From: McGill, Richard
To: Brown, Don
Subject: FW: First Notice Documents from JCAR
Date: Friday, May 20, 2022 8:17:39 AM
Attachments: 35-1000-JCAR r01.docx

Good morning, Mr. Clerk:

Please docket this email and attachment from JCAR as a single public comment in R18-28.

Thank you.

From: Eastvold, Jonathan C. <JonathanE@ilga.gov>
Sent: Friday, May 6, 2022 4:16 PM
To: McGill, Richard <Richard.McGill@illinois.gov>
Subject: [External] FW: First Notice Documents from JCAR

Richard –

Below are a number of suggested changes for this rulemaking. The line numbers correspond to the numbers in the attached document.

Thanks for your consideration.

Jonathan

PROPOSED FIRST NOTICE CHANGES

Agency: Pollution Control Board

Rulemaking: Radiation Hazards (35 Ill. Adm. Code 1000; 46 Ill. Reg. 6867)

Changes:

1. In line 69, delete "must comply" and strike "with" and "this Part".

2. In line 70, delete "and".

3. In line 72, change "the lowest radiation" to "making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other

societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest (10 CFR 20.1003 (2022)).".

4. In line 73, strike existing text and delete added text.

5. Strike lines 74-76.

6. In line 91, after "1000.202" add a comma.

7. In line 105, delete "/1".

8. In line 106, strike "*et seq.*".

9. In lines 110-111, strike existing text and delete added text.

10. Before line 121, add ""IEMA" means the Illinois Emergency Management Agency's Bureau of Nuclear Facility Safety.".

11. In line 142, strike "highspeed" and add "high-speed".

12. In line 145, strike "means" and add "mean".

13. In line 149, strike "an".

14. In line 151, strike "upon" and add "on".

15. In line 152, strike "upon".

16. In line 167, after "in" add "the".

17. In lines 172 and 178, strike "access to which" and add "to which access".

18. In line 226, strike "as to create" and add "in a way that creates". After "in" add "the".

19. In line 228, change "an" to "a dose to the whole body greater than 0.5 rem in any single year".

20. In line 229, after "account" strike the comma.

21. In line 230, delete "receiving" and strike all existing text except the semicolon.

22. In line 233, after "area" add "receiving a dose greater than 2 millirems in any single hour".

23. In line 234, strike the comma.

24. In lines 234-235, strike "receiving a dose in excess of 2 millirems in any one hour".

25. In line 238, after "area" add "receiving a dose greater than 100 millirems in any 7 consecutive days".

26. In line 238, after "by" add "the".

27. In line 239, strike the comma.

28. In lines 239-240, strike "receiving a dose in excess of 100 millirems in any seven consecutive days".

29. In line 247, strike "so as to" and add "that".

30. In line 247, after "to" add "the".

31. In line 248, after "concentration" add "limits".

32. In line 249, strike "of".

33. In line 269, strike "which" and add "that".

34. In line 277, strike "that" and add "the".

35. In line 277, strike "producing" and add "that produces".

36. In line 286, strike "which" and add "that".

37. In line 289, strike "refers" and add "is the unit used to refer".

38. In line 294, strike "that" and add "who".

39. In line 295, after "whether" add "or not".

40. In line 295, strike "may or may not" and add "is". Strike "be".

41. In line 302, after "any" add "uranium".

42. In lines 302-303, strike "through utilization of" and add "using".

43. In line 309, strike "is conducted".

44. In line 310, after "Part" add "is conducted".

45. In line 317, strike ", but" and add ". "Uranium fuel cycle"".

46. In line 319, strike "nonuranium" and add "non-uranium".

47. In line 319, strike "by-product" and add "byproduct".

48. In line 326, change "assure" to "ensure".

49. In line 333, after "operations" add a comma.

50. In line 339, strike "halflives" and add "half-lives".

51. In line 347, strike "the Department" and add "IEMA".

52. In lines 352, 355-356, 360, and 363, delete ", incorporated by reference in Section 1000.202".

53. In line 354, after "amendments" add "to that permit".

54. In line 367, after "reports" add "conducted by or for that person and".

55. In line 368, after "in" add "the".

56. In line 369, after "into" add "the".

57. In line 369, delete "conducted by or for such person".

58. In line 375, after "notify" add "IEMA".

59. In line 376, strike all existing text and delete all added text.

60. In line 380, strike "in excess of" and add "exceeding".

61. In the table after 397, in the 3rd from last and 5th from last rows, strike "radio- active" and add "radioactive".

62. In the table after 397, in the bottom row, strike ", which" and add "that".

63. In line 412, after "milligrams" add "of".

64. In line 420, after "as" add "a".

65. In line 422, change "Where" to "When".

66. In line 429, strike "such" and add "the".

67. In line 432, strike "MPC's" and add "MPCs".

68. In line 438, reinstate "for" and strike "of".

69. In line 441, strike "lieu" and add "place".

70. In line 448, strike the comma.

71. In line 451, strike "which" and add "that".

72. In lines 469 and 472, strike "than".

From: Knudson, Cheryl J.
Sent: Thursday, May 5, 2022 14:34

To: Richard.McGill@illinois.gov
Cc: Eastvold, Jonathan C. <JonathanE@ilga.gov>
Subject: RE: First Notice Documents from JCAR

First Notice documents are attached for your review:

- **Notice Page**
- **1st Notice – Numbered Line Version**
- **Agency vs. JCAR r01**

If you have any questions or concerns, please contact Jonathan Eastvold @ 217-524-9010.

Thank you,
Cheryl

Cheryl Knudson
Joint Committee on Administrative Rules
Illinois General Assembly
700 Stratton Building
Springfield, IL 62706

217.785.8993
cherylk@ilga.gov

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

PART 1000
RADIATION HAZARDS

SUBPART A: GENERAL PROVISIONS

SUBPART B: DEFINITIONS

SUBPART C: STANDARDS AND LIMITATIONS

SUBPART D: ADDITIONAL REQUIREMENTS

SUBPART E: RECORDS

AUTHORITY: Implementing Section 25b and authorized by Section 27 of the Environmental Protection Act [415 ILCS 5/25b and 27].

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; amended in R18-28 at 46 Ill. Reg. ______, effective ____________.

SUBPART A: GENERAL PROVISIONS

Section 1000.101 Authority

The Board adopts the rules contained in this title under the authority of Title VI-A of the Environmental Protection Act. [415 ILCS 5/25b]

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.102 Purpose

a) This Part establishes standards for protection against radiological air pollutants associated with materials and activities under licenses issued by the United States Nuclear Regulatory Commission (NRC) under the Atomic Energy Act of 1954 (42 U.S.C. 5801 *et seq.*), and the Energy Reorganization Act of 1974 (42 U.S.C. 5801 *et seq.*)

b) Persons subject to this Part must comply with this Part and make every 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 the lowest radiation exposure levels achievable considering 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.

c) Persons licensed by the NRC to operate light-water-cooled nuclear power reactors will satisfy subsection (b) if they achieve the design objectives and limiting conditions for operation specified in 10 CFR 50, Appendix I (1984), incorporated by reference in Section 1000.202.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.103 Scope

This Part applies to all persons who receive, possess, use, or transfer material licensed under 10 CFR 30 through 35, 40, or 70 (1984), incorporated by reference in Section 1000.202 or who are licensed to operate a production or utilization facility under 10 CFR 50 (1984), incorporated by reference in Section 1000.202.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

SUBPART B: DEFINITIONS

Section 1000.201 Definitions

Except as stated in this Section, or unless a different meaning of a word or term is clear from the context, the definition of words or terms in this Part will be the same as that applied to the same words or terms in the Environmental Protection Act [415 ILCS 5]:

"Act" means the Environmental Protection Act [415 ILCS 5/1 *et seq.*]

"Board" means the Illinois Pollution Control Board.

"Department" means the Illinois Department of Emergency Management Services Bureau of Nuclear Facility Safety.

"Dose" means the quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body. Under this Part, a dose during a period of time 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. The units of dose used in this Part are "Rad" and "Rem", as defined 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, highspeed 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 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 be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if information is available 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 (neutron/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 to protect individuals from exposure to radiation and radioactive materials. "Restricted area" must 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 to protect, individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.202 Incorporations by Reference

The following materials are incorporated by reference. These incorporations by reference do not include any later amendments or editions:

a) Numerical Guides for Design Objectives and Limiting Conditions for Operations to Meet the Criterion "As Low as is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents, 10 CFR 50, Appendix I (1984).

b) Rules of General Applicability to Domestic Licensing of Byproduct Material, 10 CFR 30 (1984).

c) General Domestic Licenses for Byproduct Material, 10 CFR 31 (1984).

d) Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material, 10 CFR 32 (1984).

e) Specific Domestic Licenses of Broad Scope for Byproduct Material, 10 CFR 33 (1984).

f) Licenses for Industrial Radiography and Radiation Safety Requirements for Industrial Radiographic Operations, 10 CFR 34 (1984).

g) Medical Use of Byproduct Material, 10 CFR 35 (1984).

h) Domestic Licensing of Source Material, 10 CFR 40 (1984).

i) Domestic Licensing of Production and Utilization Facilities, 10 CFR 50 (1984).

j) Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, 10 CFR 51 (1984).

k) Domestic Licensing of Special Nuclear Material, 10 CFR 70 (1984).

(Source: Added at 46 Ill. Reg. ______, effective ____________)

SUBPART C: STANDARDS AND LIMITATIONS

Section 1000.301 Permissible Levels of Radiation in Unrestricted Areas

A person must not possess, use, receive, or transfer licensed material or engage in licensed activities as to create radiation levels in air in any unrestricted area:

a) That could result in an individual, when all radioactive emissions by the licensee are taken into account, receiving a dose to the whole body in excess of 0.5 rem in any one year;

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

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

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.302 Radioactive Emissions to Unrestricted Areas

a) A person must not possess, use, receive, or transfer licensed material or engage in licensed activities so as to release to air in an unrestricted area radioactive material exceeding the concentration specified in Appendix A of. For this Section, concentrations of radioactive material may be averaged over a period not greater than one year.

b) For this Section, the concentration limits in Appendix A apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined for 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.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

SUBPART D: ADDITIONAL REQUIREMENTS

Section 1000.401 Applicability

This Subpart applies to radiation doses received by members of the public in the general environment and to radioactive materials introduced into the general environment due to operations which are part of a nuclear fuel cycle.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

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

"Nuclear fuel cycle" means the operations 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.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.403 Environmental Standards for Uranium Fuel Cycle

A person conducting operations covered by this Subpart must assure 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.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

SUBPART E: RECORDS

Section 1000.501 Records

A person subject to this Part must submit to the Department, for 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, incorporated by reference in Section 1000.202.

b) Application for Construction Permit and for all amendments, including information required by 10 CFR 50.34a, 50.36, and 51.20, incorporated by reference in Section 1000.202.

c) Environmental Impact Appraisal, Draft and Final Environmental Impact Statement, Negative Declaration, or other document prepared by the NRC under 10 CFR 51, incorporated by reference in Section 1000.202.

d) Operating Permit and all amendments thereto, including Technical Specifications under 10 CFR 50.36a, incorporated by reference in Section 1000.202.

e) Application for Amendment to Operating License.

f) All data, records, and reports submitted to the NRC for 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.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.502 Notification of Incidents

A person subject to this Part must immediately notify by telephone the Illinois Emergency Management Agency (IEMA) 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. IEMA's 24-hour Operations Center can be reached for notification of incidents at 1-800-782-7860, or, if calling from outside Illinois, 1-217-782-7860.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.503 Other Provisions

a) The definitions specified 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 of 35 Ill. Adm. Code 201.122, 201.123, 201.125, 201.126, 201.141, 201.150 and 201.151.

(Source: Amended at 46 Ill. Reg. ______, effective ____________)

Section 1000.APPENDIX A Concentrations in Air Above Natural Background

Element (atomic number)	Isotope[1]		µCi/ml
Actinium (89)	AC227	S	8×10^{-14}
		I	9×10^{-13}
	AC 228	S	3×10^{-9}
		I	6×10^{-10}
Americium (95)	Am 241	S	2×10^{-13}
		I	4×10^{-12}
	Am 242m	S	Am 242mS2 $\times 10^{-13}$
		I	9×10^{-12}
	Am 242	S	1×10^{-9}
		I	2×10^{-9}
	Am 243	S	2×10^{-13}
		I	4×10^{-12}
	Am 244	S	1×10^{-7}
		I	8×10^{-7}
Antimony	Sb 122	S	6×10^{-9}
		I	5×10^{-9}
	Sb 124	S	5×10^{-9}
		I	7×10^{-10}
	Sb 125	S	2×10^{-8}
		I	9×10^{-10}
Argon (18)	A 37	Sub[2]	1×10^{-4}
	A 41	Sub	4×10^{-8}
Arsenic (33)	As 73	S	7×10^{-8}
		I	1×10^{-8}
	As 74	S	1×10^{-8}
		I	4×10^{-9}
	As 76	S	4×10^{-9}
		I	3×10^{-9}
	As 77	S	2×10^{-8}
		I	1×10^{-8}
Astatine (85)	At 211	S	2×10^{-10}
		I	1×10^{-9}
Barium (56)	Ba 131	S	4×10^{-8}
		I	1×10^{-8}
	Ba 140	S	4×10^{-9}
		I	1×10^{-9}
Berkelium (97)	Bk 249	S	3×10^{-11}
		I	4×10^{-9}
	Bk 250	S	5×10^{-9}

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

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		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}

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		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	4×10^{-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	9×10^{-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}

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	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}

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		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}	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}

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		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}

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		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}

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		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	1×10^{-8}
		I	2×10^{-9}
	Sn 125	S	4×10^{-9}
		I	3×10^{-9}
Tungsten (Wolfram) (74)	W 181	S	8×10^{-8}
		I	4×10^{-9}
	W 185	S	3×10^{-8}
		I	4×10^{-9}
	W 187	S	2×10^{-8}
		I	1×10^{-8}
Uranium (92)	U 230	S	1×10^{-11}
		I	4×10^{-12}
	U 232	S	3×10^{-12}
		I	9×10^{-13}
	U 233	S	2×10^{-11}
		I	4×10^{-12}
	U 234	S[4]	2×10^{-11}
		I	4×10^{-12}
	U 235	S[4]	2×10^{-11}
		I	4×10^{-12}
	U 236	S	2×10^{-11}
		I	4×10^{-12}
	U 238	S[4]	3×10^{-12}
		I	5×10^{-12}
	U 240	S	8×10^{-9}
		I	6×10^{-9}
	U-natural	S[4]	5×10^{-12}
		I	5×10^{-12}
Vanadium (23)	V 48	S	6×10^{-9}

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		I	2×10^{-9}
Xenon (54)	Xe 131m	Sub	4×10^{-7}
	Xe 133	Sub	3×10^{-7}
	Xe 133m	Sub	3×10^{-7}
	Xe 135	Sub	1×10^{-7}
Ytterbium (70)	Yb 175	S	2×10^{-8}
		I	2×10^{-8}
Yttrium (39)	Y 90	S	4×10^{-9}
		I	3×10^{-9}
	Y 91m	S	8×10^{-7}
		I	6×10^{-7}
	Y 91	S	1×10^{-9}
		I	1×10^{-9}
	Y 92	S	1×10^{-8}
		I	1×10^{-8}
	Y 93	S	6×10^{-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}
			1×10^{-10}
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.

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 1.3×10^5 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 6.77×10^{-7} curies per gram U. The specific activity (SA) for other mixtures of U-238, U-235 and U-234, if not known, will be:

$SA=3.6 \times 10^{-7}$ curies/gram U .... U-depleted

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

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

NOTE: Where a mixture in air of more than one radionuclide exists, the limiting values 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 must be limited so that the following relationship exists:

$$(C_A/MPC_A) + (C_B/MPC_B) + (C_C/MPC_C) \le 1$$

2. If either the identity or the concentration of any radionuclide in the mixture is not known the limiting values of Appendix A must be 2×10^{-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 not known, but it is known that 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 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 before chemical separation of the uranium 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 x 10-12 µCi/ml gross alpha activity; 2 x 10-12 µCi/ml natural uranium; or 3 micrograms per cubic meter of air natural uranium.

5. For 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 (CA) to the concentration limit for that radionuclide specified in Appendix A (MPCA) does not exceed 1/10 (i.e., CA/MPCA ≤ than 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., (CA/MPCA + CB/MPCB + < than 1/4).

(Source: Amended at 46 Ill. Reg. ______, effective ____________)