SUBCHAPTER 1. GENERAL PROVISIONS1. 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 Bureau of Radiation Protection, Department of Environmental Protection, and shall govern all persons installing, using, handling, transporting or storing sources of radiation.

7:28-1.2 Construction

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

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, infrared, 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.

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

"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.

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 x 10 E+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 therapetic 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:

"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 (2) 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 (2) 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 menas the dose corresponding to the absorption of one joule per kiogram. One rad equals 10/2 grays.

"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.

"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 10/2 sieverts.

(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:

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Neutron energy (Mev)	Number of neutrons per square centi-meter equivalent to a dose of 1 rem (neutron/cm/2)	Average flux to deliver 100 milli-rem in 40 hours (neutrons/cm/2 per sec.)
Thermal	970 x 10/6	670
0.001	720 x 10/6	500
0.005	820 x 10/6	570
0.02	400 x 10/6	280
0.1	120 x 10/6	80
0.5	43 x 10/6	30
1.0	26 x 10/6	18
2.5	29 x 10/6	20
5.0	26 x 10/6	18
7.5	24 x 10/6	17
10	24 x 10/6	17
10 to 30	14 x 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.

"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 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 (+63).

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dV}\right)$$

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".

As amended, R.1984 d.337, eff. 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).

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 and Release Prevention Element, PO Box 415, Trenton, New Jersey 08625-0415. The physical location of the office is 25 Arctic Parkway, Ewing, New Jersey 08638

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

Radiation Protection and Release Prevention Element
New Jersey Department of Environmental Protection
25 Arctic Parkway
Ewing, NJ 08638
Telephone: (609)984-5462
Hours: 8:00 A.M. to 5:00 P.M. daily, except Saturday, Sunday, and Holidays
After hours and weekends: (609)292-7172 or toll free: 1 (877) 927-6337 (1 (877) WARN-DEP)

2. Communications Officer

Civil Defense/Civil Defense Bureau
New Jersey State Police
W. Trenton, New Jersey 08628
Telephone: (609) 882-2000
Hours: 24 hours, seven days.