TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE I: ATOMIC RADIATION
CHAPTER I: POLLUTION CONTROL BOARD

PART 1000
RADIATION HAZARDS

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AUTHORITY: Implementing Section 25(b) and authorized by Section 27 of the Environmental Protection Act (Ill. Rev. Stat. 1985, ch. 111 1/2, pars. 1025(b) and 1027).

SOURCE: Adopted in R82-2 at 9 Ill. Reg. 19391, effective December 4, 1985; amended in R82-2(B) at 10 Ill. Reg. 12938, effective July 21, 1986.

SUBPART A: GENERAL PROVISIONS

Section 1000.101 Authority

The Pollution Control Board adopts the rules and regulations contained in this title pursuant to the authority of Title VI-A of the Environmental Protection Act. (Ill. Rev. Stat. 1983, ch. 111- 1/2, par. 1025(b)).

Section 1000.102 Purpose and Policy

a) The regulations in this Part establish standards for protection against radiological air pollutants associated with materials and activities under licenses issued by the United States Nuclear Regulatory Commission pursuant to the Atomic Energy Act of 1954 (42 U.S.C. 5801 et seq.) as amended, and the Energy Reorganization Act of 1974 (42 U.S.C. 5801 et seq.)

b) It is the policy of the Pollution Control Board that persons subject to this Part shall, in addition to complying with the requirements of this Part, make every reasonable effort to maintain radiation exposures in, and releases of radioactive materials to, unrestricted areas as low as is reasonably achievable. The term "as low as is reasonably achievable" means as low as is reasonably achievable taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, in relation to the utilization of atomic energy in the public interest. Persons licensed by the United States Nuclear Regulatory Commission to operate light-water-cooled nuclear power reactors shall be deemed to satisfy the requirements of this subsection if they achieve the design objectives and limiting conditions for operation set out in 10 CFR 50, Appendix I (1984). This Part incorporates no further amendments or editions to those objectives and conditions for operation.

Section 1000.103 Scope

The requirements of this Part apply to all persons who receive, possess, use, or transfer material licensed pursuant to Parts 30 through 35, 40, or 70, or who are licensed to operate a production or utilization facility pursuant to 10 CFR 50 of the regulations of the United States Nuclear Regulatory Commission.

SUBPART B: DEFINITIONS

Section 1000.201 Definitions

As used in this Part:

"Act" means the Environmental Protection Act, Ill. Rev. Stat., 1983, ch. 111- 1/2, pars 1001 et seq.

"Board" means the Illinois Pollution Control Board.

"Department" means the Illinois Department of Nuclear Safety.

"Dose" means the quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body. When these regulations specify a dose during a period of time, the dose means the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time. Several different units of dose are in current use. Definitions of units as used in these regulations are set forth in the definitions of "Rad" and "Rem" in this Section.

"Individual" means any human being.

"Licensed activity" means any activity engaged in under a general or specific license issued by the NRC.

"Licensed facility" means any facility constructed or operated under a permit or a general or specific license issued by the NRC.

"Licensed material" means any material received, possessed, used, or transferred under a general or specific license issued by the NRC.

"Licensee" means any person to whom a permit or a general or specific license has been issued by the NRC.

"NRC" means the United States Nuclear Regulatory Commission.

"Rad" means a measure of the dose of any radiation to body tissues in terms of the energy absorbed per unit mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue. (One millirad (mrad) = 0.001 rad).

"Radiation" means any or all of the following: alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but not sound or radio waves, or visible, infrared, or ultraviolet light.

"Radioactive material" and "radioactive emissions" means any dusts, particulates, fumes, mists, vapors, or gases which spontaneously emit ionizing radiation.

"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 received from an exposure to one roentgen of X-rays. (One millirem (mrem) = 0.001 rem). The relation of rem to other dose units depends upon the biological effect under consideration and upon the condition of irradiation. For the purpose of this Part, any of the following is considered to be equivalent to a dose of one rem:

An exposure to one roentgen of X- or gamma radiation;

A dose of one rad due to X-, gamma, or beta radiation;

A dose of 0.1 rad due to neutrons or high energy protons;

A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye. If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, one rem of neutron radiation may for purposes of this Part 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 neutrons, the incident number of neutrons per square centimeter equivalent to one rem may be estimated from the following table.

Neutron Flux Dose Equivalents

Neutron energy (Mev)	No. of Neutron per square centimeter equivalent to a dose of 1 rem (neutrons/cm^2)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm^2) per second
Thermal	970×10^6	670
0.0001	720×10^6	500
0.005	820×10^6	570

0.02	400×10^6	280
0.1	120×10^6	80
0.5	43×10^6	30
1.0	26×10^6	18
2.5	29×10^6	20
5.0	26×10^6	18
7.5	24×10^6	17
10.0	24×10^6	17
10 to 30	14×10^6	10

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

"Unrestricted area" means any area access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.

(Source: Amended at 10 Ill. Reg. 12938, effective July 21, 1986)

SUBPART C: STANDARDS AND LIMITATIONS

Section 1000.301 Permissible Levels of Radiation in Unrestricted Areas

No person shall possess, use, receive, or transfer licensed material or engage in licensed activities in such manner as to create in any unrestricted area:

a) Radiation levels in air such that any individual would be likely, when all radioactive emissions by the licensee are taken into account, to receive a dose to the whole body in excess of 0.5 rem in any one year;

b) Radiation levels in air which, if an individual were continuously present in the area, could result, when all radioactive emissions by the licensee are taken into account, in his receiving a dose in excess of 2 millirems in any one hour; or

c) Radiation levels in air which, if an individual were continuously present in the area, could result, when all radioactive emissions by licensee are taken into account, in his receiving a dose in excess of 100 millirems in any seven consecutive days.

Section 1000.302 Radioactive Emissions to Unrestricted Areas

a) No person shall possess, use, receive, or transfer licensed material or engage in licensed activities so as to release to air in an unrestricted area radioactive material in concentrations which exceed the limits specified in Appendix A of this Part. For purposes of this Section concentrations may be averaged over a period not greater than one year.

b) For the purpose of this section the concentration limits in Appendix A of this Part shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit. If the conduit discharges within the restricted area, the concentration at the boundary may be determined by applying established factors for dilution, dispersion, or decay between the point of discharge and the boundary.

SUBPART D: ADDITIONAL REQUIREMENTS

Section 1000.401 Applicability

The provisions of this part apply to radiation doses received by members of the public in the general environment and to radioactive materials introduced into the general environment as the result of operations which are part of a nuclear fuel cycle.

Section 1000.402 Definitions

As used in this Subpart:

"Curie" (Ci) means that quantity of radioactive material producing 37 billion nuclear transformations per second. (One millicurie (mCi)=0.001 Ci.)

"Dose equivalent" means the product of absorbed dose and appropriate factors to account for differencies in biological effectiveness due to the quality of radiation and its spatial distribution in the body. The unit of dose equivalent is the "rem." (One millirem (mrem)=0.001 rem.)

"General environment" means the total terrestrial, atmospheric and aquatic environments outside sites upon which any operation which is part of a nuclear fuel cycle is conducted.

"Gigawatt-year" refers to the quantity of electrical energy produced at the busbar of a generating station. A gigawatt is equal to one billion watts. A gigawatt-year is equivalent to the amount of energy output represented by an average electric power level of one gigawatt sustained for one year.

"Member of the public" means any individual that can receive a radiation dose in the general environment, whether he may or may not also be exposed to radiation in an occupation associated with a nuclear fuel cycle. However, an individual is not considered a member of the public during any period in which he is engaged in carrying out any operation which is part of a nuclear fuel cycle.

"Nuclear fuel cycle" means the operations defined to be associated with the production of electrical power for public use by any fuel cycle through utilization of nuclear energy.

"Organ" means any human organ exclusive of the dermis, the epidermis, or the cornea.

"Site" means the area contained within the boundary of a location under the control of persons possessing or using radioactive material on which is conducted one or more operations covered by this part.

"Uranium fuel cycle" means the operations of milling of uranium ore, chemical conversion of uranium, isotopic enrichment of uranium, fabrication of uranium fuel, generation of electricity by a light-water-cooled nuclear power plant using uranium fuel, and reprocessing of spent uranium fuel, to the extent that these directly support the production of electrical power for public use utilizing nuclear energy, but excludes mining operations, operations at waste disposal sites, transportation of any radioactive material in support of these operations, and the reuse of recovered nonuranium special nuclear and by-product materials from the cycle.

Section 1000.403 Environmental Standards for Uranium Fuel Cycle

Operations covered by this Subpart shall be conducted in such a manner as to provide reasonable assurance that:

a) The annual dose equivalent does not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public as the result of exposures to planned discharges of radioactive materials, radon and its daughters excepted, to the general environment from uranium fuel cycle operations and to radiation from these operations.

b) The total quantity of radioactive materials entering the general environment from the entire uranium fuel cycle, per gigawatt-year of electrical energy produced by the fuel cycle, contains less than 50,000 curies of krypton-85, 5 millicuries of iodine-129, and 0.5 millicuries combined of plutonium-239 and other alpha-emitting transuranic radionuclides with the halflives greater than one year.

SUBPART E: RECORDS

Section 1000.501 Records

All persons subject to this Part shall submit to the Department, with respect to any material or facility permitted or licensed by the NRC or for which an NRC permit or license is sought:

a) Preliminary Safety Analysis Report and Final Safety Analysis Report, as described in 10 CFR 50.34.

b) Application for Construction Permit and for all amendments thereto, including information required by 10 CFR 50.34a, 50.36, and 51.20.

c) Environmental Impact Appraisal, Draft and Final Environmental Impact Statement, Negative Declaration, or other document prepared by the NRC under 10 CFR 51.

d) Operating Permit and all amendments thereto, including Technical Specifications under 10 CFR 50.36a.

e) Application for Amendment to Operating License.

f) All data, records, and reports submitted to the NRC in connection with determining or predicting radiation levels in air in unrestricted areas or the type or amount of radioactive materials emitted into air conducted by or for such persons.

Section 1000.502 Notification of Incidents

All person subject to this Part shall immediately notify by telephone and telegraph, mailgram, or facsimile, the Manager of the Office of Nuclear Facility Safety of the Illinois Department of Nuclear Safety, 1035 Outer Park Drive, Springfield, Illinois 62704, of any incident or condition arising from the use or possession of licensed materials or facilities or the conducting of licensed activities which may have caused or threatens to cause emissions or radiation levels in excess of those allowed under this Part.

Section 1000.503 Other Provisions

a) The definitions set out in 35 Ill. Adm. Code 201.102 apply to this Part.

b) All persons subject to this Part are subject to the requirements and provisions 35 Ill. Adm. Code 201.122, 201.123, 201.124, 201.125, 201. 126, 201.141, 201.150 and 201.151.

Section 1000.APPENDIX A Concentrations in Air Above Natural Background

Element (atomic number)	Isotope(1)		µCi/ml
Actinium (89)	AC 227		S8 x 10^{-14}
			I9 x 10^{-13}
			AC 228S3 x 10^{-9}
			I6 x 10^{-10}
Americium (95)	Am 241	S	2 x 10^{-13}
			I4 x 10^{-12}
			Am 242mS2 x 10^{-13}
			I9 x 10^{-12}
			Am 242S1 x 10^{-9}
			I2 x 10^{-9}
			Am 243S2 x 10^{-13}
			I4 x 10^{-12}
			Am 244S1 x 10^{-7}
			I8 x 10^{-7}
Antimony	Sb 122		S6 x 10^{-9}
			I5 x 10^{-9}
			Sb 124S5 x 10^{-9}
			I7 x 10^{-10}
			Sb 125S2 x 10^{-8}
		I	I9 x 10^{-10}
Argon (18)	A 37		Sub^{2}1 x 10^{-4}
			A 41Sub4 x 10^{-8}
Arsenic (33)	As 73		S7 x 10^{-8}
			I1 x 10^{-8}
			As 74S1x 10^{-8}
			I4 x 10^{-9}
			As 76S4 x 10^{-9}
			I3 x 10^{-9}
			As 77S2 x 10^{-8}
			I1 x 10^{-8}
Astatine (85)	At 211	S	2 x10^{-10}
		I	1 x 10^{-9}
Barium (56)	Ba 131	S	4 x 10^{-8}
		I	1 x 10^{-8}
	Ba 140	S	4 x 10^{-9}
		I	1 x 10^{-9}

Berkelium (97)	Bk 249	S	3×10^{-11}
		I	4×10^{-9}
	Bk 250	S	5×10^{-9}
		I	4×10^{-8}
Berylium (4)	Be 7	S	2×10^{-7}
		I	4×10^{-8}
Bismuth (83)	Bi 206	S	6×10^{-9}
		I	5×10^{-9}
	Bi 207	S	6×10^{-9}
		I	5×10^{-10}
	Bi 210	S	2×10^{-10}
		I	2×10^{-10}
	Bi 212	S	3×10^{-9}
		I	7×10^{-9}
Bromine (35)	Br 82	S	4×10^{-8}
		I	6×10^{-9}
Cadmium (48)	Cd 109	S	2×10^{-9}
		I	3×10^{-9}
	Cd 115m	S	1×10^{-9}
		I	1×10^{-9}
	Cd 115	S	8×10^{-9}
		I	6×10^{-9}
Calcium (20)	Ca 45	S	1×10^{-9}
		I	4×10^{-9}
	Ca 47	S	6×10^{-9}
		I	6×10^{-9}
Californium (98)	Cf 249	S	5×10^{-14}
		I	3×10^{-12}
	Cf 250	S	2×10^{-13}
		I	3×10^{-12}
	Cf 251	S	6×10^{-14}
		I	3×10^{-12}
	Cf 252	S	2×10^{-13}
		I	1×10^{-12}
	Cf 253	S	3×10^{-11}
		I	3×10^{-11}
	Cf 254	S	2×10^{-13}
		I	2×10^{-13}
Carbon (6)	C 14	S	1×10^{-7}
	(CO(2))	Sub	1×10^{-6}
Cerium (58)	Ce 141	S	2×10^{-8}
		I	5×10^{-9}
	Ce 143	S	9×10^{-9}
		I	7×10^{-9}
	Ce 144	S	3×10^{-10}
		I	2×10^{-10}

Cesium (55)	Cs 131	S	4×10^{-7}
		I	1×10^{-7}
	Cs 134m	S	1×10^{-6}
		I	2×10^{-7}
	Cs 134	S	1×10^{-9}
		I	4×10^{-10}
	Cs 135	S	2×10^{-8}
		I	3×10^{-9}
	Cs 136	S	1×10^{-8}
		I	6×10^{-9}
	Cs 137	S	2×10^{-9}
		I	5×10^{-10}
Chlorine (17)	Cl 36	S	1×10^{-8}
		I	8×10^{-10}
	Cl 38	S	9×10^{-8}
		I	7×10^{-8}
Chromium (24)	Cr 51	S	4×10^{-7}
		I	8×10^{-8}
Cobalt (27)	Co 57	S	1×10^{-7}
		I	6×10^{-9}
	Co 58m	S	6×10^{-7}
		I	3×10^{-7}
	Co 58	S	3×10^{-8}
		I	2×10^{-9}
	Co 60	S	1×10^{-8}
		I	3×10^{-10}
Copper (29)	Cu 64	S	7×10^{-8}
		I	4×10^{-8}
Curium (96)	Cm 242	S	4×10^{-12}
		I	6×10^{-12}
	Cm 243	S	2×10^{-13}
		I	3×10^{-12}
	Cm 244	S	3×10^{-13}
		I	3×10^{-12}
	Cm 245	S	2×10^{-13}
		I	4×10^{-12}
	Cm 246	S	2×10^{-13}
		I	4×10^{-12}
	Cm 247	S	2×10^{-13}
		I	4×10^{-12}
	Cm 248	S	2×10^{-14}
		I	4×10^{-13}
	Cm 249	S	4×10^{-7}
		I	4×10^{-7}
Dysprosium (66)	Dy 165	S	9×10^{-8}
		I	7×10^{-8}

	Dy 166	S	8×10^{-9}
		I	7×10^{-9}
Einsteinium (99)	Es 253	S	3×10^{-11}
		I	2×10^{-11}
	Es 254m	S	2×10^{-10}
		I	2×10^{-10}
	Es 254	S	6×10^{-13}
		I	4×10^{-12}
	Es 255	S	2×10^{-11}
		I	1×10^{-11}
Erbium (68)	Er 169	S	2×10^{-8}
		I	1×10^{-8}
	Er 171	S	2×10^{-8}
		I	2×10^{-8}
Europium (63)	Eu 152	S	1×10^{-8}
	(T/2=9 2 hrs) I	1×10^{-8}	
	Eu 152	S	4×10^{-10}
	(T/2=13 yrs) I	6×10^{-10}	
	Eu 154	S	1×10^{-10}
		I	2×10^{-10}
	Eu 155	S	3×10^{-9}
		I	3×10^{-9}
Fermium (100)	Fm 254	S	2×10^{-9}
		I	2×10^{-9}
	Fm 255	S	6×10^{-10}
		I	4×10^{-10}
	Fm 256	S	1×10^{-10}
		I	6×10^{-11}
Fluorine (9)	F 18	S	2×10^{-7}
		I	9×10^{-8}
Gadolinium (64)	Gd 153	S	8×10^{-9}
		I	3×10^{-9}
	Gd 159	S	2×10^{-8}
		I	1×10^{-8}
Gallium (31)	Ga 72	S	8×10^{-9}
		I	6×10^{-9}
Germanium (32)	Ge 71	S	4×10^{-7}
		I	2×10^{-7}
Gold (79)	Au 196	S	4×10^{-8}
		I	2×10^{-8}
	Au 198	S	1×10^{-8}
		I	8×10^{-9}
	Au 199	S	4×10^{-8}
		I	3×10^{-8}
Hafnium (72)	Hf 181	S	1×10^{-9}
		I	3×10^{-9}

Holmium (67)	Ho 166	S	7×10^{-9}
		I	6×10^{-9}
Hydrogen (1)	H3	S	2×10^{-7}
		I	2×10^{-7}
		Sub	4 x 10-(5)
Indium (49)	In 113m	S	3×10^{-7}
		I	2×10^{-7}
	In 114m	S	4×10^{-9}
		I	7×10^{-10}
	In 115m	S	8×10^{-8}
		I	6×10^{-8}
	In 115	S	$9 \mathrm{X} 10^{-9}$
		I	1×10^{-9}
Iodine (53)	I 125	S	8×10^{-11}
		I	6×10^{-9}
	I 126	S	9×10^{-11}
		I	1×10^{-8}
	I 129	S	2×10^{-11}
		I	2×10^{-9}
	I 131	S	1×10^{-10}
		I	1×10^{-8}
	I 132	S	3×10^{-9}
		I	3×10^{-8}
	I 133	S	4×10^{-10}
		I	7×10^{-9}
	I 134	S	6×10^{-9}
		I	1×10^{-7}
	I 135	S	1×10^{-9}
		I	1×10^{-8}
Iridium (77)	Ir 190	S	4×10^{-8}
		I	1×10^{-8}
	Ir 192	S	4×10^{-9}
		I	9×10^{-10}
	Ir 194	S	8×10^{-9}
		I	5×10^{-9}
Iron (26)	Fe 55	S	3×10^{-8}
		I	3×10^{-8}
	Fe 59	S	5×10^{-9}
		I	2×10^{-9}
Krypton (36)	Kr 85m	Sub	1×10^{-7}
	Kr 85	Sub	3×10^{-7}
	Kr 87	Sub	2×10^{-8}
	Kr 88	Sub	2×10^{-8}
Lanthanum (57)	La 140	S	5×10^{-9}
		I	4×10^{-9}
Lead (82)	Pb 203	S	9×10^{-8}

		I	6×10^{-8}
	Pb 210	S	4×10^{-12}
		I	8×10^{-12}
	Pb 212	S	6×10^{-10}
		I	7×10^{-10}
Lutetium (71)	Lu 177	S	2×10^{-8}
		I	2×10^{-8}
Manganese (25)	Mn 52	S	7×10^{-9}
		I	5×10^{-9}
	Mn 54	S	1×10^{-8}
		I	1×10^{-9}
	Mn 56	S	3×10^{-8}
		I	2×10^{-8}
Mercury (80)	Hg 197m	S	3×10^{-8}
		I	3×10^{-8}
	Hg 197	S	4×10^{-8}
		I	9×10^{-8}
	Hg 203	S	2×10^{-9}
		I	4×10^{-9}
Molybdenum (42)	Mo 99	S	3×10^{-8}
		I	7×10^{-9}
Neodymium (60)	Nd 144	S	3×10^{-12}
		I	1×10^{-11}
	Nd 147	S	1×10^{-8}
		I	8×10^{-9}
	Nd 149	S	6×10^{-8}
		I	5×10^{-8}
Neptunium (93)	Np 237	S	1×10^{-13}
		I	4×10^{-12}
	Np 239	S	3×10^{-8}
		I	2×10^{-8}
Nickel (28)	Ni 59	S	2×10^{-8}
		I	3×10^{-8}
	Ni 63	S	2×10^{-9}
		I	1×10^{-8}
	Ni 65	S	3×10^{-8}
		I	2×10^{-8}
Niobium (Columbium) (41)	Nb 93m	S	4×10^{-9}
		I	5×10^{-9}
	Nb 95	S	2×10^{-8}
		I	3×10^{-9}
	Nb 97	S	2×10^{-7}
		I	2×10^{-7}
Osmium (76)	Os 185	S	2×10^{-8}
		I	2×10^{-9}

	Os 191m	S	6×10^{-7}
		I	3×10^{-7}
	Os 191	S	4×10^{-8}
		I	1×10^{-8}
	Os 193	S	1×10^{-8}
		I	9×10^{-9}
Palladium (46)	Pd 103	S	5×10^{-8}
		I	3×10^{-8}
	Pd 109	S	2×10^{-8}
		I	1×10^{-8}
Phosphorus (15)	P 32	S	2×10^{-9}
		I	3×10^{-9}
Platinum (78)	Pt 191	S	3×10^{-8}
		I	2×10^{-8}
	Pt 193m	S	2×10^{-7}
		I	2×10^{-7}
	Pt 193	S	4×10^{-8}
		I	1×10^{-8}
	Pt 197m	S	2×10^{-7}
		I	2×10^{-7}
	Pt 197	S	3×10^{-8}
		I	2×10^{-8}
Plutonium (94)	Pu 238	S	7×10^{-14}
		I	1×10^{-12}
	Pu 239	S	6×10^{-14}
		I	1×10^{-12}
	Pu 240	S	6×10^{-14}
		I	1×10^{-12}
	Pu 241	S	3×10^{-12}
		I	1×10^{-9}
	Pu 242	S	6×10^{-14}
		I	1×10^{-12}
	Pu 243	S	6×10^{-8}
		I	8×10^{-8}
	Pu 244	S	6×10^{-14}
		I	1×10^{-12}
Polonium (84)	Po 210	S	2×10^{-11}
		I	7×10^{-12}
Potassium (19)	K 42	S	7×10^{-8}
		I	4×10^{-9}
Praseodymium (59)	Pr 142	S	7×10^{-9}
		I	5×10^{-9}
	Pr 143	S	1×10^{-8}
		I	6×10^{-9}
Promethium (61)	Pm 147	S	2×10^{-9}
		I	3×10^{-9}

	Pm 149	S	1×10^{-8}
		I	8×10^{-9}
Protoactinium (91)	Pa 230	S	6×10^{-11}
		I	3×10^{-11}
	Pa 231	S	4×10^{-14}
		I	4×10^{-12}
	Pa 233	S	2×10^{-8}
		I	6×10^{-9}
Radium (88)	Ra 223	S	6×10^{-11}
		I	8×10^{-12}
	Ra 224	S	2×10^{-10}
		I	2×10^{-11}
	Ra 226	S	3×10^{-12}
		I	2×10^{-12}
	Ra 228	S	2×10^{-12}
		I	1×10^{-12}
Radon (86)	Rn 220	S	1×10^{-8}
	Rn 222(3)	3×10^{-9}	
Rhenium (75)	Re 183	S	9×10^{-8}
		I	5×10^{-9}
	Re 186	S	2×10^{-8}
		I	8×10^{-9}
	Re 187	S	3×10^{-7}
		I	2×10^{-8}
	Re 188	S	1×10^{-8}
		I	6×10^{-9}
Rhodium (45)	Rh 103m	S	3×10^{-6}
		I	2×10^{-6}
	Rh 105	S	3×10^{-8}
		I	2×10^{-8}
Rubidium (37)	Rb 86	S	1×10^{-8}
		I	2×10^{-9}
	Rb 87	S	2×10^{-8}
		I	2×10^{-9}
Ruthenium (44)	Ru 97	S	8×10^{-8}
		I	6×10^{-8}
	Ru 103	S	2×10^{-8}
		I	3×10^{-9}
	Ru 105	S	2×10^{-8}
		I	2×10^{-8}
	Ru 106	S	3×10^{-9}
		I	2×10^{-10}
Samarium (62)	Sm 147	S	2×10^{-12}
		I	9×10^{-12}
	Sm 151	S	2×10^{-9}
		I	5×10^{-9}

	Sm 153	S	2×10^{-8}
		I	1×10^{-8}
Scandium (21)	Sc 46	S	8×10^{-9}
		I	8×10^{-10}
	Sc 47	S	2×10^{-8}
		I	2×10^{-8}
	Sc 48	S	6×10^{-9}
		I	5×10^{-9}
Selenium (34)	Se 75	S	4×10^{-8}
		I	4×10^{-9}
Silicon (14)	Si 31	S	2×10^{-7}
		I	3×10^{-8}
Silver (47)	Ag 105	S	2×10^{-8}
		I	3×10^{-9}
	Ag 110m	S	7×10^{-9}
		I	3×10^{-10}
	Ag 111	S	1×10^{-8}
		I	8×10^{-9}
Sodium (11)	Na 22	S	6×10^{-9}
		I	3×10^{-10}
	Na 24	S	4×10^{-8}
		I	5×10^{-9}
Strontium (38)	Sr 85m	S	1×10^{-6}
		I	1×10^{-6}
	Sr 85	S	8×10^{-9}
		I	4×10^{-9}
	Sr 89	S	3×10^{-10}
		I	1×10^{-9}
	Sr 90	S	3×10^{-11}
		I	2×10^{-10}
	Sr 91	S	2×10^{-8}
		I	9×10^{-9}
	Sr 92	S	2×10^{-8}
		I	1×10^{-8}
Sulfur (16)	S 35	S	9×10^{-9}
		I	9×10^{-9}
Tantalum (73)	Ta 182	S	1×10^{-9}
		I	7×10^{-10}
Technetium (43)	Tc 96m	S	3×10^{-6}
		I	1×10^{-6}
	Tc 96	S	2×10^{-8}
		I	8×10^{-9}
	Tc 97m	S	8×10^{-8}
		I	5×10^{-9}
	Tc 97	S	4×10^{-7}
		I	1×10^{-8}

	Tc 99m	S	1×10^{-6}
		I	5×10^{-7}
	Tc 99	S	7×10^{-8}
		I	2×10^{-9}
Tellurium (52)	Te 125m	S	1×10^{-8}
		I	4×10^{-9}
	Te 127m	S	5×10^{-9}
		I	1×10^{-9}
	Te 127	S	6×10^{-8}
		I	3×10^{-8}
	Te 129m	S	3×10^{-9}
		I	1×10^{-9}
	Te 129	S	2×10^{-7}
		I	1×10^{-7}
	Te 131m	S	1×10^{-8}
		I	6×10^{-9}
	Te 132	S	7×10^{-9}
		I	4×10^{-9}
Terbium (65)	Tb 160	S	3×10^{-9}
		I	1×10^{-9}
Thallium (81)	Tl 200	S	9×10^{-8}
		I	4×10^{-8}
	Tl 201	S	7×10^{-8}
		I	3×10^{-8}
	Tl 202	S	3×10^{-8}
		I	8×10^{-9}
	Tl 204	S	2×10^{-8}
		I	9×10^{-10}
Thorium (90)	Th 227	S	1×10^{-11}
		I	6×10^{-12}
	Th 228	S	3×10^{-13}
		I	2×10^{-13}
	Th 230	S	8×10^{-14}
		I	3×10^{-13}
	Th 231	S	5×10^{-8}
		I	4×10^{-8}
	Th 232	S	1×10^{-12}
		I	1×10^{-12}
	Th natural	S	2×10^{-12}
		I	2×10^{-12}
	Th 234	S	2×10^{-9}
		I	1×10^{-9}
Thulium (69)	Tm 170	S	1×10^{-9}
		I	1×10^{-9}
	Tm 171	S	4×10^{-9}
		I	8×10^{-9}

Tin (50)	Sn 113	S	1 x 10^{-8}
		I	2 x 10^{-9}
	Sn 125	S	4 x 10^{-9}
		I	3 x 10^{-9}
Tungsten (Wolfram) (74)	W 181	S	8 x 10^{-8}
		I	4 x 10^{-9}
	W 185	S	3 x 10^{-8}
		I	4 x 10^{-9}
	W 187	S	2 x 10^{-8}
		I	1 x 10^{-8}
Uranium (92)	U 230	S	1 x 10^{-11}
		I	4 x 10^{-12}
	U 232	S	3 x 10^{-12}
		I	9 x 10^{-13}
	U 233	S	2 x 10^{-11}
		I	4 x 10^{-12}
	U 234	S(4)	2 x 10^{-11}
		I	4 x 10^{-12}
	U 235	S(4)	2 x 10^{-11}
		I	4 x 10^{-12}
	U 236	S	2 x 10^{-11}
		I	4 x 10^{-12}
	U 238	S(4)	3 x 10^{-12}
		I	5 x 10^{-12}
	U 240	S	8 x 10^{-9}
		I	6 x 10^{-9}
	U-natural S(4)	5 x 10^{-12}	
		I	5 x 10^{-12}
Vanadium (23)	V 48	S	6 x 10^{-9}
		I	2 x 10^{-9}
Xenon (54)	Xe 131m	Sub	4 x 10^{-7}
	Xe 133	Sub	3 x 10^{-7}
	Xe 133m	Sub	3 x 10^{-7}
	Xe 135	Sub	1 x 10^{-7}
Ytterbium (70)	Yb 175	S	2 x 10^{-8}
		I	2 x 10^{-8}
Yttrium (39)	Y 90	S	4 x 10^{-9}
		I	3 x 10^{-9}
	Y 91m	S	8 x 10^{-7}
		I	6 x 10^{-7}
	Y 91	S	1 x 10^{-9}
		I	1 x 10^{-9}
	Y 92	S	1 x 10^{-8}
		I	1 x 10^{-8}
	Y 93	S	6 x 10^{-9}

		I	5×10^{-9}
Zinc (30)	Zn 65	S	4×10^{-9}
		I	2×10^{-9}
	Zn 69m	S	1×10^{-8}
		I	1×10^{-8}
	Zn 69	S	2×10^{-7}
		I	3×10^{-7}
Zirconium (40)	Zr 93	S	4×10^{-9}
		I	1×10^{-8}
	Zr 95	S	4×10^{-9}
		I	1×10^{-9}
	Zr 97	S	4×10^{-9}
		I	3×10^{-9}
Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radio-active half-life less than 2 hours	Sub	3×10^{-6}	
Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radio- active half-life greater than 2 hours	1×10^{-10}		
Any single radionuclide not listed above, which decays by alpha emission or spontaneous fission	2×10^{-14}		

[1]Soluble (S); Insoluble (I).

[2]"Sub" means that values given are for submersion in a semispherical infinite cloud of airborne material.

[3]These radon concentrations are appropriate for protection from radon-222 combined with its short-lived daughters. The value may be replaced by one-thirtieth (1/30) of a "working level." (A "working level" is defined as any combination of short-lived radon-222 daughters, polonium-218, lead-214, bismuth-214 and polonium-214, in one liter of air, without regard to the degree of equilibrium, that will result in the ultimate emission of 1.3 x 10 MeV of alpha particle energy.)

[4]For soluble mixtures of U-238, U-234 and U-235 in air chemical toxicity may be the limiting factor. The concentration value is 0.007 milligrams uranium per cubic meter of air. The specific activity for natural uranium is 6.77 x 10- curies per gram U. The specific activity for other mixtures of U-238, U-235 and U-234, if not known, shall be:

SA=3.6 x 10^{-7} curies/gram U.................. U-depleted

SA=(0.4 + 0.38 E + 0.0034 E^2) 10^{-6}......... E $\geq$ than 0.72

where E is the percentage by weight of U-235, expressed as percent.

NOTE: In any case where there is a mixture in air of more than one radionuclide, the limiting values for purposes of this Appendix should be determined as follows:

1. If the identity and concentration of each radionuclide in the mixture are known, the limiting values should be derived as follows: Determine, for each radionuclide in the mixture, the ratio between the quantity present in the mixture and the limit otherwise established in Appendix A for the specific radionuclide when not in a mixture. The sum of such ratios for all the radionuclides in the mixture may not exceed "1" (i.e., "unity").

EXAMPLE: If radionuclides A, B, and C are present in concentrations C_A, C_B, C_C, and if the applicable MPC's are MPC_A, and MPC_B, and MPC_C respectively, then the concentrations shall be limited so that the following relationship exists:

$$(C_A/MPC_A) + (C_B/MPC_B) + (C_C/MPC_C) \leq \text{than } 1$$

2. If either the identity or the concentration of any radionuclide in the mixture is not known the limiting values for purposes of Appendix A shall be 2 x 10^{-14}.

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

a. If the identity of each radionuclide in the mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the concentration limit for the mixture is the limit specified in Appendix A for the radionuclide in the mixture having the lowest concentration limit; or

b. If the identity of each radionuclide in the mixture is now known, but it is known that certain radionuclides specified in Appendix A are not present in the mixture, the concentration limit for the mixture is the lowest concentration limit specified in Appendix A for any radionuclide which is not known to be absent from the mixture; or

c. Element (atomic number) and isotope. μCi/ml

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.	1×10^{-10}
If it is known that alpha-emitters and Pb 210, Ac 227, Ra 228, and Pu 241 are not present.	1×10^{-11}
If it is known that alpha-emitters and Ac 227 are not present.	1×10^{-12}
If it is known that Ac 227, Th 230, Pa 231, Pu 238, Pu 239, Pu 240, Pu 242, Pu 244, Cm 248, Cf 249 and Cf 251 are not present.	1×10^{-13}

4. If a mixture of radionuclides consists of uranium and its daughters in ore dust prior to chemical separation of theuranium from the ore, the following values may be used for uranium and its daughters through radium-226, instead of those from paragraphs 1, 2, or 3 above:

3×10^{-12} μCi/ml gross alpha activity; 2×10^{-12} uCi/ml natural uranium; or 3 micrograms per cubic meter of air natural uranium.

5. For purposes of this note, a radionuclide may be considered as not present in a mixture if (a) the ratio of the concentration of that radionuclide in the mixture (C(A)) to the concentration limit for that radionuclide specified in Appendix A (MPC_A) does not exceed 1/10 (i.e., $C_A/MPC_A \leq 1/10$), and (b) the sum of such ratios for all the radionuclides considered as not present in the mixtures does not exceed 1/4, i.e.,

($C_A/MPC_A + C_B/MPC_B \ldots + \leq$ than 1/4).

(Source: Amended at 10 Ill. Reg. 12938, effective July 21, 1986)