is transferred to generally licensed persons; and

2. Furnish to each general licensee to whom such device is transferred a copy of N.J.A.C. 7:28-4.5(a), (e) and (g), 8.2 and 8.4.

(f) Each licensee authorized under N.J.A.C. 7:28-4.8(i) to distribute certain devices to specifically licensed persons shall:

1. Report to the Department all transfers of such devices to persons in New Jersey specifically licensed under N.J.A.C. 7:28-4.7 and 4.8. Such report shall identify each specific licensee by name and address, the type and number of device(s) transferred, and the quantity and kind of radioactive material contained in each device. The report shall be submitted within 30 days after the end of each calendar quarter in which such a device is transferred to specifically licensed persons.

#### **7:28-4.10 Expiration of specific State license**

Except as provided in N.J.A.C. 7:28-4.11, each specific State license shall expire at 12:01 A.M. of the day, in the month and year stated in the license.

#### **7:28-4.11 Status of specific State licenses pending renewal**

In any case in which a licensee has filed a complete application in proper form for renewal of a specific State license not less than 30 days prior to expiration of the existing license, such license and all its existing conditions shall not expire until the Department has acted upon the application.

#### **7:28-4.12 Amendment of a specific State license at request of licensee**

(a) Applications for amendment of a specific State license shall be filed in accordance with N.J.A.C. 7:28-4.6 and shall specify the amendment desired and the grounds for such amendment.

(b) The Department will evaluate only amendment applications submitted by personnel authorized by the licensee.

(c) The applicant for an amended specific State license shall not engage in the activities for which an amendment has been requested until approval has been granted by the Department.

#### **7:28-4.13 Records**

All persons licensed pursuant to this subchapter shall keep records in accordance with N.J.A.C. 7:28-8.

#### **7:28-4.14 Inspections**

(a) All licensees shall allow the Department or its agents to inspect radioactive material and the facilities and premises where radioactive material is used or stored.

(b) No person shall prevent, prohibit, obstruct, hinder, delay or interfere with personnel of this Department or its agents in performing their duties.

(c) Upon request by the Department, or its agents, licensees shall make available for inspection by the Department records kept pursuant to this chapter.

#### **7:28-4.15 Tests**

(a) At the request of the Department or its agents, each licensee shall perform, or allow the Department to perform if the Department so desires, such tests as the Department deems appropriate or necessary for the administration of this subchapter, including tests of the following:

1. Radioactive material;
2. Facilities where radioactive material is utilized or stored;
3. Radiation detection and monitoring instruments; and
4. Equipment and devices used in connection with the utilization or storage of radioactive material.

#### **7:28-4.16 Modification, revocation, suspension, and termination of general and specific State licenses**

(a) Each general State license shall be subject to modification, suspension or revocation by reason of amendments to the Act, adoption of rules by the Commission or the Department, orders issued by the Department pursuant to authority of the Act, or for violation or failure to observe any of the terms and provisions of the Act, license or any rule of the Commission or the Department, or order of the Department.

(b) Each specific State license shall be subject to modification, suspension or revocation by reason of:

1. Amendments to the Act;

2. Adoption of rules by the Commission;
3. Orders issued by the Department pursuant to the authority of the Act;
4. Conditions revealed by the application for a specific State license or statement of fact or any report, records or inspection or other means which would warrant the Department to refuse to grant a specific State license on an original application;
5. Violation of or failure to observe any of the terms and provisions of the Act or the license, or any rule of the Commission or Department or order of the Department;
6. Falsification or misleading statements in any license application;
7. Alteration of licensing document;
8. Falsification of required records; or
9. Failure to make timely payment of licensing fees.

(c) If a specific State license is not to be renewed or if a licensee requests a termination of its license, the licensee shall furnish to the Department, prior to the expiration date of the license, close-out surveys and/or wipe tests of the facility and a disposition certificate attesting to the disposal of radioactive material.

#### 7:28-4.17 Requests for an adjudicatory hearing

(a) When the Department denies an initial application for or renewal of a specific State license, or determines to modify, revoke, suspend or terminate a general or specific State license, the Department shall send a notice of decision to the applicant or licensee by certified mail return receipt requested. The notice shall advise the applicant or licensee of the right to request a contested case hearing pursuant to the Administrative Procedure Act, N.J.S.A. 52:14B-1 et seq. and the New Jersey Uniform Administrative Procedure Rules, N.J.A.C. 1:1-1 et seq. The notice shall include the following information:

1. Where and whom hearing requests should be sent;
2. The deadline by which hearing requests must be submitted;
3. The information that is required to be in the hearing request under (c) below; and
4. The requirements for requesting a stay under N.J.A.C. 7:28-4.18.

(b) All requests for a contested case hearing must be received by the Department within 30 calendar days of the date upon which the notice of decision was received.

(c) All requests for a contested case hearing shall be submitted in writing to the Department, at Office of Legal Affairs, ATTENTION: Adjudicatory Hearing Requests, Department of Environmental Protection, CN 402, Trenton, New Jersey 08625-0402. The request shall contain:

1. The name, address and telephone number of the person making such request;
2. A statement of the legal authority and jurisdiction under which the request for a hearing is made;
3. A brief and clear statement of specific facts describing the Department decision appealed from as well as the nature and scope of the interest of the requestor in such decision; and
4. A statement of all facts alleged to be at issue and their relevance to the Department decision for which a hearing is requested. Any legal issues, associated with the alleged facts at issue, must also be included.

(d) The Department shall determine whether any request for a contested case hearing should be granted. In making such determination, the Department shall evaluate the request to determine whether a contested case, as defined by the Administrative Procedure Act, N.J.S.A. 52:14B-1 et seq., exists and whether there are issues of fact which, if assumed to be true, might change the Department's decision. Where only issues of law are raised by a request for a hearing, the request will be denied. Denial by the Department of a request for a contested case hearing shall constitute the final decision of the Department for the purposes of judicial appeal.

Administrative Change in (c).  
See: 23 N.J.R. 3325(b).

#### 7:28-4.18 Requirements governing requests for stay of the effective date of the Department decision for which an adjudicatory hearing is requested

(a) The Department may grant a stay of the effective date of a decision to deny, modify, revoke or suspend any license. The applicant for such a stay must submit evidence that one of the following circumstances exist:

1. The granting of such stay is required as a constitutional or statutory right; or
2. The potential impact on public health, safety, welfare or the environment which might result from a decision to grant a stay is greatly outweighed by immediate, irreparable injury to the specific party requesting such stay.

(b) The decision to grant a contested case hearing request shall not automatically result in a stay of the Department action appealed from absent an express decision to stay such action by the Director. The burden shall be upon the party requesting a hearing to explicitly request a stay of action within the same document as well as to disclose reasons why such stay should be granted.

(c) Department decisions are effective, according to their terms, unless stayed by the Department in writing, upon receipt of written request pursuant to this section.

(d) Written requests for a stay of the effective date of the Department's decision must be made to the Department within 30 calendar days of the date upon which the notice of decision was received.

(e) Any stay that is granted by the Department shall be temporary and in no case shall it extend beyond the date of the Department's final decision of the contested case.

(f) Determinations made pursuant to this section shall be made in a writing mailed to the specific party making such request.

**7:28-4.19 Specific State license fee schedule for the production, transfer, receipt, acquisition, ownership, possession or use of naturally occurring or accelerator produced radioactive material**

(a) The specific State license fee schedule for the production, transfer, receipt, acquisition, ownership, possession or use of naturally occurring or accelerator produced radioactive materials is as follows:

Category	Annual License Fee
1. Radioactive materials license for Human Use Group I:	
i. Possession of material only;	\$ 200.00
ii. Administration of less than 10 doses per year;	\$ 300.00
iii. Administration of 10 through 49 doses per year;	\$ 400.00
iv. Administration of 50 or more doses per year.	\$ 500.00
2. Radioactive materials license for Human Use Group II:	
i. Possession of material only;	\$ 200.00
ii. Administration of less than 200 doses per year;	\$ 400.00
iii. Administration of between 200 and 1,499 doses per year;	\$ 800.00
iv. Administration of 1,500 or more doses per year.	\$1,200.00
3. Radioactive materials license for Human Use Group III:	
i. Possession of material only;	\$ 200.00
ii. Administration of less than 200 doses per year;	\$ 200.00
iii. Administration of 200 through 999 doses per year;	\$ 400.00
iv. Administration of 1,000 or more doses per year.	\$ 500.00
4. Radioactive materials license for	

Category	Annual License Fee
Human Use Group IV:	
i. Possession of material only;	\$ 200.00
ii. Administration of less than 10 doses per year;	\$ 300.00
iii. Administration of 10 through 49 doses per year;	\$ 400.00
iv. Administration of 50 or more doses per year.	\$ 500.00
5. Radioactive materials license for Human Use Group V:	
i. Possession of material only;	\$ 200.00
ii. Administration of less than 10 doses per year;	\$ 300.00
iii. Administration of 10 through 49 doses per year;	\$ 400.00
iv. Administration of 50 or more doses per year.	\$ 500.00
6. Radioactive materials license for Human Use Group VI:	
i. Possession of material only;	\$ 500.00
ii. Administration of less than 10 doses per year;	\$ 600.00
iii. Administration of 10 through 49 doses per year;	\$ 700.00
iv. Administration of 50 or more doses per year.	\$ 800.00
7. Radioactive material license for commercial manufacture, processing and/or distribution of radioactive materials for Human Use.	\$3,000.00
8. Radioactive materials license for commercial manufacture, processing and/or distribution of radioactive materials.	\$3,000.00
9. Radioactive materials license for radioactive materials as sealed sources used for calibration and quality control purposes with a possession limit of 10 mCi or less.	\$ 600.00
10. Radioactive materials license for radioactive materials, as sealed sources used for calibration and quality control purposes with a possession limit greater than 10 mCi.	\$1,000.00
11. Radioactive materials license for radioactive materials as sealed sources contained in devices used for analytical purposes with a possession limit of one mCi or less.	\$ 500.00
12. Radioactive materials license for radioactive materials, except radium-226, as sealed sources, contained in devices used for analytical purposes with a possession limit greater than one mCi but less than or equal to 300 mCi:	
i. A government body, department, agency, authority, or any other unit of any state, Federal, county or local government using X-ray fluorescence devices for lead paint analysis	\$ 100.00
ii. All others	\$ 750.00
13. Radioactive materials license for radioactive materials, except radium-226, as sealed sources, contained in devices used for analytical purposes with a possession limit of greater than 300 mCi.	\$1,000.00

Category	Annual License Fee
14. Radioactive materials license for radioactive radium-226, as sealed sources, contained in devices used for analytical purposes with possession limit greater than one mCi but less than or equal to 50 mCi.	\$1,000.00
15. Radioactive materials license for radioactive radium-226, as sealed sources, contained in devices used for analytical purposes with a possession limit greater than 50 mCi.	\$1,500.00
16. Radioactive materials license for radioactive materials as sealed sources for Non-Medical Industrial Radiography.	\$2,000.00
17. Radioactive materials license for radioactive materials not as sealed sources with a possession limit of 500 mCi or less.	\$1,500.00
18. Radioactive materials license for radioactive materials not as sealed sources with a possession limit of greater than 500 mCi.	\$2,000.00

(b) All licensees shall pay the fees set forth in (a) above by check payable to "Treasurer, State of New Jersey" prior to August 1 of each year.

1. In the event that the fees are paid after August 1, a delinquency fee equal to one-half of the annual license fee will be imposed. Failure to pay an annual license fee including any accrued delinquency fees for longer than 90 days after August 1 shall constitute grounds for suspension or revocation of the license pursuant to N.J.A.C. 7:28-4.16.

2. The annual license fee shall be mailed to:

State of New Jersey  
Department of Environmental Protection  
Bureau of Revenue  
428 East State Street  
Trenton, New Jersey 08625-0402

(c) Facilities for which multiple license categories apply shall be charged the sum of the fees for each of the applicable categories.

(d) The term "doses per year" when used in (a) above means the number of doses of radioactive materials within a category that are administered during the period July 1 to June 30.

(e) The term "human use group" when used in (a) above includes the use of radioactive material for calibration and quality control procedures as well as the administration of radioactive materials to humans.

Amended by R.1991 d.417, effective August 5, 1991.  
See: 23 N.J.R. 3300(a), 23 N.J.R. 2362(a).

In (a), changed fees in all categories; substantial rewording in 1 through 8; added 9 through 18.

In (b), substituted old text with new text; added (b)1 and 2.  
Added (c), (d), (e).

#### 7:28-4.20 Confidentiality claims

(a) Any applicant required to submit any information pursuant to the Act or this chapter which in the applicant's opinion constitutes trade secrets, proprietary information or information related to national security, may assert a confidentiality claim by following the procedures set forth in this subchapter.

(b) Any applicant submitting any information to the Department and asserting a confidentiality claim covering any information contained therein shall submit two documents to the Department. One shall contain all the information required by the Act or this chapter including any information which the applicant alleges to be entitled to confidential treatment. The second shall be identical to the first except that it shall contain no information which the applicant alleges to be entitled to confidential treatment. The second can be a photocopy of the first, with the allegedly confidential material blacked out.

(c) The top of each page of the first submission containing the information which the applicant alleges to be entitled to confidential treatment shall display the heading "CONFIDENTIAL" in bold type, or stamp.

(d) All parts of the text of the first submission which the applicant alleges to be entitled to confidential treatment shall be underscored or highlighted in a clearly identifiable manner. This manner of marking confidential information shall be such that both the allegedly confidential information and the underscoring or highlighting is reproducible on photocopying machines.

(e) The first submission, containing the information which the applicant alleges to be entitled to confidential treatment, shall be sealed in an envelope which shall display the word "CONFIDENTIAL" in bold type or stamp on both sides. This envelope, together with the second, non-confidential submission (which may or may not be enclosed in a separate envelope, at the option of the applicant), shall be enclosed in another envelope for transmittal to the Department. The outer envelope shall bear no marking indicating the confidential nature of the contents.

(f) To ensure proper delivery, the complete package should be sent by certified mail, return receipt requested, or by other means which will allow verification of receipt. Ordinary mail may be used, but the Department will assume no responsibility for packages until they are actually received.

#### 7:28-4.21 Access to information; non-disclosure

(a) Until such time as a final confidentiality determination has been made, access to any information for which a confidentiality claim has been made will be limited to Department employees whose activities necessitate such access and as provided at N.J.A.C. 7:28-4.24 and 4.26.

(b) No disclosure of information for which a confidentiality claim has been asserted shall be made to any other persons except as provided in this subchapter.

**7:28-4.28 Wrongful access or disclosure; penalties**

(a) A person shall not disclose, seek access to, obtain or have possession of any confidential information obtained pursuant to the Act or this chapter, except as authorized by this subchapter.

(b) Every Department employee who has custody or possession of confidential information shall take appropriate measures to safeguard such information and to protect against its improper disclosure.

(c) A Department employee shall not disclose, or use for his or her private gain or advantage, any information which came into his or her possession, or to which he or she gained access, by virtue of his or her official position of employment or contractual relationship with the Department.

(d) If the Department finds that any person has violated provisions of this subchapter, it may:

1. Commence a civil action in Superior Court for a restraining order and an injunction barring that person from further disclosing confidential information.
2. Pursue any other remedy available by law.

(e) In addition to any other penalty that may be sought by the Department, violation of this subchapter by a Department employee shall constitute grounds for dismissal, suspension, fine or other adverse personnel action.

(f) Use of any of the remedies specified under this section shall not preclude the use of any other remedy.

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**SUBCHAPTER 5. CONTROLLED AREAS**
**7:28-5.1 Areas which must be controlled**

(a) Except as provided in (b) below, every area in which there is any reasonable possibility of an occupant receiving an exposure dose from radiation and radioactive material more than the dose specified in N.J.A.C. 7:28-6 for radiation levels outside a controlled area shall be set apart as a controlled area by any person having possession, custody or control of any ionizing radiation-producing machine and/or radioactive material.

(b) All outgoing or incoming shipments of radioactive material shall be transported in conformance with all pertinent U.S. Department of Transportation regulations.

Amended by R.2000 d.120, effective March 20, 2000.  
See: 31 N.J.R. 3007(a), 32 N.J.R. 1016(a).  
In (b), deleted N.J.A.C. reference.

**7:28-5.2 Limitations on controlled areas**

No area within controlled areas shall be used for residential quarters although a room or rooms in residential buildings may be set apart as a controlled area.

**7:28-5.3 Precautionary procedures**

(a) Any person having possession, custody or control of any ionizing radiation-producing machine and/or radioactive material shall comply with the following precautionary procedures:

1. Area surveys shall be performed in controlled areas and in adjacent areas to insure that exposure levels to individuals conform to N.J.A.C. 7:28-6. The surveys shall be performed in accordance with N.J.A.C. 7:28-7 pertaining to Radiation survey and personnel monitoring.
2. Wipe tests shall be performed in areas where unsealed sources are routinely used to insure compliance with the requirements for radioactive contamination control in N.J.A.C. 7:28-9. The wipe tests shall be performed in accordance with N.J.A.C. 7:28-7.
3. Personnel surveys shall be performed and documented to insure compliance with N.J.A.C. 7:28-9.
4. All individuals entering a controlled area shall wear personnel monitoring equipment pursuant to the requirements for the use of personnel monitoring equipment in N.J.A.C. 7:28-7.
5. Proper and adequate instruction shall be given to all personnel working in controlled areas in the use of necessary safeguards and procedures, and they shall be supplied with such safety devices as may be required.
6. Adequate instructions or an escort shall be provided to all personnel frequenting or visiting controlled areas as shall be necessary to prevent unnecessary exposure.
7. The area shall be posted in accordance with N.J.A.C. 7:28-10.

**7:28-5.4 Termination of controlled areas**

Before an area where radioactive materials had been stored, utilized or generated can be reclassified as an uncontrolled area, surveys shall be performed and documented to ensure compliance with N.J.A.C. 7:28-6 for radiation levels outside of controlled areas. Wipe tests shall be performed and documented in areas where unsealed sources had been used or generated.

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**SUBCHAPTER 6. PERMISSIBLE DOSE RATES,  
RADIATION LEVELS AND  
CONCENTRATIONS**
**7:28-6.1 Exposure of individuals in controlled areas**

(a) Except as provided in subsection (b) of this Section, no individual in a controlled area shall receive in any period of one calendar quarter a dose in excess of the following specified limits:

1. Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads —  $1\frac{1}{4}$  Rems;
2. Hands and forearms; feet and ankles —  $18\frac{3}{4}$  Rems;
3. Skin of whole body —  $7\frac{1}{2}$  Rems.

Note: Doses received by human patients from intentional exposure to radiation for the purpose of diagnosis or therapy shall be excluded.

(b) An individual in a controlled area may receive a dose to the whole body greater than that permitted under subsection (a) of this Section, provided:

1. During any calendar quarter the dose to the whole body shall not exceed three Rems;
2. The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed five (N-18) Rems where "N" equals the individual's age in years at his last birthday; and
3. The owner has determined the individual's accumulated occupational dose to the whole body on Form BRP-27, or on a clear and legible record containing all the information required in that form: and has otherwise complied with the requirements of subsection (c) of this Section. As used in this subsection "dose to the whole body" includes any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye; and
4. Doses received by human patients from intentional exposure to radiation for the purpose of diagnosis or therapy shall be excluded, in the computations set forth in paragraphs 1 and 2 of this subsection.

(c) The following requirements must be satisfied by owners who propose, pursuant to subsection (b) of this Section to permit individuals in a controlled area to receive exposure to radiation in excess of the limits specified in subsection (a) of this Section:

1. Before permitting any individual in a controlled area to receive exposure to radiation in excess of the limits specified in subsection (a) of this Section each owner shall:

- i. Obtain a certificate on Form BRP-27, or on a clear and legible record containing all the information required in that form, signed by the individual showing each period of time after the individual attained the age of 18 in which the individual received, or may have received, an occupational dose of radiation; and
- ii. Calculate on Form BRP-27, in accordance with the instructions, or on a clear and legible record containing all the information required in that form, the previously accumulated occupational dose received by the individual and the additional dose allowed for that individual under subsection (b) of this Section.

2. In the preparation of Form BRP-27, or on a clear and legible record containing all information required in that form, the owner shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. In any case where an owner is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

Parts of body	Assumed exposure in rems for calendar quarters prior to Jan. 1, 1961	Assumed exposure in rems for calendar quarters beginning on or after Jan. 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye	$3\frac{3}{4}$	$1\frac{1}{4}$

3. If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961, yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in subsection (b) of this Section, the excess may be disregarded. The owner shall retain and preserve records used in preparing Form BRP-27, or its equivalent, as specified in subsection (b)3 of this Section.

(d) For individuals within a controlled area, the radiation dose to tissues of the body from radioactive materials within the body shall be controlled by limiting the average rates at which such materials are taken into the body. Where the intake results from the occurrence of radioactive materials in the air, the concentration of the radioisotopes in the air, averaged over any seven consecutive days, shall not be permitted to exceed the concentrations listed in Section 6.5(a) (Average concentrations) of this Chapter, Column B, or prorated values if more than one isotope is present. The limits given in Section 6.5(a) of this Chapter, Column B, are based upon exposure to the concentrations specified for 40 hours in any period of seven consecutive days. In any such period where the number of hours of exposure is less than 40, the limits specified in the table may be increased proportionately. In any such period, where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.

(e) Except as authorized by the Department in writing, no allowance shall be made in subsection (d) of this Section or the use of protective clothing or equipment, or particle size.

1. The Department may authorize an owner to expose an individual in a controlled area to airborne concentrations in excess of the limits specified in Section 6.5(a) of this Chapter, Column B, upon receipt of an application demonstrating that the concentration is composed in whole or in part of particles of such size that such particles are not respirable and that the individual will not inhale concentrations in excess of the limits established in Section 6.5(a) of this Chapter, Column B. Each application under this paragraph shall include an analysis of particle size in the concentrations and a description of the methods used in determining the particle size.

2. The Department may authorize an owner to expose an individual in a controlled area to airborne concentrations in excess of the limits specified in Section 6.5(a) of this Chapter, Column B, upon receipt of an application demonstrating that the individual will wear appropriate protective equipment and that the individual will not inhale, ingest, or absorb quantities of radioactive material in excess of those which might otherwise be permitted under this Chapter for individuals in controlled areas during a 40-hour week. Each application under this paragraph shall contain the following information:

- i. A description of the protective equipment to be employed, including the efficiency of the equipment for the material involved;
- ii. Procedures for the fitting, maintenance, and cleaning of the protective equipment;
- iii. Procedures governing the use of the protective equipment, including supervisory procedures and length of time the equipment will be used by the individuals in each workweek. The proposed periods for use of the equipment by an individual shall not be of such duration as would discourage observance by the individual of the proposed procedures; and
- iv. The average concentrations present in the areas occupied by the individuals.

(f) The dose received by any individual under 18 years of age shall not exceed ten per cent of the limits established in subsection (a) of this Section nor shall such an individual be exposed to concentrations of radioactive material greater than those listed in Section 6.5(a) of this Chapter, Column D. For purposes of this subsection, concentrations may be averaged over periods not greater than one week.

#### Case Notes

Successors to radium processor which disposed waste product on property were absolute liable to subsequent purchaser of property for damages caused by gamma radiation and radon gas from radium tailings. *T & E Industries, Inc. v. Safety Light Corp.*, 227 N.J.Super. 228, 546 A.2d 570 (A.D.1988), certification granted 117 N.J. 118, 564 A.2d 848, certification granted 117 N.J. 119, 564 A.2d 848, affirmed as modified 123 N.J. 371, 587 A.2d 1249.

Processor is absolutely liable for damages resulting from processing of radium and disposal of its waste product. *T & E Industries, Inc. v. Safety Light Corp.*, 227 N.J.Super. 228, 546 A.2d 570 (A.D.1988), certification granted 117 N.J. 118, 564 A.2d 848, certification granted 117 N.J. 119, 564 A.2d 848, affirmed as modified 123 N.J. 371, 587 A.2d 1249.

Absolute liability for damages resulting from processing of radium and disposal of its waste product is not limited to situations in which processing and disposal interferes with rights of neighboring property owners. *T & E Industries, Inc. v. Safety Light Corp.*, 227 N.J.Super. 228, 546 A.2d 570 (A.D.1988), certification granted 117 N.J. 118, 564 A.2d 848, certification granted 117 N.J. 119, 564 A.2d 848, affirmed as modified 123 N.J. 371, 587 A.2d 1249.

Doctrine of caveat emptor is not defense to absolute liability claim by purchaser against prior landowner for damages unless purchaser knowingly accepts such burden. *T & E Industries, Inc. v. Safety Light Corp.*, 227 N.J.Super. 228, 546 A.2d 570 (A.D.1988), certification granted 117 N.J. 118, 564 A.2d 848, certification granted 117 N.J. 119, 564 A.2d 848, affirmed as modified 123 N.J. 371, 587 A.2d 1249.

#### 7:28-6.2 Radiation levels outside controlled areas

(a) The radiation level at any point outside the confines of the controlled area shall be limited to a value such that there is no reasonable possibility that any individual outside the controlled area will receive a radiation dose to the whole body, head and trunk, active blood-forming organs, gonads, or lens of the eyes, in excess of 0.5 rem in any one year.

(b) The radiation level at any point outside the confines of a controlled area shall not exceed:

1. A radiation level which, if an individual were continuously present in the area, could result in his receiving a dose in excess of two millirems in any one hour; or
2. A radiation level which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 100 millirems in any seven consecutive days.

(c) Any person may apply to the Department for proposed limits upon levels of radiation outside of controlled areas in excess of those specified in subsection (b) of this Section resulting from the applicant's possession or use of sources of radiation. Such applications shall include information as to anticipated average radiation levels and anticipated occupancy times for each area involved. The Department will approve the proposed limits if the applicant demonstrates to the satisfaction of the Department that the proposed limits are not likely to cause any individual to receive a dose to the whole body in any period of one calendar year in excess of 0.5 rem.

(d) The limitations of this Section shall not be applicable to outgoing or incoming shipments of radioactive materials while being transported in conformance with the regulations of Subchapter 14 (Therapeutic Installations).

**7:28-6.3 Concentrations in effluents from controlled areas**

Concentrations of radioactive materials in effluents from controlled areas shall meet the requirements of Sections 11.2 (Disposal by release into sanitary sewerage systems) and 11.3 (Disposal by discharges into the air, ground waters or surface waters) of this Chapter.

**7:28-6.4 Exposures in the event of radiation incidents or emergencies**

In the event of a radiation incident in which an employee or emergency worker receives more than the limits specified in Section 6.1(a) (Exposure of individuals in controlled areas) of this Chapter or in the event of emergency conditions in which immediate action required to minimize danger to life results in an employee or emergency worker receiving doses beyond the limits specified in Section 6.1(a) (Exposure of individuals in controlled areas) of this Chapter. Each employer shall take measures to limit additional exposures of his employees to an extent and for a period, which shall be subject to approval by the Department. All such doses shall be reported as required by Subchapter 13 (Reports of Thefts and Radiation Incidents) of this Chapter and shall be included in the records required by Subchapter 8 (Records) of this Chapter.

**7:28-6.5 Average concentrations**

(a) Maximum permissible average concentrations of radioactive materials in air and water shall be as follows:

Astatine 211	(sol.)	$5 \times 10^{-8}$	$7 \times 10^{-9}$	$2 \times 10^{-8}$	$2 \times 10^{-10}$
	(insol.)	$2 \times 10^{-8}$	$3 \times 10^{-9}$	$10^{-9}$	$10^{-9}$
Barium 131	(sol.)	$5 \times 10^{-8}$	$10^{-8}$	$2 \times 10^{-8}$	$4 \times 10^{-8}$
	(insol.)	$5 \times 10^{-8}$	$4 \times 10^{-7}$	$2 \times 10^{-8}$	$10^{-8}$
Barium 140	(sol.)	$8 \times 10^{-8}$	$10^{-7}$	$3 \times 10^{-8}$	$4 \times 10^{-9}$
	(insol.)	$7 \times 10^{-8}$	$4 \times 10^{-8}$	$2 \times 10^{-8}$	$10^{-9}$
Berkelium 249	(sol.)	0.02	$9 \times 10^{-10}$	$6 \times 10^{-8}$	$3 \times 10^{-11}$
	(insol.)	0.02	$10^{-7}$	$6 \times 10^{-8}$	$4 \times 10^{-9}$
Berkelium 250	(sol.)	$6 \times 10^{-8}$	$1 \times 10^{-7}$	$2 \times 10^{-8}$	$5 \times 10^{-9}$
	(insol.)	$6 \times 10^{-8}$	$1 \times 10^{-8}$	$2 \times 10^{-8}$	$4 \times 10^{-9}$
Beryllium 7	(sol.)	0.05	$6 \times 10^{-8}$	0.002	$2 \times 10^{-7}$
	(insol.)	0.05	$10^{-8}$	0.002	$4 \times 10^{-8}$
Bismuth 206	(sol.)	$10^{-8}$	$2 \times 10^{-7}$	$4 \times 10^{-8}$	$6 \times 10^{-9}$
	(insol.)	$10^{-8}$	$10^{-7}$	$4 \times 10^{-8}$	$5 \times 10^{-9}$
Bismuth 207	(sol.)	$2 \times 10^{-8}$	$2 \times 10^{-7}$	$6 \times 10^{-8}$	$6 \times 10^{-9}$
	(insol.)	$2 \times 10^{-8}$	$10^{-8}$	$6 \times 10^{-8}$	$5 \times 10^{-10}$
Bismuth 210	(sol.)	$10^{-8}$	$6 \times 10^{-9}$	$4 \times 10^{-8}$	$2 \times 10^{-10}$
	(insol.)	$10^{-8}$	$6 \times 10^{-9}$	$4 \times 10^{-8}$	$2 \times 10^{-10}$
Bismuth 212	(sol.)	0.01	$10^{-7}$	$4 \times 10^{-8}$	$3 \times 10^{-9}$
	(insol.)	0.01	$2 \times 10^{-7}$	$4 \times 10^{-8}$	$7 \times 10^{-9}$
Bromine 82	(sol.)	$8 \times 10^{-8}$	$10^{-8}$	$3 \times 10^{-8}$	$4 \times 10^{-8}$
	(insol.)	$10^{-8}$	$2 \times 10^{-7}$	$4 \times 10^{-8}$	$6 \times 10^{-9}$
Cadmium 109	(sol.)	$5 \times 10^{-9}$	$5 \times 10^{-8}$	$2 \times 10^{-8}$	$2 \times 10^{-9}$
	(insol.)	$5 \times 10^{-9}$	$7 \times 10^{-8}$	$2 \times 10^{-8}$	$3 \times 10^{-9}$
Cadmium 115m	(sol.)	$7 \times 10^{-9}$	$4 \times 10^{-8}$	$3 \times 10^{-8}$	$10^{-9}$
	(insol.)	$7 \times 10^{-9}$	$4 \times 10^{-8}$	$3 \times 10^{-8}$	$10^{-9}$
Cadmium 115	(sol.)	$10^{-8}$	$2 \times 10^{-7}$	$3 \times 10^{-8}$	$8 \times 10^{-9}$
	(insol.)	$10^{-8}$	$2 \times 10^{-7}$	$4 \times 10^{-8}$	$6 \times 10^{-9}$
Calcium 45	(sol.)	$3 \times 10^{-4}$	$3 \times 10^{-4}$	$9 \times 10^{-6}$	$10^{-7}$
	(insol.)	$5 \times 10^{-4}$	$10^{-7}$	$2 \times 10^{-4}$	$4 \times 10^{-5}$
Calcium 47	(sol.)	$10^{-3}$	$2 \times 10^{-7}$	$5 \times 10^{-5}$	$6 \times 10^{-6}$
	(insol.)	$10^{-3}$	$2 \times 10^{-7}$	$3 \times 10^{-5}$	$6 \times 10^{-6}$
Californium 249	(sol.)	$10^{-4}$	$2 \times 10^{-12}$	$4 \times 10^{-9}$	$5 \times 10^{-14}$
	(insol.)	$7 \times 10^{-4}$	$10^{-10}$	$2 \times 10^{-9}$	$3 \times 10^{-12}$
Californium 250	(sol.)	$4 \times 10^{-4}$	$5 \times 10^{-12}$	$10^{-5}$	$2 \times 10^{-12}$
	(insol.)	$7 \times 10^{-4}$	$10^{-10}$	$3 \times 10^{-10}$	$3 \times 10^{-12}$
Californium 251	(sol.)	$1 \times 10^{-4}$	$2 \times 10^{-12}$	$4 \times 10^{-9}$	$6 \times 10^{-14}$
	(insol.)	$8 \times 10^{-4}$	$1 \times 10^{-10}$	$3 \times 10^{-10}$	$3 \times 10^{-12}$
Californium 252	(sol.)	$7 \times 10^{-4}$	$2 \times 10^{-11}$	$2 \times 10^{-9}$	$7 \times 10^{-12}$
	(insol.)	$7 \times 10^{-4}$	$10^{-10}$	$2 \times 10^{-9}$	$4 \times 10^{-12}$
Californium 253	(sol.)	$4 \times 10^{-4}$	$8 \times 10^{-11}$	$1 \times 10^{-8}$	$3 \times 10^{-11}$
	(insol.)	$4 \times 10^{-4}$	$8 \times 10^{-11}$	$1 \times 10^{-8}$	$3 \times 10^{-11}$
Californium 254	(sol.)	$4 \times 10^{-6}$	$5 \times 10^{-12}$	$10^{-7}$	$2 \times 10^{-12}$
	(insol.)	$4 \times 10^{-6}$	$5 \times 10^{-12}$	$10^{-7}$	$2 \times 10^{-12}$
Carbon 14	(sol.)	0.02	$7 \times 10^{-6}$	$8 \times 10^{-4}$	$10^{-7}$
	(insol.)	0.02	$5 \times 10^{-6}$	$10^{-8}$	$10^{-8}$
Cerium 141	(sol.)	$3 \times 10^{-3}$	$4 \times 10^{-7}$	$9 \times 10^{-5}$	$2 \times 10^{-8}$
	(insol.)	$3 \times 10^{-3}$	$2 \times 10^{-7}$	$9 \times 10^{-5}$	$5 \times 10^{-8}$
Cerium 143	(sol.)	$10^{-3}$	$3 \times 10^{-7}$	$4 \times 10^{-5}$	$9 \times 10^{-8}$
	(insol.)	$10^{-3}$	$2 \times 10^{-7}$	$4 \times 10^{-5}$	$7 \times 10^{-8}$
Cerium 144	(sol.)	$3 \times 10^{-4}$	$10^{-8}$	$10^{-5}$	$3 \times 10^{-10}$
	(insol.)	$3 \times 10^{-4}$	$6 \times 10^{-8}$	$10^{-5}$	$2 \times 10^{-10}$
Cesium 131	(sol.)	0.07	$10^{-5}$	0.002	$4 \times 10^{-7}$
	(insol.)	0.03	$3 \times 10^{-6}$	$9 \times 10^{-4}$	$10^{-7}$
Cesium 134m	(sol.)	0.2	$4 \times 10^{-5}$	0.006	$10^{-8}$
	(insol.)	0.03	$6 \times 10^{-6}$	0.001	$2 \times 10^{-7}$
Cesium 134	(sol.)	$3 \times 10^{-4}$	$4 \times 10^{-8}$	$9 \times 10^{-6}$	$10^{-9}$
	(insol.)	$10^{-3}$	$10^{-8}$	$4 \times 10^{-5}$	$4 \times 10^{-10}$
Cesium 135	(sol.)	$3 \times 10^{-3}$	$5 \times 10^{-7}$	$10^{-4}$	$2 \times 10^{-8}$
	(insol.)	$7 \times 10^{-3}$	$7 \times 10^{-8}$	$2 \times 10^{-4}$	$3 \times 10^{-8}$
Cesium 136	(sol.)	$2 \times 10^{-3}$	$4 \times 10^{-7}$	$9 \times 10^{-5}$	$10^{-8}$
	(insol.)	$2 \times 10^{-3}$	$2 \times 10^{-7}$	$6 \times 10^{-5}$	$6 \times 10^{-9}$
Cesium 137	(sol.)	$4 \times 10^{-4}$	$6 \times 10^{-8}$	$2 \times 10^{-5}$	$2 \times 10^{-9}$
	(insol.)	$10^{-3}$	$10^{-8}$	$4 \times 10^{-5}$	$5 \times 10^{-10}$
Chlorine 36	(sol.)	$2 \times 10^{-3}$	$4 \times 10^{-7}$	$8 \times 10^{-5}$	$10^{-8}$
	(insol.)	$2 \times 10^{-3}$	$2 \times 10^{-7}$	$6 \times 10^{-5}$	$8 \times 10^{-10}$
Chlorine 38	(sol.)	0.01	$3 \times 10^{-8}$	$4 \times 10^{-4}$	$9 \times 10^{-8}$
	(insol.)	0.01	$2 \times 10^{-8}$	$4 \times 10^{-4}$	$7 \times 10^{-8}$
Chromium 51	(sol.)	0.05	$10^{-5}$	0.002	$4 \times 10^{-7}$
	(insol.)	0.05	$2 \times 10^{-6}$	0.002	$8 \times 10^{-8}$
Cobalt 57	(sol.)	0.02	$3 \times 10^{-6}$	$5 \times 10^{-4}$	$10^{-7}$
	(insol.)	0.01	$2 \times 10^{-7}$	$4 \times 10^{-4}$	$6 \times 10^{-8}$
Cobalt 58m	(sol.)	0.08	$2 \times 10^{-5}$	0.003	$6 \times 10^{-7}$
	(insol.)	0.06	$9 \times 10^{-6}$	0.002	$3 \times 10^{-7}$
Cobalt 58	(sol.)	$4 \times 10^{-3}$	$8 \times 10^{-7}$	$10^{-4}$	$3 \times 10^{-8}$
	(insol.)	$3 \times 10^{-3}$	$5 \times 10^{-8}$	$9 \times 10^{-5}$	$2 \times 10^{-9}$
Cobalt 60	(sol.)	$10^{-3}$	$3 \times 10^{-7}$	$5 \times 10^{-5}$	$10^{-8}$
	(insol.)	$10^{-3}$	$9 \times 10^{-8}$	$3 \times 10^{-5}$	$3 \times 10^{-10}$
Copper 64	(sol.)	0.01	$2 \times 10^{-6}$	$3 \times 10^{-4}$	$7 \times 10^{-8}$
	(insol.)	$6 \times 10^{-3}$	$10^{-8}$	$2 \times 10^{-4}$	$4 \times 10^{-8}$
Curium 242	(sol.)	$7 \times 10^{-4}$	$10^{-10}$	$2 \times 10^{-8}$	$4 \times 10^{-12}$
	(insol.)	$7 \times 10^{-4}$	$2 \times 10^{-10}$	$3 \times 10^{-8}$	$6 \times 10^{-12}$

Radionuclide		Occupational 40-hr. Week		Non-Occupational	
		Water uc/ml	Air uc/ml	Water uc/ml	Air uc/ml
Column		A	B	C	D
Actinium 227	(sol.)	$6 \times 10^{-3}$	$2 \times 10^{-12}$	$2 \times 10^{-8}$	$8 \times 10^{-14}$
	(insol.)	$9 \times 10^{-3}$	$3 \times 10^{-11}$	$3 \times 10^{-8}$	$9 \times 10^{-12}$
Actinium 228	(sol.)	$3 \times 10^{-3}$	$8 \times 10^{-8}$	$9 \times 10^{-9}$	$3 \times 10^{-9}$
	(insol.)	$3 \times 10^{-3}$	$2 \times 10^{-8}$	$9 \times 10^{-9}$	$6 \times 10^{-10}$
Americium 241	(sol.)	$10^{-4}$	$6 \times 10^{-12}$	$4 \times 10^{-8}$	$2 \times 10^{-12}$
	(insol.)	$8 \times 10^{-4}$	$10^{-10}$	$2 \times 10^{-8}$	$4 \times 10^{-12}$
Americium 242m	(sol.)	$1 \times 10^{-4}$	$6 \times 10^{-12}$	$4 \times 10^{-8}$	$2 \times 10^{-12}$
	(insol.)	$3 \times 10^{-3}$	$3 \times 10^{-10}$	$9 \times 10^{-9}$	$9 \times 10^{-12}$
Americium 242	(sol.)	$4 \times 10^{-3}$	$4 \times 10^{-8}$	$1 \times 10^{-4}$	$1 \times 10^{-9}$
	(insol.)	$4 \times 10^{-3}$	$5 \times 10^{-8}$	$1 \times 10^{-4}$	$2 \times 10^{-9}$
Americium 243	(sol.)	$10^{-4}$	$6 \times 10^{-12}$	$4 \times 10^{-8}$	$2 \times 10^{-12}$
	(insol.)	$8 \times 10^{-4}$	$10^{-10}$	$3 \times 10^{-8}$	$4 \times 10^{-12}$
Americium 244	(sol.)	$1 \times 10^{-1}$	$4 \times 10^{-6}$	$5 \times 10^{-8}$	$1 \times 10^{-7}$
	(insol.)	$1 \times 10^{-1}$	$2 \times 10^{-5}$	$5 \times 10^{-8}$	$8 \times 10^{-7}$
Antimony 122	(sol.)	$8 \times 10^{-4}$	$2 \times 10^{-7}$	$3 \times 10^{-3}$	$6 \times 10^{-7}$
	(insol.)	$8 \times 10^{-4}$	$10^{-7}$	$3 \times 10^{-3}$	$5 \times 10^{-9}$
Antimony 124	(sol.)	$7 \times 10^{-4}$	$2 \times 10^{-7}$	$2 \times 10^{-3}$	$5 \times 10^{-9}$
	(insol.)	$2 \times 10^{-4}$	$2 \times 10^{-8}$	$2 \times 10^{-3}$	$7 \times 10^{-10}$
Antimony 125	(sol.)	$3 \times 10^{-3}$	$5 \times 10^{-7}$	$10^{-4}$	$2 \times 10^{-9}$
	(insol.)	$3 \times 10^{-3}$	$3 \times 10^{-8}$	$10^{-4}$	$9 \times 10^{-10}$
Argon 37	(imm.)	....	$6 \times 10^{-2}$	....	$10^{-4}$
Argon 41	(imm.)	....	$2 \times 10^{-6}$	....	$4 \times 10^{-8}$
Arsenic 73	(sol.)	0.01	$2 \times 10^{-6}$	$5 \times 10^{-4}$	$7 \times 10^{-8}$
	(insol.)	0.01	$4 \times 10^{-7}$	$5 \times 10^{-4}$	$10^{-8}$
Arsenic 74	(sol.)	$2 \times 10^{-3}$	$3 \times 10^{-7}$	$5 \times 10^{-3}$	$10^{-8}$
	(insol.)	$2 \times 10^{-3}$	$10^{-7}$	$5 \times 10^{-3}$	$4 \times 10^{-9}$
Arsenic 76	(sol.)	$6 \times 10^{-4}$	$10^{-7}$	$2 \times 10^{-8}$	$4 \times 10^{-9}$
	(insol.)	$6 \times 10^{-4}$	$10^{-7}$	$2 \times 10^{-8}$	$3 \times 10^{-9}$
Arsenic 77	(sol.)	$2 \times 10^{-3}$	$5 \times 10^{-7}$	$8 \times 10^{-3}$	$2 \times 10^{-9}$
	(insol.)	$2 \times 10^{-3}$	$4 \times 10^{-7}$	$8 \times 10^{-3}$	$10^{-8}$

Radionuclide	Column	Occupational 40-hr. Week		Non-Occupational	
		Water uc/ml	Air uc/ml	Water uc/ml	Air uc/ml
		A	B	C	D
Curium 243	(sol.) (insol.)	$10^{-4}$ $7 \times 10^{-4}$	$6 \times 10^{-12}$ $10^{-11}$	$5 \times 10^{-8}$ $2 \times 10^{-7}$	$2 \times 10^{-12}$ $3 \times 10^{-12}$
Curium 244	(sol.) (insol.)	$2 \times 10^{-4}$ $8 \times 10^{-4}$	$9 \times 10^{-12}$ $10^{-11}$	$7 \times 10^{-8}$ $3 \times 10^{-7}$	$3 \times 10^{-12}$ $3 \times 10^{-12}$
Curium 245	(sol.) (insol.)	$10^{-4}$ $8 \times 10^{-4}$	$5 \times 10^{-12}$ $10^{-11}$	$4 \times 10^{-8}$ $3 \times 10^{-7}$	$2 \times 10^{-12}$ $4 \times 10^{-12}$
Curium 246	(sol.) (insol.)	$10^{-4}$ $8 \times 10^{-4}$	$5 \times 10^{-12}$ $10^{-11}$	$4 \times 10^{-8}$ $3 \times 10^{-7}$	$2 \times 10^{-12}$ $4 \times 10^{-12}$
Curium 247	(sol.) (insol.)	$1 \times 10^{-4}$ $6 \times 10^{-4}$	$5 \times 10^{-12}$ $1 \times 10^{-10}$	$4 \times 10^{-8}$ $2 \times 10^{-7}$	$2 \times 10^{-12}$ $4 \times 10^{-12}$
Curium 248	(sol.) (insol.)	$1 \times 10^{-5}$ $4 \times 10^{-5}$	$6 \times 10^{-13}$ $1 \times 10^{-11}$	$4 \times 10^{-7}$ $1 \times 10^{-6}$	$2 \times 10^{-14}$ $4 \times 10^{-12}$
Curium 249	(sol.) (insol.)	$6 \times 10^{-7}$ $6 \times 10^{-7}$	$1 \times 10^{-5}$ $1 \times 10^{-5}$	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$4 \times 10^{-7}$ $4 \times 10^{-7}$
Dysprosium 165	(sol.) (insol.)	0.01 0.01	$3 \times 10^{-6}$ $2 \times 10^{-6}$	$4 \times 10^{-4}$ $4 \times 10^{-4}$	$9 \times 10^{-8}$ $7 \times 10^{-8}$
Dysprosium 166	(sol.) (insol.)	$10^{-3}$ $10^{-3}$	$2 \times 10^{-7}$ $2 \times 10^{-7}$	$4 \times 10^{-5}$ $4 \times 10^{-5}$	$8 \times 10^{-9}$ $7 \times 10^{-9}$
Einsteinium 253	(sol.) (insol.)	$7 \times 10^{-4}$ $7 \times 10^{-4}$	$8 \times 10^{-10}$ $6 \times 10^{-10}$	$2 \times 10^{-5}$ $2 \times 10^{-5}$	$3 \times 10^{-11}$ $2 \times 10^{-11}$
Einsteinium 254m	(sol.) (insol.)	$5 \times 10^{-4}$ $5 \times 10^{-4}$	$5 \times 10^{-9}$ $6 \times 10^{-9}$	$2 \times 10^{-5}$ $2 \times 10^{-5}$	$2 \times 10^{-10}$ $2 \times 10^{-10}$
Einsteinium 254	(sol.) (insol.)	$4 \times 10^{-4}$ $4 \times 10^{-4}$	$2 \times 10^{-11}$ $1 \times 10^{-10}$	$1 \times 10^{-5}$ $1 \times 10^{-5}$	$6 \times 10^{-12}$ $4 \times 10^{-12}$
Einsteinium 255	(sol.) (insol.)	$8 \times 10^{-4}$ $8 \times 10^{-4}$	$5 \times 10^{-10}$ $4 \times 10^{-10}$	$3 \times 10^{-5}$ $3 \times 10^{-5}$	$2 \times 10^{-11}$ $1 \times 10^{-11}$
Erbium 169	(sol.) (insol.)	$3 \times 10^{-3}$ $3 \times 10^{-3}$	$6 \times 10^{-7}$ $4 \times 10^{-7}$	$9 \times 10^{-6}$ $9 \times 10^{-6}$	$2 \times 10^{-8}$ $10^{-8}$
Erbium 171	(sol.) (insol.)	$3 \times 10^{-3}$ $3 \times 10^{-3}$	$7 \times 10^{-7}$ $6 \times 10^{-7}$	$10^{-4}$ $10^{-4}$	$2 \times 10^{-8}$ $2 \times 10^{-8}$
Europium 152 (9.2 hr.)	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$4 \times 10^{-7}$ $3 \times 10^{-7}$	$6 \times 10^{-5}$ $6 \times 10^{-5}$	$10^{-8}$ $10^{-8}$
Europium 152 (13 yr.)	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$10^{-8}$ $2 \times 10^{-8}$	$8 \times 10^{-6}$ $8 \times 10^{-6}$	$4 \times 10^{-10}$ $6 \times 10^{-10}$
Europium 154	(sol.) (insol.)	$6 \times 10^{-4}$ $6 \times 10^{-4}$	$4 \times 10^{-9}$ $7 \times 10^{-9}$	$2 \times 10^{-5}$ $2 \times 10^{-5}$	$10^{-10}$ $2 \times 10^{-10}$
Europium 155	(sol.) (insol.)	$6 \times 10^{-3}$ $6 \times 10^{-3}$	$9 \times 10^{-8}$ $7 \times 10^{-8}$	$2 \times 10^{-4}$ $2 \times 10^{-4}$	$3 \times 10^{-9}$ $3 \times 10^{-9}$
Fermium 254	(sol.) (insol.)	$4 \times 10^{-3}$ $4 \times 10^{-3}$	$6 \times 10^{-8}$ $7 \times 10^{-8}$	$1 \times 10^{-4}$ $1 \times 10^{-4}$	$2 \times 10^{-9}$ $2 \times 10^{-9}$
Fermium 255	(sol.) (insol.)	$1 \times 10^{-3}$ $1 \times 10^{-3}$	$2 \times 10^{-8}$ $1 \times 10^{-8}$	$3 \times 10^{-5}$ $3 \times 10^{-5}$	$6 \times 10^{-10}$ $4 \times 10^{-10}$
Fermium 256	(sol.) (insol.)	$3 \times 10^{-5}$ $3 \times 10^{-5}$	$3 \times 10^{-9}$ $2 \times 10^{-9}$	$9 \times 10^{-7}$ $9 \times 10^{-7}$	$1 \times 10^{-10}$ $6 \times 10^{-11}$
Fluorine 18	(sol.) (insol.)	0.02 0.01	$5 \times 10^{-6}$ $3 \times 10^{-6}$	$8 \times 10^{-4}$ $5 \times 10^{-4}$	$2 \times 10^{-7}$ $9 \times 10^{-8}$
Gadolinium 153	(sol.) (insol.)	$6 \times 10^{-3}$ $6 \times 10^{-3}$	$2 \times 10^{-7}$ $9 \times 10^{-8}$	$2 \times 10^{-4}$ $2 \times 10^{-4}$	$8 \times 10^{-9}$ $3 \times 10^{-9}$
Gadolinium 159	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$5 \times 10^{-7}$ $4 \times 10^{-7}$	$8 \times 10^{-5}$ $8 \times 10^{-5}$	$2 \times 10^{-8}$ $10^{-8}$
Gallium 72	(sol.) (insol.)	$10^{-3}$ $10^{-3}$	$2 \times 10^{-7}$ $2 \times 10^{-7}$	$4 \times 10^{-5}$ $4 \times 10^{-5}$	$8 \times 10^{-9}$ $6 \times 10^{-9}$
Germanium 71	(sol.) (insol.)	0.05 0.05	$10^{-8}$ $6 \times 10^{-8}$	0.002 0.002	$4 \times 10^{-7}$ $2 \times 10^{-7}$
Gold 196	(sol.) (insol.)	$5 \times 10^{-3}$ $4 \times 10^{-3}$	$10^{-9}$ $6 \times 10^{-9}$	$2 \times 10^{-4}$ $10^{-4}$	$4 \times 10^{-9}$ $2 \times 10^{-9}$
Gold 198	(sol.) (insol.)	$2 \times 10^{-3}$ $10^{-3}$	$3 \times 10^{-7}$ $2 \times 10^{-7}$	$5 \times 10^{-5}$ $5 \times 10^{-5}$	$10^{-8}$ $8 \times 10^{-9}$
Gold 199	(sol.) (insol.)	$5 \times 10^{-3}$ $4 \times 10^{-3}$	$10^{-9}$ $8 \times 10^{-9}$	$2 \times 10^{-4}$ $2 \times 10^{-4}$	$4 \times 10^{-9}$ $3 \times 10^{-9}$
Hafnium 181	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$4 \times 10^{-8}$ $7 \times 10^{-8}$	$7 \times 10^{-3}$ $7 \times 10^{-3}$	$10^{-9}$ $3 \times 10^{-9}$
Holmium 166	(sol.) (insol.)	$9 \times 10^{-4}$ $9 \times 10^{-4}$	$2 \times 10^{-7}$ $2 \times 10^{-7}$	$3 \times 10^{-5}$ $3 \times 10^{-5}$	$7 \times 10^{-9}$ $6 \times 10^{-9}$
Hydrogen 3 (sol., imm.)	(sol.) (imm.)	0.1 ....	$5 \times 10^{-6}$ $2 \times 10^{-3}$	0.003 ....	$2 \times 10^{-7}$ $4 \times 10^{-5}$
Indium 113m	(sol.) (insol.)	0.04 0.04	$8 \times 10^{-8}$ $7 \times 10^{-8}$	0.001 0.001	$3 \times 10^{-7}$ $2 \times 10^{-7}$
Indium 114m	(sol.) (insol.)	$5 \times 10^{-4}$ $5 \times 10^{-4}$	$10^{-7}$ $2 \times 10^{-8}$	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$4 \times 10^{-9}$ $7 \times 10^{-10}$
Indium 115m	(sol.) (insol.)	0.01 0.01	$2 \times 10^{-8}$ $2 \times 10^{-6}$	$4 \times 10^{-4}$ $4 \times 10^{-4}$	$8 \times 10^{-8}$ $6 \times 10^{-8}$
Indium 115	(sol.) (insol.)	$3 \times 10^{-3}$ $3 \times 10^{-3}$	$2 \times 10^{-7}$ $3 \times 10^{-7}$	$9 \times 10^{-3}$ $9 \times 10^{-3}$	$9 \times 10^{-9}$ $10^{-9}$
Iodine 125	(sol.) (insol.)	$4 \times 10^{-3}$ $6 \times 10^{-3}$	$5 \times 10^{-9}$ $2 \times 10^{-7}$	$2 \times 10^{-7}$ $2 \times 10^{-4}$	$8 \times 10^{-11}$ $6 \times 10^{-9}$

Iodine 126	(sol.) (insol.)	$5 \times 10^{-3}$ $3 \times 10^{-3}$	$8 \times 10^{-8}$ $3 \times 10^{-7}$	$3 \times 10^{-7}$ $9 \times 10^{-5}$	$9 \times 10^{-11}$ $10^{-8}$
Iodine 129	(sol.) (insol.)	$10^{-3}$ $6 \times 10^{-3}$	$2 \times 10^{-8}$ $7 \times 10^{-8}$	$6 \times 10^{-4}$ $2 \times 10^{-4}$	$2 \times 10^{-11}$ $2 \times 10^{-8}$
Iodine 131	(sol.) (insol.)	$6 \times 10^{-3}$ $2 \times 10^{-3}$	$9 \times 10^{-8}$ $3 \times 10^{-7}$	$3 \times 10^{-7}$ $6 \times 10^{-4}$	$1 \times 10^{-10}$ $10^{-8}$
Iodine 132	(sol.) (insol.)	$2 \times 10^{-3}$ $5 \times 10^{-3}$	$2 \times 10^{-7}$ $9 \times 10^{-7}$	$8 \times 10^{-6}$ $2 \times 10^{-4}$	$3 \times 10^{-9}$ $3 \times 10^{-8}$
Iodine 133	(sol.) (insol.)	$2 \times 10^{-4}$ $10^{-3}$	$3 \times 10^{-8}$ $2 \times 10^{-7}$	$1 \times 10^{-8}$ $4 \times 10^{-3}$	$4 \times 10^{-10}$ $7 \times 10^{-9}$
Iodine 134	(sol.) (insol.)	$4 \times 10^{-3}$ 0.02	$5 \times 10^{-7}$ $3 \times 10^{-8}$	$2 \times 10^{-3}$ $6 \times 10^{-4}$	$1 \times 10^{-8}$ $10^{-7}$
Iodine 135	(sol.) (insol.)	$7 \times 10^{-4}$ $2 \times 10^{-3}$	$10^{-7}$ $4 \times 10^{-7}$	$4 \times 10^{-6}$ $7 \times 10^{-3}$	$1 \times 10^{-9}$ $10^{-8}$
Iridium 190	(sol.) (insol.)	$6 \times 10^{-3}$ $5 \times 10^{-3}$	$10^{-8}$ $4 \times 10^{-7}$	$2 \times 10^{-4}$ $2 \times 10^{-4}$	$4 \times 10^{-9}$ $10^{-8}$
Iridium 192	(sol.) (insol.)	$10^{-3}$ $10^{-3}$	$10^{-7}$ $3 \times 10^{-8}$	$4 \times 10^{-2}$ $4 \times 10^{-8}$	$4 \times 10^{-9}$ $9 \times 10^{-10}$
Iridium 194	(sol.) (insol.)	$10^{-3}$ $9 \times 10^{-4}$	$3 \times 10^{-8}$ $2 \times 10^{-7}$	$3 \times 10^{-3}$ $3 \times 10^{-3}$	$8 \times 10^{-9}$ $5 \times 10^{-9}$
Iron 55	(sol.) (insol.)	0.02 0.07	$9 \times 10^{-7}$ $10^{-6}$	$8 \times 10^{-4}$ 0.002	$3 \times 10^{-8}$ $3 \times 10^{-8}$
Iron 59	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$10^{-7}$ $5 \times 10^{-8}$	$6 \times 10^{-3}$ $5 \times 10^{-3}$	$5 \times 10^{-9}$ $2 \times 10^{-9}$
Krypton 85m	(imm.)	....	$6 \times 10^{-8}$	....	$10^{-7}$
Krypton 85	(imm.)	....	$10^{-3}$	....	$3 \times 10^{-7}$
Krypton 87	(imm.)	....	$10^{-8}$	....	$2 \times 10^{-8}$
Lanthanum 140	(sol.) (insol.)	$7 \times 10^{-4}$ $7 \times 10^{-4}$	$2 \times 10^{-7}$ $10^{-7}$	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$5 \times 10^{-9}$ $4 \times 10^{-9}$
Lead 203	(sol.) (insol.)	0.01 0.01	$3 \times 10^{-8}$ $2 \times 10^{-8}$	$4 \times 10^{-4}$ $4 \times 10^{-4}$	$9 \times 10^{-8}$ $6 \times 10^{-8}$
Lead 210	(sol.) (insol.)	$4 \times 10^{-8}$ $5 \times 10^{-3}$	$10^{-10}$ $2 \times 10^{-10}$	$10^{-7}$ $2 \times 10^{-6}$	$4 \times 10^{-12}$ $8 \times 10^{-12}$
Lead 212	(sol.) (insol.)	$6 \times 10^{-4}$ $5 \times 10^{-4}$	$2 \times 10^{-8}$ $2 \times 10^{-8}$	$2 \times 10^{-8}$ $2 \times 10^{-8}$	$6 \times 10^{-10}$ $7 \times 10^{-10}$
Lutetium 177	(sol.) (insol.)	$3 \times 10^{-3}$ $3 \times 10^{-3}$	$6 \times 10^{-7}$ $5 \times 10^{-7}$	$10^{-4}$ $10^{-4}$	$2 \times 10^{-9}$ $2 \times 10^{-9}$
Manganese 52	(sol.) (insol.)	$10^{-3}$ $9 \times 10^{-4}$	$2 \times 10^{-7}$ $10^{-7}$	$3 \times 10^{-3}$ $3 \times 10^{-3}$	$7 \times 10^{-9}$ $5 \times 10^{-9}$
Manganese 54	(sol.) (insol.)	$4 \times 10^{-3}$ $3 \times 10^{-3}$	$4 \times 10^{-7}$ $4 \times 10^{-8}$	$10^{-4}$ $10^{-4}$	$10^{-9}$ $10^{-9}$
Manganese 56	(sol.) (insol.)	$4 \times 10^{-3}$ $3 \times 10^{-3}$	$8 \times 10^{-7}$ $5 \times 10^{-7}$	$10^{-4}$ $10^{-4}$	$3 \times 10^{-9}$ $2 \times 10^{-9}$
Mercury 197m	(sol.) (insol.)	$6 \times 10^{-3}$ $5 \times 10^{-3}$	$7 \times 10^{-7}$ $8 \times 10^{-7}$	$2 \times 10^{-4}$ $2 \times 10^{-4}$	$3 \times 10^{-9}$ $4 \times 10^{-9}$
Mercury 197	(sol.) (insol.)	$9 \times 10^{-3}$ 0.01	$10^{-8}$ $3 \times 10^{-8}$	$3 \times 10^{-4}$ $5 \times 10^{-4}$	$9 \times 10^{-9}$ $9 \times 10^{-9}$
Mercury 203	(sol.) (insol.)	$5 \times 10^{-4}$ $3 \times 10^{-3}$	$7 \times 10^{-8}$ $10^{-7}$	$2 \times 10^{-8}$ $10^{-4}$	$2 \times 10^{-9}$ $4 \times 10^{-9}$
Molybdenum 99	(sol.) (insol.)	$5 \times 10^{-3}$ $10^{-3}$	$7 \times 10^{-7}$ $2 \times 10^{-7}$	$2 \times 10^{-4}$ $4 \times 10^{-4}$	$3 \times 10^{-9}$ $7 \times 10^{-9}$
Neodymium 144	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$8 \times 10^{-11}$ $3 \times 10^{-10}$	$7 \times 10^{-3}$ $8 \times 10^{-3}$	$3 \times 10^{-10}$ $10^{-11}$
Neodymium 147	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$4 \times 10^{-7}$ $2 \times 10^{-7}$	$6 \times 10^{-6}$ $6 \times 10^{-6}$	$10^{-8}$ $8 \times 10^{-9}$
Neodymium 149	(sol.) (insol.)	$8 \times 10^{-3}$ $8 \times 10^{-3}$	$2 \times 10^{-8}$ $2 \times 10^{-8}$	$3 \times 10^{-4}$ $3 \times 10^{-4}$	$6 \times 10^{-9}$ $5 \times 10^{-9}$
Neptunium 237	(sol.) (insol.)	$9 \times 10^{-4}$ $9 \times 10^{-4}$	$4 \times 10^{-10}$ $10^{-10}$	$3 \times 10^{-6}$ $3 \times 10^{-6}$	$10^{-10}$ $4 \times 10^{-12}$
Neptunium 239	(sol.) (insol.)	$4 \times 10^{-3}$ $4 \times 10^{-3}$	$8 \times 10^{-7}$ $7 \times 10^{-7}$	$10^{-4}$ $10^{-4}$	$3 \times 10^{-9}$ $2 \times 10^{-9}$
Nickel 59	(sol.) (insol.)	$6 \times 10^{-3}$ 0.06	$5 \times 10^{-7}$ $8 \times 10^{-7}$	$2 \times 10^{-4}$ 0.002	$2 \times 10^{-8}$ $3 \times 10^{-8}$
Nickel 63	(sol.) (insol.)	$8 \times 10^{-4}$ 0.02	$6 \times 10^{-8}$ $3 \times 10^{-7}$	$3 \times 10^{-6}$ $7 \times 10^{-4}$	$2 \times 10^{-9}$ $10^{-8}$
Nickel 65	(sol.) (insol.)	$4 \times 10^{-3}$ $3 \times 10^{-3}$	$9 \times 10^{-7}$ $5 \times 10^{-7}$	$10^{-4}$ $10^{-4}$	$3 \times 10^{-9}$ $2 \times 10^{-9}$
Niobium 93m	(sol.) (insol.)	0.01 0.01	$10^{-7}$ $2 \times 10^{-7}$	$4 \times 10^{-4}$ $4 \times 10^{-4}$	$5 \times 10^{-9}$ $5 \times 10^{-9}$
Niobium 95	(sol.) (insol.)	$3 \times 10^{-3}$ $3 \times 10^{-3}$	$5 \times 10^{-7}$ $10^{-7}$	$10^{-4}$ $10^{-4}$	$2 \times 10^{-9}$ $3 \times 10^{-9}$
Niobium 97	(sol.) (insol.)	0.03 0.03	$6 \times 10^{-8}$ $5 \times 10^{-8}$	$9 \times 10^{-4}$ $9 \times 10^{-4}$	$2 \times 10^{-7}$ $2 \times 10^{-7}$
Osmium 185	(sol.) (insol.)	$2 \times 10^{-3}$ $2 \times 10^{-3}$	$5 \times 10^{-7}$ $5 \times 10^{-7}$	$7 \times 10^{-6}$ $7 \times 10^{-6}$	$2 \times 10^{-9}$ $2 \times 10^{-9}$
Osmium 191m	(sol.) (insol.)	0.07 			

Radionuclide	Occupational 40-hr. Week		Non-Occupational	
	Water		Air	
	uc/ml	uc/ml	uc/ml	uc/ml
Column	A	B	C	D
Palladium 109	(sol.) 3x10 <sup>-8</sup>	6x10 <sup>-7</sup>	9x10 <sup>-8</sup>	2x10 <sup>-8</sup>
	(insol.) 2x10 <sup>-8</sup>	4x10 <sup>-7</sup>	7x10 <sup>-8</sup>	10 <sup>-8</sup>
Phosphorus 32	(sol.) 5x10 <sup>-4</sup>	7x10 <sup>-8</sup>	2x10 <sup>-8</sup>	2x10 <sup>-9</sup>
	(insol.) 7x10 <sup>-4</sup>	8x10 <sup>-8</sup>	2x10 <sup>-8</sup>	3x10 <sup>-9</sup>
Platinum 191	(sol.) 4x10 <sup>-8</sup>	8x10 <sup>-7</sup>	10 <sup>-4</sup>	3x10 <sup>-8</sup>
	(insol.) 3x10 <sup>-8</sup>	6x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
Platinum 193m	(sol.) 0.03	7x10 <sup>-6</sup>	0.001	2x10 <sup>-7</sup>
	(insol.) 0.03	5x10 <sup>-6</sup>	0.001	2x10 <sup>-7</sup>
Platinum 193	(sol.) 0.03	10 <sup>-6</sup>	9x10 <sup>-6</sup>	4x10 <sup>-8</sup>
	(insol.) 0.03	3x10 <sup>-7</sup>	0.002	10 <sup>-8</sup>
Platinum 197m	(sol.) 0.03	6x10 <sup>-6</sup>	0.001	2x10 <sup>-7</sup>
	(insol.) 0.03	5x10 <sup>-6</sup>	9x10 <sup>-6</sup>	2x10 <sup>-7</sup>
Platinum 197	(sol.) 4x10 <sup>-8</sup>	8x10 <sup>-7</sup>	10 <sup>-4</sup>	3x10 <sup>-8</sup>
	(insol.) 3x10 <sup>-8</sup>	6x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
Plutonium 238	(sol.) 10 <sup>-4</sup>	2x10 <sup>-12</sup>	5x10 <sup>-8</sup>	7x10 <sup>-14</sup>
	(insol.) 8x10 <sup>-4</sup>	3x10 <sup>-11</sup>	3x10 <sup>-8</sup>	10 <sup>-12</sup>
Plutonium 239	(sol.) 10 <sup>-4</sup>	2x10 <sup>-12</sup>	5x10 <sup>-8</sup>	6x10 <sup>-14</sup>
	(insol.) 8x10 <sup>-4</sup>	4x10 <sup>-11</sup>	3x10 <sup>-8</sup>	10 <sup>-12</sup>
Plutonium 240	(sol.) 10 <sup>-4</sup>	2x10 <sup>-12</sup>	5x10 <sup>-8</sup>	6x10 <sup>-14</sup>
	(insol.) 8x10 <sup>-4</sup>	4x10 <sup>-11</sup>	3x10 <sup>-8</sup>	10 <sup>-12</sup>
Plutonium 241	(sol.) 7x10 <sup>-8</sup>	9x10 <sup>-11</sup>	2x10 <sup>-4</sup>	3x10 <sup>-12</sup>
	(insol.) 0.04	4x10 <sup>-8</sup>	0.001	10 <sup>-9</sup>
Plutonium 242	(sol.) 10 <sup>-4</sup>	2x10 <sup>-12</sup>	5x10 <sup>-8</sup>	6x10 <sup>-14</sup>
	(insol.) 9x10 <sup>-4</sup>	4x10 <sup>-11</sup>	3x10 <sup>-8</sup>	10 <sup>-12</sup>
Plutonium 243	(sol.) 1x10 <sup>-8</sup>	2x10 <sup>-8</sup>	3x10 <sup>-4</sup>	6x10 <sup>-8</sup>
	(insol.) 1x10 <sup>-8</sup>	2x10 <sup>-8</sup>	3x10 <sup>-4</sup>	8x10 <sup>-8</sup>
Plutonium 244	(sol.) 1x10 <sup>-4</sup>	2x10 <sup>-12</sup>	4x10 <sup>-8</sup>	6x10 <sup>-14</sup>
	(insol.) 3x10 <sup>-4</sup>	3x10 <sup>-11</sup>	1x10 <sup>-8</sup>	1x10 <sup>-12</sup>
Polonium 210	(sol.) 2x10 <sup>-3</sup>	5x10 <sup>-10</sup>	7x10 <sup>-7</sup>	2x10 <sup>-11</sup>
	(insol.) 8x10 <sup>-4</sup>	2x10 <sup>-10</sup>	3x10 <sup>-8</sup>	7x10 <sup>-12</sup>
Potassium 42	(sol.) 9x10 <sup>-8</sup>	2x10 <sup>-6</sup>	3x10 <sup>-4</sup>	7x10 <sup>-8</sup>
	(insol.) 6x10 <sup>-8</sup>	10 <sup>-7</sup>	2x10 <sup>-3</sup>	4x10 <sup>-9</sup>
Praseodymium 142	(sol.) 9x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-8</sup>	7x10 <sup>-9</sup>
	(insol.) 9x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-8</sup>	5x10 <sup>-9</sup>
Praseodymium 143	(sol.) 10 <sup>-8</sup>	3x10 <sup>-7</sup>	5x10 <sup>-5</sup>	10 <sup>-8</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-7</sup>	5x10 <sup>-5</sup>	6x10 <sup>-9</sup>
Promethium 147	(sol.) 6x10 <sup>-8</sup>	6x10 <sup>-6</sup>	2x10 <sup>-4</sup>	2x10 <sup>-9</sup>
	(insol.) 6x10 <sup>-8</sup>	10 <sup>-7</sup>	2x10 <sup>-4</sup>	3x10 <sup>-9</sup>
Promethium 149	(sol.) 10 <sup>-8</sup>	3x10 <sup>-7</sup>	4x10 <sup>-5</sup>	10 <sup>-8</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-7</sup>	4x10 <sup>-5</sup>	8x10 <sup>-9</sup>
Protactinium 230	(sol.) 7x10 <sup>-8</sup>	2x10 <sup>-6</sup>	2x10 <sup>-4</sup>	6x10 <sup>-11</sup>
	(insol.) 7x10 <sup>-8</sup>	8x10 <sup>-10</sup>	2x10 <sup>-4</sup>	3x10 <sup>-11</sup>
Protactinium 231	(sol.) 3x10 <sup>-8</sup>	10 <sup>-10</sup>	9x10 <sup>-7</sup>	4x10 <sup>-14</sup>
	(insol.) 8x10 <sup>-8</sup>	10 <sup>-10</sup>	2x10 <sup>-5</sup>	4x10 <sup>-12</sup>
Protactinium 233	(sol.) 4x10 <sup>-8</sup>	6x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
	(insol.) 3x10 <sup>-8</sup>	2x10 <sup>-7</sup>	10 <sup>-4</sup>	6x10 <sup>-9</sup>
Radium 223	(sol.) 2x10 <sup>-3</sup>	2x10 <sup>-9</sup>	7x10 <sup>-7</sup>	6x10 <sup>-11</sup>
	(insol.) 10 <sup>-4</sup>	2x10 <sup>-10</sup>	4x10 <sup>-8</sup>	8x10 <sup>-12</sup>
Radium 224	(sol.) 7x10 <sup>-3</sup>	5x10 <sup>-9</sup>	2x10 <sup>-6</sup>	2x10 <sup>-10</sup>
	(insol.) 2x10 <sup>-4</sup>	7x10 <sup>-10</sup>	5x10 <sup>-6</sup>	2x10 <sup>-11</sup>
Radium 226	(sol.) 4x10 <sup>-7</sup>	3x10 <sup>-11</sup>	3x10 <sup>-9</sup>	3x10 <sup>-12</sup>
	(insol.) 9x10 <sup>-4</sup>	5x10 <sup>-11</sup>	3x10 <sup>-5</sup>	2x10 <sup>-12</sup>
Radium 228	(sol.) 8x10 <sup>-7</sup>	7x10 <sup>-11</sup>	3x10 <sup>-8</sup>	2x10 <sup>-12</sup>
	(insol.) 7x10 <sup>-4</sup>	4x10 <sup>-11</sup>	3x10 <sup>-5</sup>	10 <sup>-12</sup>
Radon 220	.....	3x10 <sup>-7</sup>	.....	10 <sup>-8</sup>
Radon 222	.....	3x10 <sup>-8</sup>	.....	1x10 <sup>-9</sup>
Rhenium 183	(sol.) 0.02	3x10 <sup>-8</sup>	6x10 <sup>-4</sup>	9x10 <sup>-8</sup>
	(insol.) 8x10 <sup>-8</sup>	2x10 <sup>-7</sup>	3x10 <sup>-4</sup>	5x10 <sup>-9</sup>
Rhenium 186	(sol.) 3x10 <sup>-8</sup>	6x10 <sup>-7</sup>	9x10 <sup>-5</sup>	2x10 <sup>-8</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-7</sup>	5x10 <sup>-8</sup>	8x10 <sup>-9</sup>
Rhenium 187	(sol.) 0.07	9x10 <sup>-6</sup>	0.003	3x10 <sup>-7</sup>
	(insol.) 0.04	5x10 <sup>-7</sup>	0.002	2x10 <sup>-8</sup>
Rhenium 188	(sol.) 2x10 <sup>-8</sup>	4x10 <sup>-7</sup>	6x10 <sup>-8</sup>	10 <sup>-9</sup>
	(insol.) 9x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-8</sup>	6x10 <sup>-9</sup>
Rhodium 103m	(sol.) 0.4	8x10 <sup>-8</sup>	0.01	3x10 <sup>-9</sup>
	(insol.) 0.3	6x10 <sup>-8</sup>	0.01	2x10 <sup>-9</sup>
Rhodium 105	(sol.) 4x10 <sup>-8</sup>	8x10 <sup>-7</sup>	10 <sup>-4</sup>	3x10 <sup>-8</sup>
	(insol.) 3x10 <sup>-8</sup>	5x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
Rubidium 86	(sol.) 2x10 <sup>-8</sup>	3x10 <sup>-7</sup>	7x10 <sup>-3</sup>	10 <sup>-8</sup>
	(insol.) 7x10 <sup>-4</sup>	7x10 <sup>-8</sup>	2x10 <sup>-3</sup>	2x10 <sup>-9</sup>
Rubidium 87	(sol.) 3x10 <sup>-8</sup>	5x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
	(insol.) 5x10 <sup>-8</sup>	7x10 <sup>-8</sup>	2x10 <sup>-4</sup>	2x10 <sup>-9</sup>
Ruthenium 97	(sol.) 0.01	2x10 <sup>-6</sup>	4x10 <sup>-4</sup>	8x10 <sup>-8</sup>
	(insol.) 0.01	2x10 <sup>-6</sup>	3x10 <sup>-4</sup>	6x10 <sup>-8</sup>
Ruthenium 103	(sol.) 2x10 <sup>-3</sup>	5x10 <sup>-7</sup>	8x10 <sup>-3</sup>	2x10 <sup>-8</sup>
	(insol.) 2x10 <sup>-3</sup>	8x10 <sup>-8</sup>	8x10 <sup>-3</sup>	3x10 <sup>-9</sup>
Ruthenium 105	(sol.) 3x10 <sup>-8</sup>	7x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
	(insol.) 3x10 <sup>-8</sup>	5x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>

Ruthenium 106	(sol.) 4x10 <sup>-4</sup>	8x10 <sup>-8</sup>	10 <sup>-3</sup>	3x10 <sup>-9</sup>
	(insol.) 3x10 <sup>-4</sup>	6x10 <sup>-8</sup>	10 <sup>-3</sup>	2x10 <sup>-10</sup>
Samarium 147	(sol.) 2x10 <sup>-3</sup>	7x10 <sup>-10</sup>	6x10 <sup>-13</sup>	2x10 <sup>-12</sup>
	(insol.) 2x10 <sup>-3</sup>	3x10 <sup>-10</sup>	7x10 <sup>-13</sup>	9x10 <sup>-12</sup>
Samarium 151	(sol.) 0.01	6x10 <sup>-8</sup>	4x10 <sup>-4</sup>	2x10 <sup>-9</sup>
	(insol.) 0.01	10 <sup>-7</sup>	4x10 <sup>-4</sup>	5x10 <sup>-9</sup>
Samarium 153	(sol.) 2x10 <sup>-3</sup>	5x10 <sup>-7</sup>	8x10 <sup>-3</sup>	2x10 <sup>-8</sup>
	(insol.) 2x10 <sup>-3</sup>	4x10 <sup>-7</sup>	8x10 <sup>-3</sup>	10 <sup>-8</sup>
Scandium 46	(sol.) 10 <sup>-8</sup>	2x10 <sup>-7</sup>	4x10 <sup>-3</sup>	8x10 <sup>-9</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-8</sup>	4x10 <sup>-3</sup>	8x10 <sup>-10</sup>
Scandium 47	(sol.) 3x10 <sup>-3</sup>	6x10 <sup>-7</sup>	9x10 <sup>-3</sup>	2x10 <sup>-8</sup>
	(insol.) 3x10 <sup>-3</sup>	5x10 <sup>-7</sup>	9x10 <sup>-3</sup>	2x10 <sup>-8</sup>
Scandium 48	(sol.) 8x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-3</sup>	6x10 <sup>-9</sup>
	(insol.) 8x10 <sup>-4</sup>	10 <sup>-7</sup>	3x10 <sup>-3</sup>	5x10 <sup>-9</sup>
Selenium 75	(sol.) 9x10 <sup>-3</sup>	10 <sup>-8</sup>	3x10 <sup>-4</sup>	4x10 <sup>-9</sup>
	(insol.) 8x10 <sup>-8</sup>	10 <sup>-7</sup>	3x10 <sup>-4</sup>	4x10 <sup>-9</sup>
Silicon 31	(sol.) 0.03	6x10 <sup>-6</sup>	9x10 <sup>-4</sup>	2x10 <sup>-7</sup>
	(insol.) 6x10 <sup>-3</sup>	10 <sup>-6</sup>	2x10 <sup>-4</sup>	3x10 <sup>-9</sup>
Silver 105	(sol.) 3x10 <sup>-3</sup>	6x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
	(insol.) 3x10 <sup>-8</sup>	8x10 <sup>-8</sup>	10 <sup>-4</sup>	3x10 <sup>-8</sup>
Silver 110m	(sol.) 9x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-8</sup>	7x10 <sup>-9</sup>
	(insol.) 9x10 <sup>-4</sup>	10 <sup>-8</sup>	3x10 <sup>-8</sup>	3x10 <sup>-10</sup>
Silver 111	(sol.) 10 <sup>-8</sup>	3x10 <sup>-7</sup>	4x10 <sup>-8</sup>	10 <sup>-8</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-7</sup>	4x10 <sup>-8</sup>	8x10 <sup>-9</sup>
Sodium 22	(sol.) 10 <sup>-3</sup>	2x10 <sup>-7</sup>	4x10 <sup>-4</sup>	6x10 <sup>-9</sup>
	(insol.) 9x10 <sup>-4</sup>	9x10 <sup>-9</sup>	3x10 <sup>-5</sup>	3x10 <sup>-10</sup>
Sodium 24	(sol.) 6x10 <sup>-3</sup>	10 <sup>-8</sup>	2x10 <sup>-4</sup>	4x10 <sup>-8</sup>
	(insol.) 8x10 <sup>-4</sup>	10 <sup>-7</sup>	3x10 <sup>-3</sup>	5x10 <sup>-9</sup>
Strontium 85m	(sol.) 0.2	4x10 <sup>-6</sup>	0.007	10 <sup>-6</sup>
	(insol.) 0.2	3x10 <sup>-6</sup>	0.007	10 <sup>-6</sup>
Strontium 85	(sol.) 3x10 <sup>-3</sup>	2x10 <sup>-7</sup>	10 <sup>-4</sup>	8x10 <sup>-9</sup>
	(insol.) 5x10 <sup>-3</sup>	10 <sup>-7</sup>	2x10 <sup>-4</sup>	4x10 <sup>-9</sup>
Strontium 89	(sol.) 3x10 <sup>-4</sup>	3x10 <sup>-8</sup>	3x10 <sup>-6</sup>	3x10 <sup>-10</sup>
	(insol.) 8x10 <sup>-4</sup>	4x10 <sup>-8</sup>	3x10 <sup>-6</sup>	10 <sup>-9</sup>
Strontium 90	(sol.) 1x10 <sup>-5</sup>	1x10 <sup>-9</sup>	4x10 <sup>-7</sup>	4x10 <sup>-11</sup>
	(insol.) 10 <sup>-8</sup>	5x10 <sup>-9</sup>	4x10 <sup>-8</sup>	2x10 <sup>-10</sup>
Strontium 91	(sol.) 2x10 <sup>-8</sup>	4x10 <sup>-7</sup>	7x10 <sup>-5</sup>	2x10 <sup>-8</sup>
	(insol.) 10 <sup>-8</sup>	3x10 <sup>-7</sup>	5x10 <sup>-5</sup>	9x10 <sup>-9</sup>
Strontium 92	(sol.) 2x10 <sup>-3</sup>	4x10 <sup>-7</sup>	7x10 <sup>-8</sup>	2x10 <sup>-8</sup>
	(insol.) 2x10 <sup>-3</sup>	3x10 <sup>-7</sup>	6x10 <sup>-5</sup>	10 <sup>-8</sup>
Sulfur 35	(sol.) 2x10 <sup>-3</sup>	3x10 <sup>-7</sup>	6x10 <sup>-3</sup>	9x10 <sup>-9</sup>
	(insol.) 8x10 <sup>-3</sup>	3x10 <sup>-7</sup>	3x10 <sup>-4</sup>	9x10 <sup>-9</sup>
Tantalum 182	(sol.) 10 <sup>-8</sup>	4x10 <sup>-8</sup>	4x10 <sup>-6</sup>	10 <sup>-9</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-8</sup>	4x10 <sup>-6</sup>	7x10 <sup>-10</sup>
Technetium 96m	(sol.) 0.4	8x10 <sup>-8</sup>	0.01	3x10 <sup>-6</sup>
	(insol.) 0.3	3x10 <sup>-8</sup>	0.01	10 <sup>-6</sup>
Technetium 96	(sol.) 3x10 <sup>-9</sup>	6x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-8</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-7</sup>	5x10 <sup>-3</sup>	8x10 <sup>-9</sup>
Technetium 97m	(sol.) 0.01	2x10 <sup>-6</sup>	4x10 <sup>-4</sup>	8x10 <sup>-9</sup>
	(insol.) 5x10 <sup>-8</sup>	2x10 <sup>-7</sup>	2x10 <sup>-4</sup>	5x10 <sup>-9</sup>
Technetium 97	(sol.) 0.05	10 <sup>-8</sup>	0.002	4x10 <sup>-7</sup>
	(insol.) 0.02	3x10 <sup>-7</sup>	8x10 <sup>-4</sup>	10 <sup>-6</sup>
Technetium 99m	(sol.) 0.2	4x10 <sup>-3</sup>	0.006	10 <sup>-6</sup>
	(insol.) 0.08	10 <sup>-3</sup>	0.003	5x10 <sup>-7</sup>
Technetium 99	(sol.) 0.01	2x10 <sup>-6</sup>	3x10 <sup>-4</sup>	7x10 <sup>-9</sup>
	(insol.) 5x10 <sup>-8</sup>	6x10 <sup>-6</sup>	2x10 <sup>-4</sup>	2x10 <sup>-9</sup>
Tellurium 125m	(sol.) 5x10 <sup>-9</sup>	4x10 <sup>-7</sup>	2x10 <sup>-4</sup>	10 <sup>-8</sup>
	(insol.) 3x10 <sup>-9</sup>	10 <sup>-7</sup>	10 <sup>-4</sup>	4x10 <sup>-9</sup>
Tellurium 127m	(sol.) 2x10 <sup>-9</sup>	10 <sup>-7</sup>	6x10 <sup>-9</sup>	5x10 <sup>-9</sup>
	(insol.) 2x10 <sup>-9</sup>	4x10 <sup>-8</sup>	5x10 <sup>-9</sup>	10 <sup>-9</sup>
Tellurium 127	(sol.) 8x10 <sup>-8</sup>	2x10 <sup>-6</sup>	3x10 <sup>-6</sup>	6x10 <sup>-9</sup>
	(insol.) 5x10 <sup>-8</sup>	9x10 <sup>-7</sup>	2x10 <sup>-6</sup>	3x10 <sup>-9</sup>
Tellurium 129m	(sol.) 10 <sup>-8</sup>	8x10 <sup>-7</sup>	3x10 <sup>-8</sup>	3x10 <sup>-9</sup>
	(insol.) 6x10 <sup>-4</sup>	3x10 <sup>-8</sup>	2x10 <sup>-8</sup>	10 <sup>-9</sup>
Tellurium 129	(sol.) 0.02	5x10 <sup>-6</sup>	8x10 <sup>-4</sup>	2x10 <sup>-7</sup>
	(insol.) 0.02	4x10 <sup>-6</sup>	8x10 <sup>-4</sup>	10 <sup>-7</sup>
Tellurium 131m	(sol.) 2x10 <sup>-8</sup>	4x10 <sup>-7</sup>	6x10 <sup>-8</sup>	10 <sup>-8</sup>
	(insol.) 10 <sup>-8</sup>	2x10 <sup>-7</sup>	4x10 <sup>-8</sup>	6x10 <sup>-9</sup>
Tellurium 132	(sol.) 9x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-3</sup>	7x10 <sup>-9</sup>
	(insol.) 6x10 <sup>-4</sup>	10 <sup>-7</sup>	2x10 <sup>-3</sup>	4x10 <sup>-9</sup>
Terbium 160	(sol.) 10 <sup>-8</sup>	10 <sup>-7</sup>	4x10 <sup>-3</sup>	3x10 <sup>-9</sup>
	(insol.) 10 <sup>-9</sup>	3x10 <sup>-8</sup>	4x10 <sup>-3</sup>	10 <sup>-9</sup>

Radionuclide	Column	Occupational 40-hr. Week		Non-Occupational	
		Water uc/ml	Air uc/ml	Water uc/ml	Air uc/ml
		A	B	C	D
Thorium 230	(sol.)	5x10 <sup>-3</sup>	2x10 <sup>-12</sup>	2x10 <sup>-6</sup>	8x10 <sup>-14</sup>
	(insol.)	9x10 <sup>-4</sup>	10 <sup>-11</sup>	3x10 <sup>-3</sup>	3x10 <sup>-13</sup>
Thorium 231	(sol.)	7x10 <sup>-3</sup>	10 <sup>-6</sup>	2x10 <sup>-4</sup>	5x10 <sup>-5</sup>
	(insol.)	7x10 <sup>-3</sup>	10 <sup>-6</sup>	2x10 <sup>-4</sup>	4x10 <sup>-5</sup>
Thorium 232	(sol.)	5x10 <sup>-3</sup>	3x10 <sup>-11</sup>	2x10 <sup>-6</sup>	10 <sup>-12</sup>
	(insol.)	10 <sup>-3</sup>	3x10 <sup>-11</sup>	4x10 <sup>-3</sup>	10 <sup>-12</sup>
Thorium 234	(sol.)	5x10 <sup>-4</sup>	6x10 <sup>-8</sup>	2x10 <sup>-3</sup>	2x10 <sup>-9</sup>
	(insol.)	5x10 <sup>-4</sup>	3x10 <sup>-8</sup>	2x10 <sup>-3</sup>	10 <sup>-9</sup>
Thorium Nat.	(sol.)	3x10 <sup>-3</sup>	3x10 <sup>-11</sup>	10 <sup>-6</sup>	10 <sup>-12</sup>
	(insol.)	3x10 <sup>-4</sup>	3x10 <sup>-11</sup>	10 <sup>-3</sup>	10 <sup>-12</sup>
Thulium 170	(sol.)	10 <sup>-3</sup>	4x10 <sup>-8</sup>	5x10 <sup>-6</sup>	10 <sup>-9</sup>
	(insol.)	10 <sup>-3</sup>	3x10 <sup>-8</sup>	5x10 <sup>-6</sup>	10 <sup>-9</sup>
Thulium 171	(sol.)	0.01	10 <sup>-7</sup>	5x10 <sup>-4</sup>	4x10 <sup>-9</sup>
	(insol.)	0.01	2x10 <sup>-7</sup>	5x10 <sup>-4</sup>	8x10 <sup>-9</sup>
Tin 113	(sol.)	2x10 <sup>-3</sup>	4x10 <sup>-7</sup>	9x10 <sup>-6</sup>	10 <sup>-9</sup>
	(insol.)	2x10 <sup>-3</sup>	5x10 <sup>-8</sup>	8x10 <sup>-6</sup>	2x10 <sup>-9</sup>
Tin 125	(sol.)	5x10 <sup>-4</sup>	10 <sup>-7</sup>	2x10 <sup>-6</sup>	4x10 <sup>-9</sup>
	(insol.)	5x10 <sup>-4</sup>	8x10 <sup>-8</sup>	2x10 <sup>-6</sup>	3x10 <sup>-9</sup>
Tungsten 181	(sol.)	0.01	2x10 <sup>-6</sup>	4x10 <sup>-4</sup>	8x10 <sup>-9</sup>
	(insol.)	0.01	10 <sup>-7</sup>	3x10 <sup>-4</sup>	4x10 <sup>-9</sup>
Tungsten 185	(sol.)	4x10 <sup>-3</sup>	8x10 <sup>-7</sup>	10 <sup>-4</sup>	3x10 <sup>-9</sup>
	(insol.)	3x10 <sup>-3</sup>	10 <sup>-7</sup>	10 <sup>-4</sup>	4x10 <sup>-9</sup>
Tungsten 187	(sol.)	2x10 <sup>-3</sup>	4x10 <sup>-7</sup>	7x10 <sup>-6</sup>	2x10 <sup>-9</sup>
	(insol.)	2x10 <sup>-3</sup>	3x10 <sup>-7</sup>	6x10 <sup>-6</sup>	10 <sup>-9</sup>
Uranium 230	(sol.)	7x10 <sup>-4</sup>	3x10 <sup>10</sup>	2x10 <sup>-6</sup>	10 <sup>-11</sup>
	(insol.)	10 <sup>-4</sup>	10 <sup>-10</sup>	5x10 <sup>-6</sup>	4x10 <sup>-12</sup>
Uranium 232	(sol.)	2x10 <sup>-3</sup>	10 <sup>-10</sup>	8x10 <sup>-7</sup>	3x10 <sup>-12</sup>
	(insol.)	8x10 <sup>-4</sup>	3x10 <sup>-11</sup>	3x10 <sup>-9</sup>	9x10 <sup>-12</sup>
Uranium 233	(sol.)	10 <sup>-4</sup>	5x10 <sup>-10</sup>	4x10 <sup>-6</sup>	2x10 <sup>-11</sup>
	(insol.)	9x10 <sup>-4</sup>	10 <sup>-10</sup>	3x10 <sup>-6</sup>	4x10 <sup>-12</sup>
Uranium 234	(sol.)	10 <sup>-4</sup>	6x10 <sup>-10</sup>	4x10 <sup>-6</sup>	2x10 <sup>-11</sup>
	(insol.)	9x10 <sup>-4</sup>	10 <sup>-10</sup>	3x10 <sup>-6</sup>	4x10 <sup>-12</sup>
Uranium 235	(sol.)	10 <sup>-4</sup>	5x10 <sup>-10</sup>	4x10 <sup>-6</sup>	2x10 <sup>-11</sup>
	(insol.)	8x10 <sup>-4</sup>	10 <sup>-10</sup>	3x10 <sup>-6</sup>	4x10 <sup>-12</sup>
Uranium 236	(sol.)	10 <sup>-4</sup>	6x10 <sup>-10</sup>	5x10 <sup>-6</sup>	2x10 <sup>-11</sup>
	(insol.)	10 <sup>-3</sup>	10 <sup>-10</sup>	3x10 <sup>-6</sup>	4x10 <sup>-12</sup>
Uranium 238	(sol.)	2x10 <sup>-3</sup>	7x10 <sup>-11</sup>	6x10 <sup>-7</sup>	3x10 <sup>-12</sup>
	(insol.)	10 <sup>-3</sup>	10 <sup>-10</sup>	4x10 <sup>-8</sup>	5x10 <sup>-12</sup>
Uranium 240 & Neptunium 240	(sol.)	1x10 <sup>-3</sup>	2x10 <sup>-7</sup>	3x10 <sup>-6</sup>	8x10 <sup>-9</sup>
	(insol.)	1x10 <sup>-3</sup>	2x10 <sup>-7</sup>	3x10 <sup>-6</sup>	6x10 <sup>-9</sup>
Uranium-Nat.	(sol.)	2x10 <sup>-3</sup>	7x10 <sup>-11</sup>	6x10 <sup>-7</sup>	3x10 <sup>-12</sup>
	(insol.)	5x10 <sup>-4</sup>	6x10 <sup>-11</sup>	2x10 <sup>-6</sup>	2x10 <sup>-12</sup>
Vanadium 48	(sol.)	9x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-6</sup>	6x10 <sup>-9</sup>
	(insol.)	8x10 <sup>-4</sup>	6x10 <sup>-8</sup>	3x10 <sup>-6</sup>	2x10 <sup>-9</sup>
Xenon 131m	(imm.)	.....	2x10 <sup>-3</sup>	.....	4x10 <sup>-7</sup>
Xenon 133	(imm.)	.....	10 <sup>-3</sup>	.....	3x10 <sup>-7</sup>
Xenon 133m	(imm.)	.....	1x10 <sup>-3</sup>	.....	3x10 <sup>-7</sup>
Xenon 135	(imm.)	.....	4x10 <sup>-3</sup>	.....	10 <sup>-7</sup>
Ytterbium 175	(sol.)	3x10 <sup>-3</sup>	7x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-9</sup>
	(insol.)	3x10 <sup>-3</sup>	6x10 <sup>-7</sup>	10 <sup>-4</sup>	2x10 <sup>-9</sup>
Yttrium 90	(sol.)	6x10 <sup>-4</sup>	10 <sup>-7</sup>	2x10 <sup>-6</sup>	4x10 <sup>-9</sup>
	(insol.)	6x10 <sup>-4</sup>	10 <sup>-7</sup>	2x10 <sup>-6</sup>	3x10 <sup>-9</sup>
Yttrium 91m	(sol.)	0.1	2x10 <sup>-9</sup>	0.003	8x10 <sup>-7</sup>
	(insol.)	0.1	2x10 <sup>-9</sup>	0.003	6x10 <sup>-7</sup>
Yttrium 91	(sol.)	8x10 <sup>-4</sup>	4x10 <sup>-8</sup>	3x10 <sup>-6</sup>	10 <sup>-9</sup>
	(insol.)	8x10 <sup>-4</sup>	3x10 <sup>-8</sup>	3x10 <sup>-6</sup>	10 <sup>-9</sup>
Yttrium 92	(sol.)	2x10 <sup>-3</sup>	4x10 <sup>-7</sup>	6x10 <sup>-6</sup>	10 <sup>-9</sup>
	(insol.)	2x10 <sup>-3</sup>	3x10 <sup>-7</sup>	6x10 <sup>-6</sup>	10 <sup>-9</sup>
Yttrium 93	(sol.)	8x10 <sup>-4</sup>	2x10 <sup>-7</sup>	3x10 <sup>-6</sup>	6x10 <sup>-9</sup>
	(insol.)	8x10 <sup>-4</sup>	10 <sup>-7</sup>	3x10 <sup>-6</sup>	5x10 <sup>-9</sup>
Zinc 65	(sol.)	3x10 <sup>-3</sup>	10 <sup>-7</sup>	10 <sup>-4</sup>	4x10 <sup>-9</sup>
	(insol.)	5x10 <sup>-3</sup>	6x10 <sup>-8</sup>	2x10 <sup>-4</sup>	2x10 <sup>-9</sup>
Zinc 69m	(sol.)	2x10 <sup>-3</sup>	4x10 <sup>-7</sup>	7x10 <sup>-6</sup>	10 <sup>-9</sup>
	(insol.)	2x10 <sup>-3</sup>	3x10 <sup>-7</sup>	6x10 <sup>-6</sup>	10 <sup>-9</sup>
Zinc 69	(sol.)	0.05	7x10 <sup>-6</sup>	0.002	2x10 <sup>-7</sup>
	(insol.)	0.05	9x10 <sup>-6</sup>	0.002	3x10 <sup>-7</sup>
Zirconium 93	(sol.)	0.02	10 <sup>-7</sup>	8x10 <sup>-4</sup>	4x10 <sup>-9</sup>
	(insol.)	0.02	3x10 <sup>-7</sup>	8x10 <sup>-4</sup>	10 <sup>-9</sup>
Zirconium 95	(sol.)	2x10 <sup>-3</sup>	10 <sup>-7</sup>	6x10 <sup>-6</sup>	4x10 <sup>-9</sup>
	(insol.)	2x10 <sup>-3</sup>	3x10 <sup>-8</sup>	6x10 <sup>-6</sup>	10 <sup>-9</sup>
Zirconium 97	(sol.)	5x10 <sup>-4</sup>	10 <sup>-7</sup>	2x10 <sup>-6</sup>	4x10 <sup>-9</sup>
	(insol.)	5x10 <sup>-4</sup>	9x10 <sup>-8</sup>	2x10 <sup>-6</sup>	3x10 <sup>-9</sup>
Unidentified Radionuclide(s)		3x10 <sup>-7</sup>	1x10 <sup>-12</sup>	10 <sup>-3</sup>	4x10 <sup>-14</sup>

Abbreviations—  
 sol. = soluble  
 insol. = insoluble  
 imm. = immersion  
 m = metastable

(b) In any case where there is a mixture in air or water of more than one radionuclide, the limiting values for purposes of this Section shall be determined as follows:

1. If the identity and concentration of each radionuclide in the mixture are known, the limiting values shall be derived as follows:

i. Determine, for each radionuclide in the mixture, the ratio between the quantity present in the mixture, the ratio between the quantity present in the mixture and the limit otherwise established in this Section for the specific radionuclide when not in a mixture.

ii. The sum of such ratios for all the radionuclides in the mixture may not exceed "1" ("unity").

iii. For example, if radionuclides A, B, and C are present in concentrations, C<sub>a</sub>, C<sub>b</sub>, and C<sub>c</sub>, and if the applicable MPC's are MPC<sub>a</sub> and MPC<sub>b</sub> and MPC<sub>c</sub> respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_a}{MPC_a} + \frac{C_b}{MPC_b} + \frac{C_c}{MPC_c} < 1$$

2. If either the identity or the concentration of any radionuclide in the mixture is not known, the limiting values for purposes of this section are:

- i. For purposes of Column A — 3 × 10<sup>-7</sup>
- ii. For purposes of Column B — 1 × 10<sup>-12</sup>
- iii. For purposes of Column C — 1 × 10<sup>-8</sup>
- iv. For purposes of Column D — 4 × 10<sup>-14</sup>

3. If any of the conditions specified in this paragraph are met, the corresponding values specified in this paragraph may be used in lieu of those specified in paragraph 2 of this subsection.

i. If the identity of each radionuclide in the mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the concentration limit for the mixture is the limit specified in subsection (a) of this Section for the radionuclide in the mixture having the lowest concentration limit;

ii. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in subsection (a) of this Section are not present in the mixture, the concentration limit for the mixture is the lowest concentration limit specified in subsection (a) of this Section for any radionuclide which is not known to be absent from the mixture; or

iii.

c. Element (atomic number) and isotope	Table I		Table II	
	Col. 1 Air (uc/ml)	Col. 2 Water (uc/ml)	Col. 1 Air (uc/ml)	Col. 2 Water (uc/ml)
If it is known that Sr 90, I 129, Pb 210, Po 210, At 211, Ra 223, Ra 224, Ra 226, Ac 227, Ra 228, Th 230, Pa 231, Th 232, and Th-nat are not present	.....	9x10 <sup>-5</sup>	.....	3x10 <sup>-6</sup>
If it is known that Sr 90, I 129, Pb 210, Po 210, Ra 223, Ra 226, Ra 228, Pa 231, and Th-nat are not present	.....	6x10 <sup>-5</sup>	.....	2x10 <sup>-6</sup>
If it is known that Sr 90, Pb 210, Ra 226 and Ra 228 are not present	.....	2x10 <sup>-5</sup>	.....	6x10 <sup>-7</sup>
If it is known that Ra 226 and Ra 228 are not present	.....	3x10 <sup>-6</sup>	.....	1x10 <sup>-7</sup>
If it is known that alpha-emitters and Sr 90, I 129, Pb 210, Ac 227, Ra 228, Pa 230, Pu 241 and Bk 249 are not present	3x10 <sup>-10</sup>	.....	1x10 <sup>-10</sup>	.....
If it is known that alpha-emitters and Pb 210, Ac 227, Ra 228 and Pu 241 are not present	3x10 <sup>-10</sup>	.....	1x10 <sup>-11</sup>	.....
If it is known that alpha-emitters and Ac 227 are not present	3x10 <sup>-11</sup>	.....	1x10 <sup>-12</sup>	.....
If it is known that Ac 227, Th 230, Pa 231, Pu 238, Pu 239, Pu 240, Pu 242, and Cf 249 are not present	3x10 <sup>-12</sup>	.....	1x10 <sup>-13</sup>	.....
If Pa 231, Pu 239, Pu 240, Pu 242 and Cf 249 are not present	2x10 <sup>-12</sup>	.....	7x10 <sup>-14</sup>	.....

4. If the mixture of radionuclides consists of uranium and its daughter products in ore dust prior to chemical processing of the uranium ore, the values specified in this paragraph may be used in lieu of those determined in accordance with paragraph 1 of this subsection, or those specified in paragraphs 2 and 3 of this subsection.

i. For purposes of subsection (a) of this Section, Column B, 1 x 10<sup>-10</sup> uc/ml gross alpha activity; or 2.5 x 10<sup>-11</sup> uc/ml natural uranium; or 75 micrograms per cubic meter of air natural uranium.

ii. For purposes of subsection (a) of this Section, Column D, 3 x 10<sup>-13</sup> uc/ml gross alpha activity; or 8 x 10<sup>-13</sup> uc/ml natural uranium; or 3 micrograms per cubic meter of air natural uranium.

5. For purposes of this subsection, a radionuclide may be considered as not present in a mixture if:

i. The ratio of the concentration of that radionuclide in the mixture (C<sub>a</sub>) to the concentration limit for the radionuclide specified in Columns C and D of subsection (a) of this Section, (MPC<sub>a</sub>) does not exceed 1/10, that is

$$C_a / MPC_a \leq 1/10$$

ii. The sum of such ratios for all the radionuclides considered as not present in the mixture does not exceed 1/4; that is

$$C_a / MPC_a + C_b / MPC_b + \dots \leq 1/4$$

SUBCHAPTER 7. RADIATION SURVEYS AND PERSONNEL MONITORING

7:28-7.1 Surveys inside controlled areas

(a) Controlled areas shall be surveyed by, or under the direction of, a qualified individual to determine if the installation is maintained and operations are conducted in compliance with this Chapter.

(b) Radiation levels shall be determined with the use of suitable instruments and methods.

(c) Surveys shall be made of the air for radioactive content when the average concentrations may exceed 1/4 the amount specified in Section 6.5(a) (Average concentrations) of this Chapter, Column B, or prorated values when more than one isotope is present.

(d) Installations where unsealed radioactive materials are stored or used shall be periodically surveyed for contamination of surfaces. These surveys shall be conducted in a manner to insure that the levels of surface contamination are below those which could lead to exposures amounting to ten per cent of the limits specified in Section 6.1(a), (d) (Exposure of individuals in controlled areas) of this Chapter.

(e) The record of a survey shall contain, but shall not be limited to the radiation levels, the time the radiation is produced, the workweek and the fraction of the workweek that any individual may be exposed to the radiation and when required, the radioactive air concentrations and surface contaminations.

(f) Subsequent surveys shall be conducted at such times and as frequently as may be necessary to assure that the controlled areas and operations remain in compliance with this Chapter.

7:28-7.2 Surveys outside controlled areas

Surveys shall be made outside controlled areas at sufficient intervals and locations as may be necessary to insure compliance with Sections 6.2 (Radiation levels outside controlled areas) and 6.3 (Concentrations in effluents from controlled areas) of this Chapter.

**7:28-7.3 Statement in lieu of actual survey**

A written statement signed by a qualified individual and including his calculations and analysis of the dose rates in the vicinity of a radiation source may be acceptable in place of the survey required in Section 7.1 (Surveys inside controlled areas) of this Chapter, except when radioactive-air contamination or surface contamination is involved.

**7:28-7.4 Use of personnel-monitoring equipment**

(a) Each owner shall supply appropriate personnel-monitoring equipment to and shall require that it be used by:

1. Each individual who enters a controlled area under such circumstances that he receives, or is likely to receive, a dose in excess of 25 millirems in any period of seven consecutive days;
2. Each individual under 18 years of age who enters a controlled area under such circumstances that he receives or is likely to receive a dose in excess of ten millirems in any period of seven consecutive days;
3. Each individual who enters a high radiation area; and
4. At least one visitor in a group of visitors entering a controlled area.

(b) All individuals required to wear personnel-monitoring equipment shall be instructed in its proper use and purpose. Records shall be kept in accordance with Section 8.1 (Personnel-monitoring records) of this Chapter.

(c) When an individual working on the premises of an owner, but not employed by him is wearing personnel-monitoring equipment provided by his employer, the owner of the radiation source shall not be required to provide additional personnel-monitoring equipment.

**7:28-7.5 Requirements for bio-assays**

Where necessary or desirable in order to aid in determining the extent of an individual's exposure to concentrations of radioactive material, the Department may incorporate license provisions or issue an order requiring the owner to have appropriate bio-assays made and to furnish the Department with copies of such bio-assays.

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**SUBCHAPTER 8. RECORDS****7:28-8.1 Personnel-monitoring records**

(a) Clear and legible records shall be maintained by the owner for calendar quarters on Form RH-26, or on a clear and legible form containing all the information required on RH-26. These records shall show the radiation exposures of all individuals who are required to wear personnel-monitoring equipment according to Section 7.4 (Use of

personnel-monitoring equipment) of this Chapter and any required bio-assays according to Section 7.5 (Requirements for bio-assays) of this Chapter.

(b) Each employee, at his request, shall be supplied by the owner with an annual statement of his radiation exposure record and any bio-assays.

(c) At the request of an individual formerly employed by the owner, each owner shall furnish such individual a report of his exposure to radiation, including bio-assays, as shown in records maintained by the owner pursuant to subsection (a) of this Section. Such report shall be furnished within 30 days from the time the request is made or within 60 days from termination of employment, whichever is later. The report shall cover each calendar quarter of the individual's employment involving exposure to radiation.

(d) When an individual working on the premises of an owner, but not employed by him, is required by the owner to wear personnel-monitoring equipment, the owner of the radiation source shall furnish such individual's employer within 90 days a statement of the individual's radiation record and this shall be incorporated in the individual's exposure record.

(e) Each report or statement required by subsections (b) through (d) of this Section shall contain the following statement: "This report is furnished to you under the provisions of Subchapter 8 of the New Jersey Radiation Protection Code. You should preserve this report for future reference."

(f) The exposure records on each employee shall be preserved during the course of his employment and for at least ten years after termination of employment. Exposure records of other persons shall be preserved for at least ten years.

(g) These records or true copy of same shall be made available to the Department on request.

**7:28-8.2 Records of surveys**

(a) Records shall be maintained showing the results of such surveys as are required pursuant to Subchapter 7 (Radiation Surveys and Personnel Monitoring) of this Chapter.

(b) The records of each survey shall be retained for at least ten years.

(c) These records or true copy of same shall be made available to the Department on request.

(d) The owner of any installation covered in Subchapters 14 through 16 of this Chapter shall submit to the Department within 30 days of receipt a copy of each report of radiation surveys made in compliance with Subchapter 7

(Radiation Surveys and Personnel Monitoring) of this Chapter.

### 7:28-8.3 Records of radioactive materials

(a) An accurate accounting for all radioactive materials shall be maintained for a radiation installation. Such records shall show radioactive materials received, produced, and disposed, the amounts and form of the radioactive material received or produced and the amount on hand.

(b) Such records shall be retained for at least two years after the final disposition of any radioactive material.

(c) These records or true copy of same shall be made available to the Department on request.

### 7:28-8.4 Records of sealed source testing

Records of the results of sealed source testing shall be kept at least two years.

### 7:28-8.5 Records from discontinued installations

The discontinuance of a radiation installation does not relieve the owner from the responsibility of retaining the records required by this Subchapter. Such owner may, however, request the Department to accept the records. The acceptance of such records by the Department relieves the owner of subsequent responsibility only in respect to their preservation as required by this Chapter.

## SUBCHAPTER 9. RADIOACTIVE CONTAMINATION CONTROL

### 7:28-9.1 General precautions

All work with radioactive materials shall be carried out under such conditions as to minimize the radioactive contamination of the area and of the person(s) working therein.

### 7:28-9.2 Personnel and material contamination

(a) When the nature of the work is such that an individual or his clothing may become contaminated, the individual and his clothing shall be suitably monitored.

(b) Any contamination which might lead to exposures greater than ten per cent of the limits specified in Section 6.1(a) or (d) (Exposure of individuals in controlled areas) of this Chapter shall be removed from the contaminated individual before that individual is permitted to leave the area.

(c) No clothing, equipment, or other material having contamination which might lead to exposures greater than those specified in subsection (b) of this Section shall be permitted to leave the area except as radioactive material.

### 7:28-9.3 Decontamination of premises

Radioactively contaminated premises shall be decontaminated so that individuals using these premises shall not receive exposures greater than those listed in Section 9.2(b) (Personnel and material contamination) of this Chapter.

### 7:28-9.4 Sealed source testing

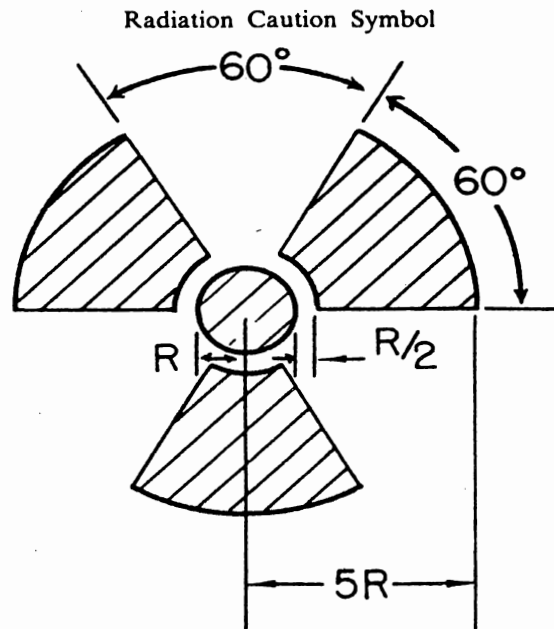
(a) Unless otherwise specified in a Federal agency license, or a State license, sealed sources except tritium and krypton, containing more than ten times the exempt quantities of Section 3.6 (Table of exempt quantities) of this Chapter, shall be leak tested than ten times the generally licensed quantities of Section 4.19 (Quantities generally licensed) of this Chapter, Column B, or more at intervals of not longer than six months.

(b) Records of all sealed source testing shall be kept in accordance with Section 8.4 (Records of sealed source testing) of this Chapter.

## SUBCHAPTER 10. LABELING, POSTING, AND CONTROLS

### 7:28-10.1 General requirement

(a) All signs and labels required by this Subchapter shall use the conventional radiation caution symbol shaped and colored as follows:



1. Cross-hatched area is to be magenta or purple;
2. Background is to be yellow.

(b) In addition to the language prescribed in the various sections of this Subchapter, any supplementary information which might be appropriate in aiding individuals to minimize exposure to radiation or to radioactive materials may be provided on or near such required signs or labels.

#### 7:28-10.2 Radiation areas

(a) Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

1. CAUTION—RADIATION AREA; or
2. DANGER—RADIATION AREA

#### 7:28-10.3 High radiation areas

(a) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

1. CAUTION—HIGH RADIATION AREA; or
2. DANGER—HIGH RADIATION AREA

(b) Each high radiation area shall be under direct, constant surveillance to protect against unauthorized or accidental entry unless:

1. It is equipped with a control device which shall cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in one hour upon entry into the area;
2. It is equipped with a control device which shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the owner or the supervisor of the activity are made aware of the entry; or
3. It is locked to protect against unauthorized or accidental entry and the owner or the supervisor of the activity maintains direct personal control over access to the key.

#### 7:28-10.4 Airborne radioactivity areas

(a) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words;

1. CAUTION—AIRBORNE RADIOACTIVITY AREA; or
2. DANGER—AIRBORNE RADIOACTIVITY AREA

#### 7:28-10.5 Areas containing radioactive materials

(a) Each area or room in which radioactive material, other than natural uranium or thorium is used or stored in an amount greater than ten times that listed in Section 10.9 (Labeling, posting and disposal quantities of radioactive material) of this Chapter shall be conspicuously posted with

a sign or signs bearing the radiation caution symbol and the words:

1. CAUTION—RADIOACTIVE MATERIAL(S); or
2. DANGER—RADIOACTIVE MATERIAL(S)

(b) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity listed in Section 10.9 (Labeling, posting and disposal quantities of radioactive material) of this Chapter shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

1. CAUTION—RADIOACTIVE MATERIAL(S); or
2. DANGER—RADIOACTIVE MATERIAL(S)

#### 7:28-10.6 Labeling of equipment and containers

(a) Any equipment or container in which radioactive material, other than natural uranium or thorium, is transported, stored, or used, in an amount greater than that specifically listed in Section 10.9 (Labeling, posting and disposal quantities of radioactive material) of this Chapter shall bear a durable, clearly visible label bearing the radiation caution symbol and the words:

1. CAUTION—RADIOACTIVE MATERIAL; or
2. DANGER—RADIOACTIVE MATERIAL

(b) Each container in which natural uranium or thorium is transported, stored, or used in a quantity greater than 10 times the quantity listed in Section 10.9 (Labeling, posting and disposal quantities of radioactive material) of this Chapter shall bear a durable, clearly visible label bearing the radiation caution symbol and the words:

1. CAUTION—RADIOACTIVE MATERIAL; or
2. DANGER—RADIOACTIVE MATERIAL

(c) Where containers are used for storage, the labels required in this Section shall state also the quantities and kinds of radioactive materials in the containers and the date of measurement of the quantities.

(d) All radiation-producing machines capable, when operated, of producing a radiation area shall be labeled in a manner which cautions individuals of this fact.

#### 7:28-10.7 Removal of signs and labels

All radiation caution signs and labels which may have been posted at a time when they were required shall be removed when the condition which originally required the posting no longer exists.

#### 7:28-10.8 Exceptions from posting and labeling requirements

(a) Radiation areas and high radiation areas which result from the operation of therapeutic x-ray machines operated

at potentials of 60 kv and below or from the operation of diagnostic x-ray machines shall be exempt from the posting requirements of Sections 10.2, 10.3 and 10.6(d) of this Chapter provided that the operator of the equipment has taken precautions to insure that no individual other than the patient shall be in the radiation area.

(b) Rooms or other areas in hospitals are not required to be posted with radiation caution signs because of the presence of patients containing radioactive material provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual other than the patient to radiation or radioactive material in excess of the limits established in this Chapter.

(c) A room or area is not required to be posted with a radiation caution sign because of the presence of a sealed source provided the radiation level 12 inches from the surface of the source container or source housing does not exceed five millirems per hour.

(d) Radiation caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than eight hours provided that:

1. The materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any other individual to radiation or radioactive materials in excess of the limits established in these regulations; and
2. Such area or room is subject to the user's control.

(e) Laboratory containers such as beakers, flasks and test tubes need not be labeled if they are being used transiently in laboratory procedures when the user is present.

(f) A container in which radioactive material is transported, stored, or used need not be labeled, if the concentration of the material in the container does not exceed that specified in Section 6.5(a) (Average concentrations) of this Chapter, Column A.

(g) Radioactive materials packaged and labeled in accordance with regulations of the appropriate Federal agency shall be exempt from the labeling and posting requirements of this Section during shipment, provided that the inside containers are labeled in accordance with the provisions of Section 10.6 (Labeling of equipment and containers) of this Chapter.

Material	Microcuries
Au199	10
Ba140 + La140	1
Be7	50
Cl4	50
Ca45	10
Cd109 + Ag109	10
Ce144 + Pr144	1
Cl36	1
Co60	1
Cr51	50
Cs137 + Ba137	1
Cu64	50
Eu134	1
F18	50
Fe55	50
Fe59	1
Ga72	10
Ge71	50
H3(HTO or H32O)	250
I131	10
In114	1
Ir192	10
K42	10
Kr85	5
La140	10
Mn52	1
Mn56	50
Mo99	10
Na22	10
Na24	10
Nb95	10
Ni59	1
Ni63	1
P32	10
Pd103 + Rh103	50
Pd109	10
Pm147	10
Po210	0.1
Pr143	10
Pu239	1
Ra226	0.1
Rb86	10
Re186	10
Rh105	10
Ru106 + Rh106	1
S35	50
Sb124	1
Sc46	1
Sm153	10
Sn113	10
Sr89	1
Sr90 + Y90	0.1
Ta182	10
Tc96	1
Tc99	1
Te127	10
Te129	1
Th (natural)	50
Tl204	50
Tritium (See H3)	250
U (natural)	50
U233	1
U234-U235	50
V48	1
W185	10
Y90	1
Y91	1
Zn65	10
Unidentified radioactive materials or any of the above in unknown mixtures	0.1

**7:28-10.9 Labeling, posting and disposal quantities of radioactive materials**

(a) Microcuries table is as follows:

Material	Microcuries
Ag105	1
Ag111	10
As76	10
As77	10
Au198	10

(b) For purposes of Section 10.5 (Areas containing radioactive material) and 10.6 (Labeling of equipment and containers), where there is involved a combination of isotopes in known amounts, the limit for the combination shall be derived by determining for each isotope in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific isotope when not in combination. The sum of such ratios for all the isotopes in the combination may not exceed "1" ("unity").

## SUBCHAPTER 11. DISPOSAL OF RADIOACTIVE MATERIALS

### 7:28-11.1 General requirements

The disposal of radioactive materials is permitted only to the extent and under the conditions specified in Sections 11.2 through 11.7 of this Chapter.

### 7:28-11.2 Disposal by release into sanitary sewerage systems

(a) An owner may discharge radioactive material into a sanitary sewerage system providing:

1. It is readily soluble or dispersible in water;
2. The quantity of any radioactive material released into the system by the owner in any one day does not exceed the larger of subparagraphs (i) or (ii) of this paragraph:
  - i. The quantity which, if diluted by the average daily quantity of sewage released into the sewer by the owner, will result in an average concentration not greater than the limits specified in Section 6.5(a) (Average concentrations) of this Chapter, Column A, or prorated values if more than one isotope is released: or
  - ii. Ten times the quantity of such material specified in Section 10.9 (Labeling, posting and disposal quantities of radioactive materials) of this Chapter; and
3. The quantity of any radioactive material released in any one month, if diluted by the average monthly quantity of sewage released by the owner, will not result in an average concentration exceeding the limits specified in Section 6.5(a) (Average concentrations) of this Chapter, Column A, or prorated values if more than one isotope is released; and
4. The gross quantity of radioactive material released into the sewerage system by the owner does not exceed one curie per year.

(b) Radioactive wastes excreted by humans shall be exempt from the limitations of subsection (a) of this Section.

### 7:28-11.3 Disposal by discharges into the air, ground waters or surface waters

(a) An owner may dispose of radioactive material into the air outside a controlled area provided the concentration at the point where the material leaves the controlled area is not in excess of the concentration specified in Section 6.5(a) (Average concentrations) of this Chapter, Column D, or prorated values if more than one isotope is discharged. Where the material is discharged through a stack, tube pipe, or similar conduit, the determination may be made with respect to the point where the material leaves such conduit. For purposes of this subsection, concentrations may be averaged over periods not greater than one year.

(b) No owner shall dispose of radioactive material into surface waters or into ground waters without specific, prior permission in writing from the Department.

### 7:28-11.4 Disposal by burial in the soil

(a) No owner shall dispose of radioactive material by burial in the soil without prior approval in writing from the Department.

(b) Sites that have been used for burial of radioactive materials shall not be converted to other uses except with the written permission of the Department.

(c) The owner of any burial ground shall notify the Department in writing not less than 30 days in advance of any transfer of title to the property involved.

### 7:28-11.5 Disposal by transfer to a radioisotope disposal service

(a) An owner may dispose of radioactive materials by transfer to a radioisotope disposal service providing this service has been approved by the Department to receive such materials.

(b) An owner may dispose of radioactive materials by transfer to a person who is authorized to receive such material under a license issued by the Department, a Federal agency, or any agreement state.

### 7:28-11.6 Disposal by incineration

No owner shall incinerate radioactive materials for the purpose of disposal or preparation for disposal except as specifically approved by the Department in writing.

### 7:28-11.7 Disposal by a specially approved method

(a) Any person may apply to the Department for approval of proposed procedure to dispose of radioactive material in a manner not otherwise authorized in this Subchapter.

(b) Each application shall include a description of the radioactive material, including the quantities and kinds of radioactive material and the levels of radioactivity involved, and the proposed manner and conditions of disposal.

(c) The application, where appropriate, shall also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, geological, meteorological, and hydrological characteristics; usage of ground and surface waters in the general area; the nature and location of other potentially affected facilities; and procedures to be observed to minimize the risk of unexpected or hazardous exposures.

### 7:28-11.8 Unauthorized removal

Sources of radiation shall be secured against unauthorized removal from the place of storage.

## SUBCHAPTER 12. REMEDIATION STANDARDS FOR RADIOACTIVE MATERIALS

### Authority

N.J.S.A. 26:2D-1 et seq. and 58:10B-1 et seq.

**Source and Effective Date**

R.2000 d.314, effective August 7, 2000.  
See: 31 N.J.R. 1723(a), 32 N.J.R. 2866(a).

**7:28-12.1 Purpose and scope**

The purpose of this subchapter is to establish minimum standards for the remediation of real property contaminated by radioactive materials. This subchapter also provides direction on remediating a site contaminated with radioactive materials with regard to sampling, surveying, and laboratory requirements, remedial action selection, and remedial action requirements.

**7:28-12.2 Applicability**

(a) The standards in this subchapter are applicable to:

1. Remediation of radioactive contamination of real property by any technologically enhanced naturally occurring radioactive materials;
2. Remediation of radioactive contamination of real property by accelerator-produced radionuclides; and
3. Any other remediation of radioactive contamination including, without limitation, any remediation pursuant to: the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11 et seq.; the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq.; the Industrial Site Recovery Act, N.J.S.A. 13:1K-6 et seq.; the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq.; the Comprehensive Regulated Medical Waste Management Act, N.J.S.A. 13:1E-48.1 et seq.; the Major Hazardous Waste Facilities Siting Act, N.J.S.A. 13:1E-49 et seq.; the Sanitary Landfill Facility Closure and Contingency Fund Act, N.J.S.A. 13:1E-100 et seq.; the Regional Low Level Radioactive Waste Disposal Facility Siting Act, N.J.S.A. 13:1E-177 et seq.; any law or regulation by which the State may compel a person to perform remediation activities; or N.J.A.C. 7:26C.

(b) The standards in this subchapter are not applicable to:

1. Materials containing naturally occurring radionuclides whose concentrations have not been technologically enhanced; or
2. Coal ash that has been or is being used in:
  - i. The manufacture of construction materials including, but not limited to, cinder blocks, concrete products and roofing materials;
  - ii. Road construction materials including, but not limited to, asphalt filler or road base material; or
  - iii. Landfill cover.

(c) The Department shall apply the radiation soil standards in this chapter at applicable sites as "Applicable or Relevant and Appropriate Requirements" as **defined in the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§ 9601 et seq.**

**7:28-12.3 Definitions**

The following words and terms, when used in this subchapter, shall have the following meanings, unless the context clearly indicates otherwise:

"Appropriate period of time" means the length of time required for the radionuclide to decay seven half-lives.

"Committed dose equivalent" means the total dose equivalent averaged throughout any body tissue in the 50 years after intake of a radionuclide into the body.

"Committed effective dose equivalent" means the sum of the products of the committed dose equivalents to individual tissues resulting from an intake of a radionuclide multiplied by the appropriate weighting factor ( $W_T$ ) indicated below:

Organ or Tissue	$W_T$
Gonads	0.25
Breast	0.15
Red bone marrow	0.12
Lung	0.12
Thyroid	0.03
Bone Surfaces	0.03
Remainder	0.30*
Whole Body (external)	1.00

\*0.30 results from 0.06 for each of five "remainder" organs (excluding the skin and the lens of the eye) that receive the highest doses.

"Deep-dose equivalent" means, applied to external whole-body exposure, the dose equivalent at a tissue depth of one centimeter.

"Derived concentration guideline level" means the radionuclide-specific activity concentration corresponding to the release criterion.

"Design features" means those features of a remediation that do not rely on additional expenditures after installation to achieve their intended purpose.

"Dose equivalent" means the product of the absorbed dose (D), the quality factor (Q), and other modifying factors (N). For purposes of this definition,  $N = 1$ .

"Engineering controls" means any mechanism to contain or stabilize contamination or ensure the effectiveness of a remedial action. Engineering controls under this subchapter may include, without limitation, caps, covers, dikes, trenches, leachate collection systems, radon remediation systems, signs, fences and physical access controls.

"Final status survey" is a survey or analysis, performed after remediation, which provides data that demonstrates that all radiological parameters satisfy the remediation standards.

vii. An analysis of both continued use of existing structures and future use scenarios. Future use scenarios shall include, if applicable, the construction of buildings for either unrestricted use remedial actions or limited restricted use remedial actions, including excavations for basements and/or footings.

(g) Engineering controls or institutional controls may be incorporated as part of a petition for an alternative remediation standard provided that these controls will be durable and implemented for an appropriate period of time to achieve their intended purpose.

(h) Computer models acceptable to the Department may be used by the petitioner for an alternative soil standard to confirm that the requirements of N.J.A.C. 7:28-12.9 have been and will continue to be met.

**7:28-12.11 Requirements pertaining to engineering or institutional controls**

(a) All remediation proposals shall designate the intended use(s) of the property. Such intended use(s) shall be restricted as necessary to prevent future exposure, and shall otherwise be consistent with current and projected State and local zoning designations or land uses. For sites not remediated to the unrestricted use standards in N.J.A.C. 7:28-12.9, the Department shall define the nature and duration of all appropriate engineering or institutional controls necessary to meet the standards in N.J.A.C. 7:28-12.9 or 12.10(a), based upon the particular conditions of the site.

(b) In order for any remediation under this subchapter requiring engineering controls or institutional controls to meet the standards in N.J.A.C. 7:28-12.9 or 12.10(a), the person responsible for conducting the remediation shall, in addition to meeting the provisions of N.J.S.A. 58:10B-13:

1. Implement all necessary actions, as determined by the Department, to assure that such engineering or institutional controls are being implemented and maintained for an appropriate period of time; and
2. Provide for the costs of implementing and maintaining the requisite active engineered or institutional controls for an appropriate period of time.

**7:28-12.12 Requirements pertaining to a change in land use**

(a) Any subsequent proposed use of a property that is different from the intended use (other than unrestricted use

remedial actions) described in the original remediation proposal shall require a prior review and prior approval by the Department. To initiate this review, 90 calendar days prior to a proposed change in land use, the person proposing such use shall prepare and submit to the Department, at the Bureau of Environmental Radiation, PO Box 415, Trenton, NJ 08625-0415, and to each affected municipality, a brief written description of the new proposed use as compared to the intended use upon which the original remediation was based including all planned soil excavations, and any additional remedial actions to be implemented.

(b) If the Department determines that the proposed new use may cause the dose limitations of N.J.A.C. 7:28-12.8 to be exceeded, the person requesting the use change shall be required to prepare and submit to the Department's Bureau of Environmental Radiation, PO Box 415, Trenton, NJ 08625-0415, a dose assessment analysis, containing the information required under N.J.A.C. 7:28-12.10(f)2, (g), and (h), to ascertain whether the dose limitation requirements of N.J.A.C. 7:28-12.8 will be met for the proposed new use.

(c) In preparing the dose assessment analysis, the person may incorporate into the new use plan new remedial measures such as different radionuclide in soil concentrations, or radioactive contamination vertical extents, and/or new engineering or institutional controls, provided that for engineering or institutional controls, the person responsible for conducting the remediation provides for the cost of implementing and maintaining them as specified in N.J.A.C. 7:28-12.11(c)3.

**7:28-12.13 Requirements pertaining to the final status survey**

The final status survey is performed to demonstrate that a site meets the remediation standards. It shall be done in accordance with that version of the Department of Environmental Protection's Field Sampling Manual's section on Radiological Assessment, which is incorporated herein by reference, in effect at the time of the survey which may be obtained by calling the Bureau of Environmental Radiation at (609) 984-5400 or from the Radiation Protection Program's web site at <http://www.state.nj.us/dep/rpp/index.htm>. Chapter 12 of the Department's Field Sampling Procedures Manual follows the methodology provided in MARSSIM with some modifications.

**APPENDIX A**

Allowed Incremental Derived Concentration Guideline Levels (pCi/g) for the Gamma and Intake Pathways<sup>(1)</sup>

Nuclide	Feet of Vertical Extent of Residual Radionuclides (VE)								
	VE1	VE2	VE3	VE4	VE5	VE6	VE7	VE8	VE9
Ra226 Unrestricted Use Standards	3	2	2	2	2	2	2	2	2

Ra226 Limited Restricted Use Standards	5	5	5	5	5	5	5	4	4
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Allowed Incremental Derived Concentration Guideline Levels (pCi/g) for the Gamma and Intake Pathways<sup>(1)</sup>

Feet of Uncontaminated Surface Soil (USS)	Feet of Vertical Extent of Residual Radionuclide (VE)								
	VE1	VE2	VE3	VE4	VE5	VE6	VE7	VE8	VE9
Ra226 Restricted Use Standards									
USS 1	22	15	10	8	6	5	5	4	4
USS 2	28	15	10	8	6	5	5	5	5
USS 3	28	15	10	8	6	6	6	6	6
USS 4	28	15	10	8	7	7	7	7	7
USS 5	28	15	10	9	9	9	9	9	9

Allowed Incremental Derived Concentration Guideline Levels (pCi/g) for the Gamma and Intake Pathways<sup>(1)</sup>

Nuclide	Feet of Vertical Extent of Residual Radionuclides (VE)								
	VE1	VE2	VE3	VE4	VE5	VE6	VE7	VE8	VE9
Ra226 Unrestricted Use Standards	0.13	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08
Ra226 Limited Restricted Use Standards	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.15	0.15

Allowed Incremental Derived Concentration Guideline Levels (Bq/g) for the Gamma and Intake Pathways<sup>(1)</sup>

Feet of Uncontaminated Surface Soil (USS)	Feet of Vertical Extent of Residual Radionuclide (VE)								
	VE1	VE2	VE3	VE4	VE5	VE6	VE7	VE8	VE9
Ra226 Restricted Use Standards									
USS 1	0.81	0.55	0.37	0.30	0.22	0.18	0.18	0.15	0.15
USS 2	1.04	0.56	0.37	0.30	0.22	0.18	0.18	0.18	0.18
USS 3	1.04	0.56	0.37	0.30	0.22	0.22	0.22	0.22	0.22
USS 4	1.04	0.56	0.37	0.30	0.26	0.26	0.26	0.26	0.26
USS 5	1.04	0.56	0.37	0.33	0.33	0.33	0.33	0.33	0.33

(1) These Ra226 concentration numbers may be used only when more than one radionuclide is present for the sum of the fractions rule at N.J.A.C. 7:28-12.9(b).

APPENDIX B

Allowed Incremental Derived Concentration Guideline Levels (pCi/g) for the Gamma and Intake Pathways<sup>(1)</sup>

Feet of Uncontaminated Surface Soil (USS)	Feet of Vertical Extent of Residual Radionuclide (VE)								
	VE1	VE2	VE3	VE4	VE5	VE6	VE7	VE8	VE9
Ra226 Unrestricted Use									
USS 1	5*	3*	3	3	3	3	2	2	2
USS 2	7*	4*	4*	3*	3	3	2	2	2
Pre-mixing Values									
USS 3	7	5*	4*	4	3	3	3	3	3
USS 4	11	7*	5*	4	3	3	3	3	3
USS 5	13*	8	6	4	4	4	4	4	4
Ra226 Limited Restricted Use									
USS 1	11*	8*	7*	7*	6*	6*	5*	5*	5*
USS 2	16*	11*	9*	8*	7*	6*	6*	5*	5*
USS 3	21*	13*	10*	9*	7*	6*	6*	6*	6*
Pre-mixing Values									
USS 4	26*	16*	12*	9*	8*	7*	7*	6*	6*
USS 5	31*	18*	11*	10*	9*	8*	7*	7*	7*

\* Back-calculated to ensure 15 mrem/yr TEDE after mixing

Allowed Incremental Derived Concentration Guideline Levels (Bq/g) for the Gamma and Intake Pathways<sup>(1)</sup>

Feet of Uncontaminated Surface Soil (USS)	Feet of Vertical Extent of Residual Radionuclide (VE)								
	VE1	VE2	VE3	VE4	VE5	VE6	VE7	VE8	VE9

Unrestricted	USS 1	0.18*	0.12*	0.12*	0.12*	0.12	0.10	0.09	0.08	0.08
Use	USS 2	0.25*	0.15*	0.15*	0.15*	0.12*	0.11	0.09	0.09	0.09
Pre-mixing	USS 3	0.25*	0.18*	0.17*	0.17	0.14	0.11	0.11	0.11	0.11
Values	USS 4	0.40*	0.25*	0.18*	0.17	0.13	0.13	0.13	0.13	0.13
	USS 5	0.48*	0.32	0.22	0.16	0.16	0.16	0.16	0.16	0.16
Ra226										
Limited	USS 1	0.40*	0.30*	0.26*	0.26*	0.22*	0.22*	0.18*	0.18*	0.18*
Restricted	USS 2	0.59*	0.40*	0.33*	0.30*	0.26*	0.22*	0.22*	0.18*	0.18*
Use	USS 3	0.77*	0.48*	0.37*	0.33*	0.26*	0.22*	0.22*	0.22*	0.22*
Pre-mixing	USS 4	0.96*	0.59*	0.44*	0.33*	0.30*	0.26*	0.26*	0.22*	0.22*
Values	USS 5	1.15*	0.67*	0.41*	0.37*	0.33*	0.30*	0.26*	0.26*	0.26*

\* Back-calculated to ensure 15 mrem/yr TEDE after mixing

(1) These Ra226 concentration numbers may be used only when more than one radionuclide is present for the sum of the fractions rule at N.J.A.C. 7:28-12.9(b).

## SUBCHAPTER 13. REPORTS OF THEFTS AND RADIATION INCIDENTS

### 7:28-13.1 Reports of theft or loss of radioactive materials

The owner from whose possession a theft or loss occurs shall immediately notify the Department by telephone and telegraph of any theft or loss of radioactive material in such quantities and under such circumstances that a substantial radiation hazard and/or contamination hazard may result.

### 7:28-13.2 Reportable radiation incidents

(a) The owner shall immediately notify the Department by telephone and telegraph of any radiation incident which may have caused or threatens to cause the following:

1. Exposure of the whole body of any individual to 25 rems or more of radiation; exposure of the skin of the whole body of any individual to 150 rems or more of radiation; or exposure of the feet, ankles, hands or forearms of any individual to 375 rems or more of radiation;

2. The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limits specified for such materials in Section 6.5(a) (Average concentrations) of this Chapter Columns C and D, or prorated values if more than one isotope is released;

3. A loss of one working week or more of the operation of any facilities affected; or

4. Damage to property in excess of \$100,000.

(b) The names of any individuals who have been exposed to radiation levels set forth in subsection (a) of this Section shall not be included in the report.

(c) The owner shall notify the Department within 24 hours by telephone and telegraph of any radiation incident which may have caused or threatens to cause the following:

1. Exposure of the whole body of any individual to five rems or more of radiation; exposure of the skin of the whole body of any individual to 30 rems or more of radiation; or exposure of the feet, ankles, hands or forearms to 75 rems or more of radiation;

2. The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 500 times the limit specified for such materials in Section 6.5(a) (Average concentrations) of this Chapter Columns C and D, or prorated values if more than one isotope is released;

3. A loss of one day or more of the operation of any facilities affected; or

4. Damage to property in excess of \$1,000.

(d) The names of any individuals who have been exposed to radiation levels set forth in subsection (c) of this Section shall not be included in the report.

(e) The owner shall notify the Department in writing within 30 days of the following:

1. Each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit Subchapter 6 (Permissible Dose Rated, Radiation Levels and Concentrations) of this Chapter, or of a licensee's license;

2. Any incident for which notification is required by subsections (a) and (c) of this Section; or

3. Levels of radiation or concentrations of radioactivity, not involving exposure of any individual in excess of any applicable limit Subchapter 6 (Permissible Dose Rated, Radiation Levels and Concentrations) of this Chapter, outside a controlled area in excess of ten times the limits of Section 6.2 (Radiation levels outside controlled areas) and Subchapter 11 (Disposal of Radioactive Materials) of this Chapter, or of a licensee's license.

(f) The reports set forth in subsection (e) of this Section shall describe the extent of exposure of individuals to radiation or to radioactive materials, the levels of radiation and concentrations of radioactive materials involved, the cause of the exposure, levels, or concentrations and corrective steps taken or planned to assure against a recurrence.

(g) In each case where subsection (e)1 of this Section requires a report to the Department of exposure of an individual, the owner shall:

1. Delete from the report all references to the names and addresses of individuals so exposed. The identity of such individuals shall be privileged and shall be submitted as a separate document of such report; and

2. Concurrently given written notification to the individual of the nature and extent of the exposure. Such notice shall contain the following statement: "This report is furnished to you under the provisions of Subchapter 13 (Reports of Thefts and Radiation Incidents) of the New Jersey Administrative Code. You should preserve this report for future reference."

## SUBCHAPTER 14. THERAPEUTIC INSTALLATIONS

### 7:28-14.1 Scope

(a) This subchapter covers therapeutic installations used in the healing arts. These therapeutic installations include x-ray, accelerator and teletherapy installations. No registrant shall operate or permit the operation of therapeutic equipment used in the healing arts unless the equipment and installation meet the applicable requirements of this subchapter.