From: <trudy.hill@dhhs.ne.gov>
To: <RXL1@NRC.Gov>
Date: 09/12/2007 3:27:10 PM
Subject: Proposed regulations Part 1 of 3

Please find attached a letter concerning proposed revisions to Nebraska Regulations for Control of Radiation and attached regulations. This enote will be transmitted in 3 parts.

Please note that our Agency has a new name as of July 1, 2007. It is "Nebraska Department of Health and Human Services" and the Office of Radiological Health is in the "Division of Public Health."

Our web site has a new address which is http://www.dhhs.ne.gov/rad/radindex.htm and our regulations are located at http://www.dhhs.ne.gov/reg/t180.htm

Please contact me if you have any questions. THANK YOU!

Trudy K. Hill
Radiological Health Specialist
NE DHHS , Office of Radiological Health
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Phone: (402)471-0560, Fax: (402)471-0169
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CC: <KXS@NRC.gov>, <julia.schmitt@dhhs.ne.gov>

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NRC_NE Comparison 09-12-07.doc		1547776
NRC proposed letter 9-12-07.pdf		89545
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NEBRASKA HEALTH AND HUMAN SERVICES SYSTEM
DEPARTMENT OF SERVICES • DEPARTMENT OF REGULATION
DEPARTMENT OF [illegible]

STATE OF NEBRASKA
DAVE HEINEMAN, GOVERNOR

September 12 2007

Robert J. Lewis, Deputy Director
Division Materials Safety and State Agreements
Office of Federal and State Materials and
Environmental Management Programs
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Lewis:

Attached is a copy of the revisions to the proposed Nebraska Regulations for Control of Radiation:

- 180 NAC 1 General Provisions (Draft 6-28-2007)
- 180 NAC 3 Licensing of Radioactive Material (Draft 8-16-2007)
- 180 NAC 4 Standards for Protection Against Radiation (Draft 8-9-2007)
- 180 NAC 5 Radiation Safety Requirements for Industrial Radiographic Operations (Draft 8-16-2007)
- 180 NAC 7 Medical Use of Radioactive Material (Draft 5-15-2007)
- 180 NAC 10 Notices, Instructions and Reports to Workers: Inspections (Draft 8-16-2007)
- 180 NAC 13 Transportation of Radioactive Material (Draft 6-29-2007)
- 180 NAC 14 Radiation Safety Requirements for Well Logging and Subsurface Tracer Studies (Draft 8-16-2007)
- 180 NAC 15 Training and Experience Requirements for Use of Radiation Sources (Draft 9-5-2007)
- 180 NAC 17 Enforcement of Radiation Control Act and Rights to Hearing Procedures for Licensees and Registrants; Penalties (Draft 9-7-2007)
- 180 NAC 18 Fees for Certificates of Registration, Radioactive Material(s) Licenses, Environmental Surveillance, Emergency Response and Other Regulatory Services (Draft 9-7-2007)
- 180 NAC 19 Licenses and Radiation Requirements for Irradiators (Draft 9-10-2007)

We hope to schedule a public hearing in December or early January. The proposed revisions will be made available for public comment 30 days before the public hearing with request for comments by the public hearing. We request NRC's comments by November 13, 2007. The proposed regulations are identified by line-in/line-out text and correspond to the following equivalent amendments to NRC's regulations.

Rats ID	Title	State Section
2002-1	Revision of the Skin Dose Limit – Part 20	180 NAC 4
2002-2	Medical Use of Byproduct Material Part 20, 32, and 25	180 NAC 7, 1, 3 & 4
2003-1	Financial Assurance for Materials Licensees – Parts 30, 40, 70	180 NAC 3

Rats ID	Title	State Section
2004-1	Compatibility with IAEA Transportation Safety Standards and Other Transportation Safety amendments – Part 71	180 NAC 13, 1 & 17
2005-1	Security Requirements for Portable Gauges Containing Byproduct Material – Part 30	180 NAC 4
2005-2	Medical Use of Byproduct Material - Recognition of Specialty Boards – Part 35	180 NAC 7 & 4
2006-1	Minor Amendments- Part 20, 30, 32, 35, 40 and 70"	180 NAC 7 & 3

We will be making changes within 180 NAC 7 and 13 that are not in the attached draft. We recently received an opinion from our Legal Services staff that will allow us to incorporate those changes. The changes that we will make are listed in the "180 NAC & Significant Difference" column of the side by side comparison which is part of this package.

With the changes addressed above, we believe that adoption of these revisions satisfies the compatibility and health and safety categories established in the Office of Federal and State Materials and Environmental Programs (FSME) Procedure SA-200.

If you have any questions, please feel free to contact me at (402)471-0528 or julia.schmitt@hhss.ne.gov or Trudy K. Hill of my staff at (402)471-0560 or trudy.hill@dhhs.ne.gov

Sincerely,

Julia Schmitt, Manager
Office of Radiological Health

Enclosures:

NRC_NRC Comparison 09-10-07
180 NAC 1 (Draft 6-28-2007)
180 NAC 3 (Draft 8-16-2007)
180 NAC 4 (Draft 8-9-2007)
180 NAC 5 (Draft 8-16-2007)
180 NAC 7 (Draft 5-15-2007)
180 NAC 10 (Draft 8-16-2007)
180 NAC 13 (Draft 6-29-2007)
180 NAC 14 (Draft 8-16-2007)
180 NAC 15 (Draft 9-5-2007)
180 NAC 17 (Draft 9-7-2007)
180 NAC 18 (Draft 9-7-2007)
180 NAC 19 (Draft 9-10-2007)

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska

Side by Side Comparison of NRC's RAT's and Nebraska's Title 180

NOTE:

The right column "Nebraska" includes text from 180 NAC as written. Text is included for compatibility A, B, C and H&S.
The text in the "Nebraska" column is what is in the draft that is in for review.

If the text is written similar to the NRC language "(NRC)" is written in the 180 NAC column.

If the text is written similar to the SSR language "(SSR)" is written in the 180 NAC column.

Additional comments are also written in the 180 NAC column concerning changes and differences.

	Page #
RATS 2002-1	111
RATS 2002-2	112
RATS 2003-1	104
RATS 2004-1	456
RATS 2005-1	16
RATS 2005-2	17
RATS 2005-3	45
RATS 2006-1	1

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
Minor Amendments- Part 20 (71 FR 15005) RATS ID # 2006-1 Effective date 03/27/06 Date Due For State Adoption 03/27/09						
20. Appendix B	**STANDARDS FOR PROTECTION AGAINST RADIATION**	**No**	A	In Appendix B to Part 20, "List of Elements," the Element "Thalium," Atomic Number 69, should be changed to read as "Thulium."	Appendix 4 B NO	Change was made
20. Appendix D	**STANDARDS FOR PROTECTION AGAINST RADIATION**	**NA**	**D**	N/A		
Minor Amendments- Part 30 (71 FR 15005) RATS ID # 2006-1 Effective date 03/27/06 Date Due For State Adoption 03/27/09						
30.06	**Communications**		**D**	**N/A**		
Minor Amendments- Part 32 (71 FR 15005) RATS ID # 2006-1 Effective date 03/27/06 Date Due For State Adoption 03/27/09						
32.72	Manufacture, preparation, or transfer for commercial distribution of radioactive drugs containing byproduct material for medical use under part 35.	**No**	**B**	**In § 32.72, paragraph (b)(2)(ii) is revised to read as follows:** (b) * * * (2) * * * (ii) This individual meets the requirements specified in 10 CFR 35.55(b) and 35.59 and the licensee has received an approved license amendment identifying this individual as an authorized nuclear pharmacist, or * * * * *	**3-014.10, item 2.b.(2) (NRC)** **NO**	(2) This individual meets the requirements specified in 180 NAC 7-024.02 and 7-027 and the licensee has received an approved license amendment identifying this individual as an authorized nuclear pharmacist, or

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
32.74	Manufacture and distribution of sources or devices containing byproduct material for medical use.		**B**	**In § 32.74, the introductory text of paragraph (a) is revised to read as follows:** (a) An application for a specific license to manufacture and distribute sources and devices containing byproduct material to persons licensed pursuant to part 35 of this chapter for use as a calibration, transmission, or reference source or for the uses listed in §§ 35.400, 35.500, and 35.600 of this chapter will be approved if: * * * * *	**3-014.12 (NRC) NO**	3-014.12. Manufacture and Distribution of Sources or Devices Containing Radioactive Material for Medical Use. An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed pursuant to 180 NAC 7 for use as a calibration or reference source or for the uses listed in 180 NAC 7-055, 7-065 and 7-067 will be approved if:
35.2	**Definitions**			**In § 35.2, paragraph (1) of the definitions for the terms" Authorized medical physicist," "Authorized nuclear pharmacist," "Authorized user," "Radiation Safety Officer" and for "Medical event" are revised to read as follows:**	**7-002**	
			B	*Authorized medical physicist* means an individual who— (1)Meets the requirements in §§ 35.51(a) and 35.59; or * * * * *	**(NRC) NO**	Authorized medical physicist means an individual who: 1. Meets the requirements in 180 NAC 7-023.01 and 7-027; or
			B	*Authorized nuclear pharmacist* means a pharmacist who—(1) Meets the requirements in §§ 35.55(a) and 35.59; or * * * * *	**(NRC) NO**	Authorized nuclear pharmacist means a pharmacist who: 1. Meets the requirements of 180 NAC 7-024.01 and 7-027; or
			B	*Authorized user* means a physician, dentist, or podiatrist who—(1) Meets the requirements in §§ 35.59 and 35.190(a), 35.290(a), 35.390(a), 35.392(a), 35.394(a), 35.490(a), 35.590(a), or 35.690(a); or * * * * *	**(No podiatrist or dentist)but will add)**	Authorized user means a physician who: 1. Meets the requirements in 180 NAC 7-027 and 7-043.01, 7-047.01, 7-052.01, 7-053.01, 7-054.01, 7-063.01, 7-066.01 or 7-084.01; or
				Radiation Safety Officer means an individual who— (1) Meets the requirements in §§ 35.50(a) or (c)(1) and 35.59; or * * * * *		Radiation Safety Officer (RSO) means an individual who:
			F	*Medical event* N/A	**(NRC) NO**	1. Meets the requirements in 180 NAC 7-022.01 and 7-026;
35.8	**Information collection requirements: OMB approval**		**D**	**N/A**		
35.10	**Implementation**		**D**	**N/A**	**7-006**	
35.13	**License Amendments**		**D**	**N/A**	**7-010**	
35.14	**Notifications**		**D**	**N/A**	**7-011**	

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
35.49	**Suppliers for sealed**		**C**	**In § 35.49, paragraph (b) is revised to read as follows:**(b) Sealed sources or devices noncommercially transferred from a Part 35 licensee or an Agreement State medical use licensee. * * * * *	**7-021 (Missing & will add to finial) YES**	7-021 SUPPLIERS FOR SEALED SOURCES OR DEVICES FOR MEDICAL USE: For medical use, a licensee may only use: 7-021.01 Sealed sources or devices initially manufactured, labeled, packaged, and distributed in accordance with a license issued pursuant to 180 NAC 3 or the equivalent regulations of the U.S. Nuclear Regulatory Commission, or another Agreement State; 7-021.02 Teletherapy sources manufactured and distributed in accordance with a license issued pursuant to 180 NAC 3, or the equivalent regulations of the U.S. Nuclear Regulatory Commission or another Agreement State.
35.50	**Training for Radiation Safety Officer**		**B**	**In § 35.50, paragraph (a)(2)(ii)(B) is revised to read as follows:** (a) * * * (2) * * * (ii) * * * (B) In clinical nuclear medicine facilities providing diagnostic and/or therapeutic services under the direction of physicians who meet the requirements for authorized users in§§ 35.290 or 35.390; * * * * *	**7-022, item 1.b.(2) (NRC) NO**	7-022.01, item 1.b.(2) In clinical nuclear medicine facilities providing diagnostic and/or therapeutic services under the direction of physicians who meet the requirements or for authorized users in 180 NAC 7-047 or 7-052; and

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
35/51	**Training for an authorized medical physicist**		B	**In § 35.51, paragraphs (a)(2)(ii) and (b)(2) are revised to read as follows:** a) * * * (2) * * * (ii) In clinical radiation facilities providing high-energy, external beam therapy (photons and electrons with energies greater than or equal to 1 million electron volts) and brachytherapy services under the direction of physicians who meet the requirements for authorized users in §§ 35.490 or 35.690; and * * * * * (b) * * * (2) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (c) and (a)(1) and (2), or (b)(1) and (c) of this section, and has achieved a level of competency sufficient to function independently as an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. The written attestation must be signed by a preceptor authorized medical physicist who meets the requirements in § 35.51, or equivalent Agreement State requirements for an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status; and * * * * *	**7-023.01, item 2.b. (NRC) NO** **7-023.03 (NRC) NO**	7-023.01, item 2.b. b. In a clinical radiation facilities providing high energy, external beam therapy (photons and electrons with energies greater than or equal to one million electron volts) and brachytherapy services under the direction of physicians who meet the requirements for authorized users in 180 NAC 7-063 or 7-084; and 7-023.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-023.04 and 180 NAC 7-023.01, item 1 and 2, or 180 NAC 7-023.02, item 1 and 180 NAC 7-023.04, and has achieved a level of competency sufficient to function independently as an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. The written attestation must be signed by a preceptor authorized medical physicist who meets the requirements in 180 NAC 7-023, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements for an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status.
35.59	**Recentness of training**		**B**	**Section 35.59 is revised to read as follows:** The training and experience specified in Subparts B, D, E, , G, and H of this part must have been obtained within the even years preceding the date of application or the individual must have had related continuing education and experience since the required training and experience was completed.	**7-027 (NRC) NO**	7-027 RECENTNESS OF TRAINING The training and experience specified in 180 NAC 7 must have been obtained within seven years preceding the date of license application or the individual must have had related continuing education and experience since the required training and experience was completed.
35.65	**Authorization for calibration, transmission, and reference sources**		**D**	**N/A**		

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
35.100	**Use of unsealed byproduct material for uptake, dilution and excretion studies for which a written directive is not required**		**H&S**	**In § 35.100, paragraph (b)(2) is revised to read as ollows:** b) * * * (2) A physician who is an authorized user and who meets he requirements specified in §§ 35.290, or 35.390 and 35..290(c)(1)(ii)(G); or * * * * *	**7-041.02 (NRC) NO**	7-041.02, item 2 A physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047 or 7-051 and 7-047.03, item 1.b.(7); or
35.190	**Training for uptake, dilution, and excretion studies.**		B	**In § 35.190, paragraphs (b), (c)(1)(ii) and (c)(2) are revised to read as follows:** (b) Is an authorized user under §§ 35.290, 35.390, or equivalent Agreement State requirements; or (c)(1)* * * (ii) Work experience, under the supervision of an authorized user who meets the requirements in §§ 35.190, 35.290, 35.390, or equivalent Agreement State requirements, involving— * * * * * (2) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in §§ 35.190, 35.290, or 35.390, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraph (a)(1) or (c)(1) of this section and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under § 35.100.	**7-043.02 (NRC) NO** **7-043.02, item 2 (NRC) NO** **7-043.04 (NRC) NO**	7-043.02 Is an authorized user under 180 NAC 7-047 or 7-051 or equivalent U.S. Nuclear Regulatory or Agreement State requirements; or **7-043.03, item 2.** 2. Work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-043, 7-047 or 7-051 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, involving: 7-043.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-043, 7-047, or 7-051, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirement in 180 NAC 7-043.01, item 1 or 7-043.03, item 1 and 2 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized in 180 NAC 7-041.
35.200	**Use of unsealed byproduct material for imaging and localization studies for which a written directive is not required.**		**H&S**	**In § 35.200, paragraph (b)(2) is revised to read as follows:** (b) * * * (2) A physician who is an authorized user and who meets the requirements specified in § 35.290, or 35.390 and 35.290(c)(1)(ii)(G); or * * * * *	**7-044.02, item 2 (NRC) NO**	**7-044.02, item 2** A physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7), or

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
35.290	**Training for imaging and localization studies**		**B**	**In § 35.290, paragraphs (a)(1), (b), the introductory text of paragraph (c)(1)(ii) and paragraph (c)(2) are revised to read as follows:** (a) * * * (1) Complete 700 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed byproduct material for imaging and localization studies that includes the topics listed in paragraphs (c)(1)(i) and (c)(1)(ii) of this section; and * * * * * (b) Is an authorized user under § 35.390 and meets the requirements in 35.290(c)(1)(ii)(G), or equivalent Agreement State requirements; or (c)(1) * * * (ii) Work experience, under the supervision of an authorized user, who meets the requirements in §§ 35.290, or 35.290(c)(1)(ii)(G), and 35.390, or equivalent Agreement State requirements, involving— * * * * * (2) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in §§ 35.290, or 35.390 and 35.290(c)(1)(ii)(G), or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraph (a)(1) or (c)(1) of this section and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under §§ 35.100 and 35.200.	**7-047.02, item 1 (NRC) NO** **7-047.02 (NRC) NO** **7-047.03, item l.b. (NRC) NO** **7-047.04 (NRC) (NO)**	**7-047.02, item 1** 1. Complete 700 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for imaging and localization studies that includes the topics listed in 180 NAC 7-047.03; and 7-047.02 Is an authorized user in 180 NAC 7-051 and meets the requirements in 180 NAC 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements; or 7-047.03, item 1.b. Work experience, under the supervision of an authorized user, who meets the requirements in 180 NAC 7-047 or 7-47.03, item 1.b.(7) and 180 NAC 7-051 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, involving; 7-047.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-047.01, item 1 or 180 NAC 7-047.03, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-041 and 7-044 .
35.300	**Use of unsealed byproduct material for which a written directive is required**		**H&S**	**In § 35.300, paragraph (b)(2) is revised to read as follows:** (b) * * * (2) A physician who is an authorized user and who meets the requirements specified in §§ 35.290, 35.390, or * * * * *	**7-048.02 (NRC NO)**	7-048.02 Prepared by an authorized nuclear pharmacist, a physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047 or 7-051, or an individual under the supervision of either as specified in 180 NAC 7-018; or

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
35.390	**Trainig for use of unsealed byproduct material for which a written directive is required.**		**B**	**In § 35.390, paragraphs (b)(1)(ii) introductory text, (b)(1)(ii)(G)(*3*), and (b)(2) are revised to read as follows:** (b)(1) * * * (ii) Work experience, under the supervision of an authorized user who meets the requirements in § 35.390, or equivalent Agreement State requirements. A supervising authorized user, who meets the requirements in §35.390(b), must also have experiencein administering dosages in the same dosage category or categories (*i.e.*,35.390(b)(1)(ii)(G)) as the individual requesting authorized user status. The work experience must involve— * * * * * (G) * * * (*3*) Parenteral administration of any beta emitter, or al photon-emitting radionuclide with a photon energy less than 150 keV, for which a written directive is required; and/or * ** * * (2) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (a)(1) and (b)(1)(ii)(G) or (b)(1) of this section, and hasachieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under § 35.300. The written attestation must be signed by a preceptor authorized user who meets the requirements in § 35.390 or equivalent Agreement State requirements. The preceptor authorized user, who meets the requirements in § 35.390(b) must have experience in administering dosages in the same dosage category or categories (*i.e.*, § 35.390(b)(1)(ii)(G)) as the individual requesting authorized user status.	**7-051.02 Item 1.b. (NRC) NO** **7-051.02 item 1.c. (NRC) NO** **7-051.03 (NRC) NO**	7-051.02 b. Work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory or Agreement State requirements. A supervising authorized user, who meets the requirements in 180 NAC 7-051.02, must also have experience in administering dosages in the same dosage category or categories (that is , 180 NAC 7-051.02, item 1., b.(6)) as the individual requesting authorized user status. The work experience must involve: (c) Parenteral administration of any beta emitter or a photon-emitting radionuclide with a photon energy less than 150 keV, for which a written directive is required; and/or 7-051.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-051.01, item 1 and 7-051.02, item 1.b.(6) or 7-051.02, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. The preceptor authorized user, who meets the requirement in 180 NAC 7-051.02 must have experience in administering dosages in the same dosage category or categories (that is, 180 NAC 7-051.02, item 1.b.(6)) as the individual requesting authorized user status.

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
35.392	**Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities less than or equal to 1.22 gigabecquerels (33 millicureis).**		**B**	**In § 35.392, paragraph (b), the introductory text of paragraph ©)(2) and paragraph (c)(3) are revised to read as follows:** (b) Is an authorized user under § 35.390 for uses listed in §35.390(b)(1)(ii)(G)(*1*) or (*2*), § 35.394, or equivalent Agreement State requirements; or (c) * * * (2) Has work experience, under the supervision of an authorized user who meets the requirements in §§ 35.390, 35.392, 35.394, or equivalent Agreement State requirements. A supervising authorized user who meets the requirements in § 35.390(b) must also have experience in administering dosages as specified in § 35.390(b)(1)(ii)(G)(*1*) or (*2*). The work experience must involve— * * * * * (3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (c)(1) and (c)(2) of this section, and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under § 35.300. The written attestation must be signed by a preceptor authorized user who meets the requirements in §§ 35.390, 35.392, 35.394, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirement in § 35.390(b), must also have experience in administering dosages as specified in § 35.390(b)(1)(ii)(G)(*1*) or (*2*).	**7-052.02 (NRC NO** **Item 2 (NRC) NO** **7-052.04 (NRC) NO**	7-052.02 Is an authorized user under 180 NAC 7-051.01, 7-051.02 for uses listed in 180 NAC 7-051.02, item 1.b.(6)(a) or (b), 180 NAC 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements; or 7-052.03, item 2 Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051.01, 7-051.02, 7-052, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A supervising authorized user who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(a) or (b). The work experience must involve: 7-052.04 Has obtained written attestation that the individual has satisfactorily completed the requirements in180 NAC 7-052.03, item 1. and 2. and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, 7-052, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A preceptor authorized user, who meets the requirement in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(a) or (b).

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
35.394	**Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities greater than 1.22 gigabecquerels (33 millicuries)**		**B**	**In § 35.394, paragraph (b), the introductory text of paragraph (c)(2), and paragraph (c)(3) are revised to read as follows:** (b) Is an authorized user under § 35.390 for uses listed in § 35.390(b)(1)(ii)(G)(2) or equivalent Agreement State requirements; or (c) * * * (2) Has work experience, under the supervision of an authorized user who meets the requirements in §§ 35.390, 35.394, or equivalent Agreement State requirements. A supervising authorized user, who meets the requirements in § 35.390(b), must also have experience in administering dosages as specified in § 35.390(b)(1)(ii)(G)(2). The work experience must involve— * * * * * (3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (c)(1) and (c)(2) of this section, and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under §35.300. The written attestation must be signed by a preceptor authorized user who meets the requirements in §§ 35.390, 35.394, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in § 35.390(b), must also have experience in administering dosages as specified in § 35.390(b)(1)(ii)(G)(2).	**7-053.02 (NRC) NO** **7-053.04 (NRC) NO**	7-053.02 Is an authorized user under 180 NAC 7-051, for uses listed in 180 NAC 7-051.02, item 1.b.(6)(b), or equivalent Agreement State, or U.S. Nuclear Regulatory Commission requirements; or **7-053.03** 2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A supervising authorized user, who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(b). The work experience must involve: 7-053.04 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-053.03, item 1. and 2. and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized in 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051 or, 7-053, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.(6)(b).

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35.396	**Training for the parenteral administration of unsealed byproduct material requiring a written directive**		B	**In § 35.396, the introductory paragraph, paragraphs (a), (b), (c), the introductory text of paragraphs (d)(1) and (d)(2), paragraph (d)(2)(vi), and paragraph (d)(3) are revised to read as follows:** Except as provided in § 35.57, the licensee shall require an authorized user for the parenteral administration requiring a written directive, to be a physician who— (a) Is an authorized user under § 35.390 for uses listed in §§ 35.390(b)(1)(ii)(G)(*3*) or 35.390(b)(1)(ii)(G)(*4*), or equivalent Agreement State requirements; or (b) Is an authorized user under §§ 35.490, 35.690, or equivalent Agreement State requirements and who meets the requirements in paragraph (d) of this section; or (c) Is certified by a medical specialty board whose certification process has been recognized by the Commission or an Agreement State under §§ 35.490 or 35.690, and who meets the requirements in paragraph (d) of this section. (d)(1) Has successfully completed 80 hours of classroom and laboratory training, applicable to parenteral administrations, for which a written directive is required, of any beta emitter, or any photonemitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training must include— * * * * * (2) Has work experience, under the supervision of an authorized user who meets the requirements in §§ 35.390, 35.396, or equivalent Agreement State requirements, in the parenteral administration, for which a written directive is required, of any beta emitter, or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements in § 35.390 must have experience in administering dosages as specified in §§ 35.390(b)(1)(ii)(G)(*3*) and/or35.390(b)(1)(ii)(G)(*4*). The work experience must involve— * * * * * (vi) Administering dosages to patients or human research subjects, that include at least 3 cases involving the parenteral administration, for which a written directive is required, of any beta emitter, or any photon-emitting radionuclide with a photon energy less than 150 keV and/or at least 3 cases involving the parenteral administration of any other radionuclide, for which a written directive is	**7-054 (NRC) NO** **7-054.01 (NRC) NO** **7-054.02 (NRC) NO** **7-054.03 (NRC) NO** **7-054.04 (NRC) NO**	7-054 TRAINING FOR THE PARENTERAL ADMINISTRATION OF UNSEALED RADIOACTIVE MATERIAL REQUIRING A WRITTEN DIRECTIVE Except as provided in 180 NAC 7-026, the licensee must require an authorized user for the parenteral administration requiring a written directive, to be a physician who: 7-054.01 Is an authorized user under 180 NAC 7-051 for uses listed in 7-051.02, item 1.b. (6)(c) or (d),or equivalent Agreement State requirements; or 7-054.02 Is an authorized user under 180 NAC 7-063 or 7-084, or equivalent Agreement State requirements and who meets the requirements in 180 NAC 7-054.04; or 7-054.03 Is certified by a medical specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State under 180 NAC 7-063 or 7-084; and who meets the requirements in 180 NAC 7-054.04. 7-054.04 The physician: 1. Has successfully completed 80 hours of classroom and laboratory training, applicable to parenteral administrations, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training must include: 2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051 or 7-054, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, in the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements in 180 NAC 7-051, must have experience in

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				administering dosages as specified in §§ 35.390(b)(1)(ii)(G)(*3*) and/or 35.390(b)(1)(ii)(G)(*4*). The work experience must involve— * * * * *		administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d). The work experience must involve:
				. (vi) Administering dosages to patients or human research subjects, that include at least 3 cases involving the parenteral administration, for which a written directive is required, of any beta emitter, or any photon-emitting radionuclide with a photon energy less than 150 keV and/or at least 3 cases involving the parenteral administration of any other radionuclide, for which a written directive is required; and (3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraph (b) or (c) of this section, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed byproduct material requiring a written directive. The written attestation must be signed by a preceptor authorized user who meets the requirements in §§ 35.390, 35.396, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in § 35.390, must have experience in administering dosages as specified in §§ 35.390(35.390(b)(1)(ii)(G)(*3*) and/or 35.390(b)(1)(ii)(G)(*4*).	**7-054.04, item 2.f. (NRC) NO** **7-054.04, item 3 (NRC) NO**	7-054.04, item 2 f. Administering dosages to patients or human research subjects, that include at least three cases involving the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV and/or at least three cases involving the parenteral administration of any other radionuclide, for which a written directive is required; and 3. Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-054.02 or 7-054.03, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed radioactive material requiring a written directive. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or 7-054, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in 180 NAC 7-051, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d).

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35.490	**Training for use of manual brachytherapy sources**		**B**	**In § 35.490, the introductory text of paragraph (b)(1)(ii), and paragraphs (b)(2), and (b)(3) are revised to read as follows:** (b)(1) * * * (ii) 500 hours of work experience, under the supervision of an authorized user who meets the requirements in § 35.490 or equivalent Agreement State requirements at a medical institution, involving— * * * * * (2) Has completed 3 years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements in § 35.490 or equivalent Agreement State requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by paragraph (b)(1)(ii) of this section; and (3) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in § 35.490 or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraphs (a)(1), or (b)(1) and (b)(2) of this section and has achieved a level of competency sufficient to function independently as an authorized user of manual brachytherapy sources for the medical uses authorized under § 35.400.	**7-063.02, item 1.b. (NRC) NO** **7-063.02, Item 2 (NRC) NO** **7-063.03 (NRC) NO**	**7-063.02, item 1.b.** b. 500 hours of work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements at a medical institution, involving: 2. Has completed three years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements in 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements, as a part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdocutoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by 180 NAC 7-063.02, item 1.b.; and 3. Meet the requirements of 180 NAC 7-063.03. 7-063.03 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-063, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-063.01, item 1 or 7-063.02, item 2 and has achieved a level of competency sufficient to independently function as an authorized user of manual brachytherapy sources for the medical uses authorized under 180 NAC 7-055.

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35.491	**Training for ophthalmic use of strontium-90**		**B**	**In § 35.491, paragraphs (a) and (b)(3) are revised to read as follows:** (a) Is an authorized user under § 35.490 or equivalent Agreement State requirements; or (b) * * * (3) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in §§ 35.490, 35.491, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraphs (a) and (b) of this section and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use.	**7-064.01 (NRC) NO** **7-064.02, item 3 (NRC) NO**	7-064.01 Is an authorized user under 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements; or 7-064.02 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-063 or 7-064 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-064.01 and 7-064.02 and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use.

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35.690	**Training for use of remote afterloader units, teletherapy units, and gamma sterotactic radiosurgery units**		**B**	**In § 35.690, the introductory text of paragraph (b)(1)(ii), and paragraphs (b)(2), and (b)(3) are revised to read asfollows:** (b)(1) * * * (ii) 500 hours of work experience, under the supervision of an authorized user who meets the requirements in § 35.690 or, equivalent Agreement State requirements at a medical institution, involving— * * * * * (2) Has completed 3 years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements in § 35.690 or equivalent Agreement State requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by paragraph (b)(1)(ii) of this section; and (3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (a)(1) or (b)(1) and (b)(2), and (c) of this section, and has achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation must be signed by a preceptor authorized user who meets the requirements in § 35.690 or equivalent Agreement State requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and * * * * *	**7-084 Item 1.b. (NRC) NO** **Item 2 (NRC) NO**	7-084.02, item 1.b. b. 500 hours of work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-084.01, 7-084.02 or equivalent U.S. Nuclear Regulatory or Agreement State requirements at a medical institution, involving: 2. Has completed three years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements in 180 NAC 7-084, or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by 180 NAC 7-084.02, item 1.b.; and 3. Meets the requirements of 180 NAC 7-084.03 and 7-084.04. 7-084.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-084.01, item 1 or 7-084.02, item 1 and 2, and 7-084.04 has achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-084 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and

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Minor Amendments- Part 40 (71 FR 15005) RATS ID # 2006-1 Effective date 03/27/06 Date Due For State Adoption 03/27/09						
40.5	Communication		D	N/A		
Minor Amendments- Part 70 (71 FR 15005) RATS ID # 2006-1 Effective date 03/27/06 Date Due For State Adoption 03/27/09						
70.5	Communication		D	N/A		
7-.14	Foreign military aircraft		D	N/A		

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Security Requirements for Portable Gauges Containing Byproduct Material - Part 30 (70 FR 2001) RATS ID # 2005-1 Effective date 7/11/05 Date Due For State Adoption 7/11/08						
30.34	Terms and conditions of licenses.		C	**The final rule requires a portable gauge licensee to use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal whenever the portable gauges are not under the control and constant surveillance of the licensee. The primary intent of this rulemaking is to increase licensees' control of portable gauges to reduce the opportunity for unauthorized removal or theft.** (i) Security requirements for portable gauges. Each portable gauge licensee shall use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal, whenever portable gauges are not under the control and constant surveillance of the licensee.	4-031.05 (NRC) NO	4-031.05 Security requirements for portable gauges. Each portable gauge licensee must use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal, whenever portable gauges are not under the control and constant surveillance of the licensee.

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Medical Use of Byproduct Material - Recognition of Specialty Boards - Part 35 (70 FR 16336) RATS ID # 2005-2 Effective date 4/29/05 Date due for State Adoption : 4/29/08						
§ 35.2	Definitions		B B	**In § 35.2, the definition "Radiation Safety Officer" is amended by republishing the introductory text and revising paragraph (1) of the definition, and the definition of "Preceptor" is revised to read as follows:** * * * * * *Preceptor* means an individual who provides, directs, or verifies training and experience required for an individual to become an authorized user, an authorized medical physicist, an authorized nuclear pharmacist, or a Radiation Safety Officer. * * * * * *Radiation Safety Officer* means an individual who— (1) Meets the requirements in §§ 35.50(a) or (c)(1) and 35.59; or, before October 24, 2005, §§ 35.900(a) and 35.59; or * * * * *	7-002 (NRC) NO 7-002 NO	Preceptor means an individual who provides, directs, or verifies training and experience required for an individual to become an authorized user, an authorized medical physicist, an authorized nuclear pharmacist, a nuclear medicine technologist, a radiation therapy technologist or a Radiation Safety Officer. Radiation Safety Officer (RSO) means an individual who: 2. Meets the requirements in 180 NAC 7-022.01 and 7-026; 3. Is identified as a Radiation Safety Officer on a Nuclear Regulatory Commission or Agreement State license or other equivalent permit or license recognized by the Department for similar types and uses of radioactive material.
§ 35.8	Information collection requirements: OMB approval		D	N/A	NA	
§ 35.10	Implementation		D	N/A	7-006	
§ 35.13	License amendments		D	N/A	7-010	
§ 35.14	Notifications		D	N/A	7-011	

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§ 35.50	Training for Radiation Safety Officer		B	**In § 35.50, paragraph (a), the introductory text of paragraph (b)(1)(I), paragraphs (b)(1)(ii)(G), and (c) are revised, paragraph (b)(2) is removed and reserved, and paragraphs (d) and (e) are added to read as follows:** * * * * * (a) Is certified by a specialty board whose certification process has been recognized by the Commission or an Agreement State and who meets the requirements in paragraphs (d) and (e) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board shall require all candidates for certification to: (1)(i) Hold a bachelor's or graduate degree from an accredited college or university in physical science or engineering or biological science with a minimum of 20 college credits in physical science; (ii) Have 5 or more years of professional experience in health physics (graduate training may be substituted for no more than 2 years of the required experience) including at least 3 years in applied health physics; and (iii) Pass an examination administered by diplomats of the specialty board, which evaluates knowledge and competence in radiation physics and instrumentation, radiation protection, mathematics pertaining to the use and measurement of radioactivity, radiation biology, and radiation dosimetry; or	7-022.01 (NRC) NO Item 1 (NRC) NO	7-022 TRAINING FOR RADIATION SAFETY OFFICER Except as provided in 180 NAC 7-026, the licensee must require an individual fulfilling the responsibilities of the Radiation Safety Officer as provided in 180 NAC 7-015 to be: 7-022.01 An individual who is certified by a specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission and who meets the requirements in 180 NAC 7-022.04 and 7-022.05. (The names of board certifications which have been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State will be posted on the NRC's web page.) 1. To have its certification process recognized, a specialty board will require all candidates for certification to: a. Hold a bachelor's or graduate degree from an accredited college or university in physical science or engineering or biological science with a minimum of 20 college credits in physical science; b. Have five or more years of professional experience in health physics (graduate training may be substituted for no more than two years of the required experience) including at least three years in applied health physics; and c. Pass an examination administered by diplomats of the specialty board, which evaluates knowledge and competence in radiation physics and instrumentation, radiation protection, mathematics pertaining to the use and measurement of radioactivity, radiation biology, and radiation dosimetry; or

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				(2)(i) Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; (ii) Have 2 years of full-time practical training and/or supervised experience in medical physics— (A) Under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the Commission or an Agreement State; or (B) In clinical nuclear medicine facilities providing diagnostic and/or therapeutic services under the direction of physicians who meet the requirements for authorized users in §§ 35.290, 35.390, or, before October 24, 2005, §§ 35.920, or 35.930; and (iii) Pass an examination, administered by diplomats of the specialty board, that assesses knowledge and competence in clinical diagnostic radiological or nuclear medicine physics and in radiation safety; or (b) * * * (1) * * * (i) 200 hours of classroom and laboratory training in the following areas- (ii) * * * (G) Disposing of byproduct material; or * * * * *	Item 2 (NRC) NO 7-022.02 (NRC) NO	2. Require all candidates for certification to: a. Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; b. Have two years of full-time practical training and/or supervised experience in medical physics: (1) Under the supervision of a medical physicist who is certified in medical physicist by a specialty board recognized by an agreement state of the U.S. Nuclear Regulatory Commission. (2) In clinical nuclear medicine facilities providing diagnostic and/or therapeutic services under the direction of physicians who meet the requirements or for authorized users in 180 NAC 7-047 or 7-052; and c. Pass an examination, administered by diplomats of the specialty board, that assesses knowledge and competence in clinical diagnostic radiological or nuclear medicine physics and in radiation safety; or 7-022.02 An individual who: a. Has completed a structured educational program consisting of both: b. 200 hours of classroom and laboratory training in the following areas: (7) Disposing of radioactive material; and

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				(c)(1) Is a medical physicist who has been certified by a specialty board whose certification process has been recognized by the Commission or an Agreement State under § 35.51(a) and has experience in radiation safety for similar types of use of byproduct material for which the licensee is seeking the approval of the individual as Radiation Safety Officer and who meets the requirements in paragraphs (d) and (e) of this section; or (2) Is an authorized user, authorized medical physicist, or authorized nuclear pharmacist identified on the licensee's license and has experience with the radiation safety aspects of similar types of use of byproduct material for which the individual has Radiation Safety Officer responsibilities; and,	7-022.03 (NRC) NO	7-022.03 The individual who is a: 1. Medical physicist who has been certified by a specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State in 180 NAC 7-023.01 and has experience in radiation safety for similar types of use of radioactive material for which the licensee is seeking the approval of the individual as Radiation Safety Officer and who meets the requirement in 180 NAC 7-022.04 and 7-022.05; or 2. Is an authorized user, authorized medical physicist, or authorized nuclear pharmacist identified on the licensee's license and has experience with the radiation safety aspects of similar types of use of radioactive material for which the individual has Radiation Safety Officer responsibilities and who meets the requirements in 180 NAC 7-022.04 and 7-022.05.
				(d) Has obtained written attestation, signed by a preceptor Radiation Safety Officer, that the individual has satisfactorily completed the requirements in paragraph (e) and in paragraphs (a)(1)(i) and (a)(1)(ii) or (a)(2)(i) and (a)(2)(ii) or (b)(1) or (c)(1) of this section, and has achieved a level of radiation safety knowledge sufficient to function independently as a Radiation Safety Officer for a medical use licensee; and	7-022.04 (NRC) NO	7-022.04 An individual who has obtained written attestation, signed by a preceptor Radiation Safety Officer, that the individual has satisfactorily completed the requirements in 180 NAC 7-022.05 and in 180 NAC 7-022.01, item 1.a. and b. or 180 NAC 7-022.01, item 2.a. and b, or 180 NAC 7-022.02 item 1 or 180 NAC 7-022.03 and has achieved a level of radiation safety knowledge sufficient to function independently as a Radiation Safety Officer for a medical use licensee.
				(e) Has training in the radiation safety, regulatory issues, and emergency procedures for the types of use for which a licensee seeks approval. This training requirement may be satisfied by completing training that is supervised by a Radiation Safety Officer, authorized medical physicist, authorized nuclear pharmacist, or authorized user, as appropriate, who is authorized for the type(s) of use for which the licensee is seeking approval	7-022.04 (NRC) NO	7-022.05 An individual who has training in the radiation safety, regulatory issues and emergency procedures for the types of use for which a licensee seeks approval. This training requirement may be satisfied by completing training that is supervised by a radiation safety officer, authorized medical physicist, authorized nuclear pharmacist, or authorized user as appropriate, who is authorized for the type(s) of use for which the licensee is seeking approval

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§ 35.51	Training for an authorized medical physicist		B	**In § 35.51, paragrapre revised, and paragraph (c) is added to read as follows:** * * * * * (a) Is certified by a specialty board whose certification process has been recognized by the Commission or an Agreement State and who meets the requirements in paragraphs (b)(2) and (c) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board shall require all candidates for certification to: (1) Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; (2) Have 2 years of full-time practical training and/or supervised experience in medical physics— (i) Under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the Commission or an Agreement State; or (ii) In clinical radiation facilities providing high-energy, external beam therapy (photons and electrons with energies greater than or equal to 1 million electron volts) and brachytherapy services under the direction of physicians who meet the requirements for authorized users in §§ 35.490 or 35.690, or, before October 24, 2005, authorized users who meet the requirements in §§ 35.940 or 35.960; and (3) Pass an examination, administered by diplomates of the specialty board, that assesses knowledge and competence in clinical radiation therapy, radiation safety, calibration, quality assurance, and treatment planning for external beam therapy, brachytherapy, and stereotactic radiosurgery; or	7-023.01 (NRC) NO Item 1 NO Item 2 NO	7-023 TRAINING FOR AN AUTHORIZED MEDICAL PHYSICIST The licensee must require the authorized medical physicist to be: 7-023.01 An individual who is certified by a specialty board whose certification process has been recognized by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State and who meets the requirements of 180 NAC 7-023.03 and 7-023.04. (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 1. Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; 2. Have two years of full-time practical training and/or supervision experience in medical physics: a. Under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission, or b. In a clinical radiation facilities providing high energy, external beam therapy (photons and electrons with energies greater than or equal to one million electron volts) and brachytherapy services under the direction of physicians who meet the requirements for authorized users in 180 NAC 7-063 or 7-084; and 3. Pass an examination, administered by diplomats of the specialty board, which assesses knowledge and competence in clinical radiation therapy, radiation safety, calibration, quality assurance, and treatment planning for external beam therapy, brachytherapy, and stereotactic radiosurgery; or

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				(b)(1) Holds a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; and has completed 1 year of full-time training in medical physics and an additional year of fulltime work experience under the supervision of an individual who meets the requirements for an authorized medical physicist for the type(s) of use for which the individual is seeking authorization. This training and work experience must be conducted in clinical radiation facilities that provide high-energy, external beam therapy (photons and electrons with energies greater than or equal to 1 million electron volts) and brachytherapy services and must include: (i) Performing sealed source leak tests and inventories; (ii) Performing decay corrections; (iii) Performing full calibration and periodic spot checks of external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable; and (iv) Conducting radiation surveys around external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable; and	7-023.02 item 1 (NRC) NO	7-023.02 An individual who: 1. Holds a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; and has completed one year of full-time training in medical physics and an additional year of full-time work experience under the supervision of an individual who meets the requirements for an authorized medical physicist for the types(s) of use for which the individual is seeking authorization. This training and work experience must be conducted in clinical radiation facilities that provide high energy, external beam therapy (photons and electrons with energies greater than or equal to one million electron volts) and brachytherapy services and must include: a. Performing sealed source leak tests and inventories; b. Performing decay corrections; c. Performing full calibration and periodic spot checks of external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable; and d, Conducting radiation surveys around external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable, and 2. Meets the requirements of 180 NAC 7-023.03. and 7-023.04.
				(2) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (c) and (a)(1) and (2), or (b)(1) and (c) of this section, and has achieved a level of competency sufficient to function independently as an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. The written attestation must be signed by a preceptor authorized medical physicist who meets the requirements in § 35.51, or, before October 24, 2005, § 35.961, or equivalent Agreement State requirements for an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized	7-023.03 (NRC) NO	7-023.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-023.04 and 180 NAC 7-023.01, item 1 and 2, or 180 NAC 7-023.02, item 1 and 180 NAC 7-023.04, and has achieved a level of competency sufficient to function independently as an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. The written attestation must be signed by a preceptor authorized medical physicist who meets the requirements in 180 NAC 7-023, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements for an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized

7-023.04 Has training for the type(s) of use for which authorization is sought that includes hands-on device operation, safety procedures, clinical use,

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				medical physicist status; and (c) Has training for the type(s) of use for which authorization is sought that includes hands-on device operation, safety procedures, clinical use, and the operation of a treatment planning system. This training requirement may be satisfied by satisfactorily completing either a training program provided by the vendor or by training supervised by an authorized medical physicist authorized for the type(s) of use for which the individual is seeking authorization.	7-023.04 (NRC) NO	Medical physicist status and 7-023.04 Has training for the type(s) of use for which authorization is sought that includes hands-on device operation, safety procedures, clinical use, and the operation of a treatment planning system. This training requirement may be satisfiedby satisfactorily completing either a training program provided by the vendor or by training supervised by an authorized medical physicist authorized for the type(s) of use for which the individual is seeking authorization.

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§ 35.55	Training for an authorized nuclear pharmacist		B	**In § 35.55, paragraphs (a), (b)(1)(I) introductory text, and (b)(2) are revised to read as follows:** * * * * * (a) Is certified by a specialty board whose certification process has been recognized by the Commission or an Agreement State and who meets the requirements in paragraph (b)(2) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board shall require all candidates for certification to: (1) Have graduated from a pharmacy program accredited by the American Council on Pharmaceutical Education (ACPE) or have passed the Foreign Pharmacy Graduate Examination Committee (FPGEC) examination; (2) Hold a current, active license to practice pharmacy; (3) Provide evidence of having acquired at least 4000 hours of training/experience in nuclear pharmacy practice. Academic training may be substituted for no more than 2000 hours of the required training and experience; and (4) Pass an examination in nuclear pharmacy administered by diplomates of the specialty board, that assesses knowledge and competency in procurement, compounding, quality assurance, dispensing, distribution, health and safety, radiation safety, provision of information and consultation, monitoring patient outcomes, research and development; or (b) * * * (1) * * * (i) 200 hours of classroom and laboratory training in the following areas— * * * * *	7-024.01 (NRC) NO Item 1 NO Item 2 NO Item 3 NO Item 4 NO 7-024.02 item 1.a. NO	7-024 TRAINING FOR AN AUTHORIZED NUCLEAR PHARMACIST The licensee will require the authorized nuclear pharmacist to be a pharmacist who: 7-024.01 Is certified by a specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission who meets the requirements of 180 NAC 7-024.03. (The names of the board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) will be posted on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 1. Have graduated from a pharmacy program accredited by the American Council on Pharmaceutical Education (ACPE) or have passed the Foreign Pharmacy Graduate Examination Committee (FPGEC) examination; 2. Hold a current, active license to practice pharmacy; 3. Provide evidence of having acquired at least 4,000 hours of training/experience in nuclear pharmacy practice. Academic training may be substituted for no more than 2,000 hours of the required training and experience; 4. Pass an examination in nuclear pharmacy administered by diplomats of the specialty board, which assesses knowledge and competency in procurement, compounding, quality assurance, dispensing, distribution, health and safety, radiation safety, provision of information and consultation, monitoring patient outcomes, research and development; or 7-024.02 item 1.a. 200 hours of classroom and laboratory training in the following areas:

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				((2) Has obtained written attestation, signed by a preceptor authorized nuclear pharmacist, that the individual has satisfactorily completed the requirements in paragraphs (a)(1), (a)(2), and (a)(3) or (b)(1) of this section and has achieved a level of competency sufficient to function independently as an authorized nuclear pharmacist.	7-024.03 NO	7-024.03 Has obtained written attestation, signed by a preceptor authorized nuclear pharmacist, that the individual has satisfactorily completed the requirements of 180 NAC 7-024.01, item 1, 2, and 3 or 7-024.02 and has achieved a level of competency sufficient to function independently as an authorized nuclear pharmacist.
§ 35.57	Training for experienced Radiation SafetyOfficer, teletheraphy or medical physicist, authorized medical physicist, authorized user, nuclear pharmacist, and authorized nuclear pharmacist		B	**Section 35.57 is revised to read as follows:** (a)(1) An individual identified as a Radiation Safety Officer, a teletherapy or medical physicist, or a nuclear pharmacist on a Commission or Agreement State license or a permit issued by a Commission or Agreement State broad scope licensee or master material license permit or by a master material license permittee of broad scope before October 24, 2002, need not comply with the training requirements of §§ 35.50, 35.51, or 35.55, respectively. (2) An individual identified as a Radiation Safety Officer, an authorized medical physicist, or an authorized nuclear pharmacist on a Commission or Agreement State license or a permit issued by a Commission or Agreement State broad scope licensee or master material license permit or by a master material license permittee of broad scope between October 24, 2002 and April 29, 2005 need not comply with the training requirements of §§ 35.50, 35.51, or 35.55, respectively.	7-026.01 (NRC) NO	7-026 PROVISIONS FOR EXPERIENCED RADIATION SAFETY OFFICER, TELETHERAPY OR MEDICAL PHYSICIST, AUTHORIZED MEDICAL PHYSICIST, AUTHORIZED USER, NUCLEAR PHARMACIST AND AUTHORIZED NUCLEAR PHARMACIST 7-026.01 An individual identified as a Radiation Safety Officer, a teletherapy or medical physicist, or a nuclear pharmacist on a U.S. Nuclear Regulatory Commission, an Agreement State license or on a permit issued by a U.S. Nuclear Regulatory Commission or Agreement State broad scope licensee or master material license permit or by a master material permittee of broad scope that authorizes medical use or practice of nuclear pharmacy, before the effective date of these regulations need not comply with the training requirements of 180 NAC 7-022 through 7-024.

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				(b)(1) Physicians, s, or podiatrists identified as authorized users for the medical use of byproduct material on a license issued by the Commission or Agreement State, a permit issued by a Commission master material licensee, a permit issued by a Commission or Agreement State broad scope licensee, or a permit issued by a Commission master material license broad scope permittee before October 24, 2002, who perform only those medical uses for which they were authorized on that date need not comply with the training requirements of Subparts D through H of this part. (2) Physicians, dentists, or podiatrists identified as authorized users for the medical use of byproduct material on a license issued by the Commission or Agreement State, a permit issued by a Commission master material licensee, a permit issued by a Commission or Agreement State broad scope licensee, or a permit issued by a Commission master material license broad scope permittee who perform only those medical uses for which they were authorized between October 24, 2002 and April 29, 2005, need not comply with the training requirements of Subparts D through H of this part.	7-026.02 NO except (Doses not include dentist and podiatrist but will add)	7-026.02 Physicians identified as authorized users for the medical, use of radioactive material on a license issued by the U.S. Nuclear Regulatory Commission or Agreement State, a permit issued by a U.S. Nuclear Regulatory Commission master material licensee, a permit issued by a U.S. Nuclear Regulatory Commission or Agreement State broad scope licensee, or on a permit issued by a U.S. Nuclear Regulatory Commission master material license broad scope permittee before the effective date of these regulations who perform only those medical uses for which they were authorized on that date need not comply with the training requirements 180 NAC 7-041 through 7-084
§ 35.75	Release of individuals containing unsealed byproduct material or implants containing byproduct material		C, paragraphs (a) and (b) D – paragraphs (c) and (d)	In § 35.75, paragraph (a), footnote 1, remove "(draft)".	7-037 (NRC) NO	U.S. Nuclear Regulatory Commission's - Regulatory Guide 7.1, "Release of Patients Administered Radioactive Materials," describes methods for calculating doses to other individuals and contains tables of activities not likely to cause doses exceeding 5 mSv (0.5 rem).

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§ 35.100	Use of unsealed byproduct material for uptake, dultion, and excretion studies for which a written directive is not required		H&S	**In § 35.100, paragraph (b)(2) is revised to read as follows:** * * * * * (b) * * * (2) A physician who is an authorized user and who meets the requirements specified in §§ 35.290, or 35.390 and 35.290(c)(1)(ii)(G), or, before October 24, 2005, § 35.920; or * * * * *	7-041.02 (NRC) NO	7-041.02 Prepared by: 1. An authorized nuclear pharmacist; 2. A physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047 or 7-051 and 7-047.03, item 1.b.(7); or 3. An individual under the supervision, as specified in 180 NAC 7-018, of the authorized nuclear pharmacist in 180 NAC 7-041.02, item 1 or the physician who is authorized user in 180 NAC 7-041.02, item 2; or

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§ 35.190	Training for uptake, dilution, and excretion studies		B	**In § 35.190, paragraphs (a), the introductory text of (c)(1), (c)(1)(ii)(B) and (c)(2) are revised to read as follows:** * * * * * (a) Is certified by a medical specialty board whose certification process has been recognized by the Commission or an Agreement State and who meets the requirements in paragraph (c)(2) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board shall require all candidates for certification to: (1) Complete 60 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed byproduct material for uptake, dilution, and excretion studies that includes the topics listed in paragraphs (c)(1)(i) and (c)(1)(ii) of this section; and (2) Pass an examination, administered by diplomates of the specialty board, that assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or * * * * * c) * * * (1) Has completed 60 hours of training and experience, including a minimum of 8 hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed byproduct material for uptake, dilution, and excretion studies. The training and experience must include--- (ii)*** (B) Performing qaulity control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters; ******	7-043.01 (NRC) NO 7-043-03 (NRC) NO	7-043.01 Is certified by a medical specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State and who meets the requirements in 180 NAC 7-043.04. (The names of board certifications which have been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 1. Complete 60 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies that includes the topics listed in 180 NAC 7-043.03, item 1.and 2 and 7-043.04; and 2. Pass an examination, administered by diplomats of the specialty board, that assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or 7-043.03 Has completed 60 hours of training and experience, including a minimum of eight hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies. The training and experience must include: 2. b. Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper

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				(2) Has obtained written attestation, sighed by a preceptor authorized user who meets the requirements in §§ 35.190, 35.290, or 35.390, or, before October 24, 2005, §§ 35.910, 35.920, or 35.930, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraph (a)(1) or (c)(1) of this section and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under §35.100.	7-034.04 (NRC) NO	7-043.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-043, 7-047, or 7-051, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirement in 180 NAC 7-043.01, item 1 or 7-043.03, item 1 and 2 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized in 180 NAC 7-041.
§ 35.200	Use of unsealed byproduct material for imaging and localization studies for which a written directive is not required.		H&S	**In § 35.200, paragraph (b)(2) is revised to read as follows:** * * * * * (b) * * * (2) A physician who is an authorized user and who meets the requirements specified in §§ 35.290, or 35.390 and 35.290(c)(1)(ii)(G), or, before October 24,2005, § 35.920; or * * * * *	7-044.02 (NRC) NO	7-044.02 Prepared by: 2. A physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7), or

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§ 35.290	Training for imaging and localization studies		B	**In § 35.290, paragraphs (a), (b), the introductory text of (c)(1) and (c)(1)(ii) introductory text, (c)(1)(ii)(B), and (c)(2) are revised to read as follows:** * * * * * (a) Is certified by a medical specialty board whose certification process has been recognized by the Commission or an Agreement State and who meets the requirements in paragraph (c)(2) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board shall require all candidates for certification to: (1) Complete 700 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed byproduct material for uptake, dilution, and excretion studies that includes the topics listed in paragraphs (c)(1)(i) and (c)(1)(ii) of this section; and (2) Pass an examination, administered by diplomates of the specialty board, which assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or b) Is an authorized user under § 35.390 and meets the requirements in § 35.290(c)(1)(ii)(G), or, before October 24, 2005, § 35.920, or equivalent Agreement State requirements; or (c)(1) Has completed 700 hours of training and experience, including a minimum of 80 hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed byproduct material for imaging and localization studies. The training and experience must include, at a minimum— * * * * *	7-047.01 (NRC) NO	7-047.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) and who meets to requirement in 180 NAC 7-047.04. (The names of board certification which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 2. Complete 700 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for imaging and localization studies that includes the topics listed in 180 NAC 7-047.03; and 3. Pass an examination, administered by diplomats of the specialty board, which assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or 7-047.02 Is an authorized user in 180 NAC 7-051 and meets the requirements in 180 NAC 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements; or 7-047.03 The physician: 1. Completed 700 hours of training and experience, including a minimum of 80 hours of classroom and laboratory training in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for imaging and localization studies. The training and experience must include at a minimum:

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				(ii) Work experience, under the supervision of an authorized user, who meets the requirements in §§ 35.290, or 35.290(c)(1)(ii)(G) and 35.390, or, before October 24, 2005, § 35.920, or equivalent Agreement State requirements, involving— * * * * * (B) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters; * * * * *	7-047.02 (NRC) NO	b. Work experience, under the supervision of an authorized user, who meets the requirements in 180 NAC 7-047 or 7-47.03, item 1.b.(7) and 180 NAC 7-051 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, involving; (2) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;
				(2) Has obtained written attestation, signed by a preceptor authorized user who meets the equirements in §§ 35.290 or 35.390 and 35.290(c)(1)(ii)(G), or, before October 24, 2005, § 35.920, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraph (a)(1) or (c)(1) of this section and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under §§ 35.100 and 35.200.	7-047.04 (NRC) NO	7-047.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-047.01, item 1 or 180 NAC 7-047.03, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-041 and 7-044 .

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§ 35.390	Training for use of unsealed byproduct material for which a written directive is required.		B	**In § 35.390, paragraph (a), the introductory text of paragraphs (b)(1) and (b)(1)(ii) introductory text, paragraphs (b)(1)(ii)(B), (b)(1)(ii)(G)(1), (3) and (4), and (b)(2) are revised, and paragraph (b)(1)(ii)(F) is removed and reserved.** * * * * * (a) Is certified by a medical specialty board whose certification process has been recognized by the Commission or an Agreement State and who meets the requirements in paragraphs (b)(1)(ii)(G) and (b)(2) of this section. (Specialty boards whose certification processes have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.) To be recognized, a specialty board shall require all candidates for certification to: (1) Successfully complete residency training in a radiation therapy or nuclear medicine training program or a program in a related medical specialty. These residency training programs must include 700 hours of training and experience as described in paragraphs (b)(1)(i) through (b)(1)(ii)(E) of this section. Eligible training programs must be approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education, the Royal College of Physicians and Surgeons of Canada, or the Committee on Post-Graduate Training of the American Osteopathic Association; and 2) Pass an examination, administered by diplomates of the specialty board, which tests knowledge and competence in radiation safety, radionuclide handling, quality assurance, and clinical use of unsealed byproduct material for which a written directive is required; or	7-051.01 (NRC) NO except (will change to complete residency training)	7-051.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) who meets the requirements in 180 NAC 7-051.02, item 1.b.(6) and 7-051.03. (Specialty Boards whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) To be recognized, a specialty board must require all candidates for certification to: 1. Successfully complete a minimum of three years of residency training in a radiation therapy or nuclear medicine training program or a program in a related medical specialty. These residency training programs must include 700 hours of training and experience as described in 180 NAC 7-051.02, item 1.a. through 7-051.02, item 1.b.(5). Eligible training programs must be approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and 2. Pass an examination, administered by diplomats of the specialty board, which tests knowledge and competence in radiation safety, radionuclide handling, quality assurance, and clinical use of unsealed radioactive material for which a written directive is required; or

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§ 35.390	Training for use of unsealed byproduct material for which a written directive is required.		B	(b)(1) Has completed 700 hours of training and experience, including a minimum of 200 hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed byproduct material requiring a written directive. The training and experience must include— * * * * * (ii) Work experience, under the supervision of an authorized user who meets the requirements in § 35.390, or, before October 24, 2005, § 35.930, or equivalent Agreement State requirements. A supervising authorized user, who meets the requirements in § 35.390(b) or, before October 24, 2005, § 35.930(b), must also have experience in administering dosages in the same dosage category or categories (i.e., § 35.390(b)(1)(ii)(G)) as the individual requesting authorized user status. The work experience must involve— * * * * (B) Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters; * * * * * (G) * * * (1) Oral administration of less than or equal to 1.22 gigabecquerels (33 millicuries) of sodium iodide I–131, for which a written directive is required; * * * * * (3) Parenteral administration of any beta emitter or a photon-emitting radionuclide with a photon energy less than 150 keV, for which a written directive is required; and/or (4) Parenteral administration of any other radionuclide, for which a written directive is required; and *	7--051.02 (NRC) NO	7-051.02 The physician: 1. Has completed 700 hours of training and experience, including a minimum of 200 hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material requiring a written directive. The training and experience must include: b. Work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory or Agreement State requirements. A supervising authorized user, who meets the requirements in 180 NAC 7-051.02, must also have experience in administering dosages in the same dosage category or categories (that is , 180 NAC 7-051.02, item 1., b.(6)) as the individual requesting authorized user status. The work experience must involve: (2) Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters; **(6)** (a) Oral administration of less than or equal to 1.22 GBq (33 mCi) of sodium iodide I-131, for which a written directive is required; (c) Parenteral administration of any beta emitter or a photon-emitting radionuclide with a photon energy less than 150 keV, for which a written directive is required; and/or (d) Parenteral administration of any beta emitter, or a photon-emitting radionuclide with a photon energy less than 150 kev, for which a written directive is required; and/or

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				(2) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (a)(1) and (b)(1)(ii)(G) or (b)(1) of this section, and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under § 35.300. The written attestation must be signed by a preceptor authorized user who meets the requirements in § 35.390, or, before October 24, 2005, § 35.930, or equivalent Agreement State requirements. The preceptor authorized user, who meets the requirements in § 35.390(b), or, before October 24, 2005, § 35.930(b), must have experience in administering dosages in the same dosage category or categories (i.e.,§ 35.390(b)(1)(ii)(G)) as the individual requesting authorized user status.	**7-051.03 NO**	7-051.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-051.01, item 1 and 7-051.02, item 1.b.(6) or 7-051.02, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. The preceptor authorized user, who meets the requirement in 180 NAC 7-051.02 must have experience in administering dosages in the same dosage category or categories (that is, 180 NAC 7-051.02, item 1.b.(6)) as the individual requesting authorized user status.

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
§ 35.392	Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities less than or equal to 1.22 gigabecquerels (33 millicures).		B	**In § 35.392, paragraphs (a), (c)(2)(ii) and (c)(3) *are revised to read as follows:*** * * * * * (a) Is certified by a medical specialty board whose certification process includes all of the requirements in paragraphs (c)(1) and (c)(2) of this section and whose certification process has been recognized by the Commission or an Agreement State and who meets the requirements in paragraph (c)(3) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.); or * * * * * (c) * * * (2) * * * (ii) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters; * * * * * (3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (c)(1) and (c)(2) of this section, and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under § 35.300. The written attestation must be signed by a preceptor authorized user who meets the requirements in §§ 35.390, 35.392, or 35.394, or, before October 24, 2005, §§ 35.930, 35.932, or 35.934, or equivalent Agreement State requirements. A preceptor authorized user, who meets the preceptor authorized user, who meets the requirement in § 35.390(b), must also have *experience in administering dosages as specified* in § 35.390(b)(1)(ii)(G)(1) or (2).	7-052.01 (NRC) NO 7-052.03 (NRC) NO 7-052.04 (NRC) NO	7-052.01 Is certified by a medical specialty board whose certification process includes all of the requirements in 180 NAC 7-052.03, item 1. and 2. and whose certification has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission who meets the requirements of 180 NAC 7-052.04. (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) or **7-052.03 2.** b. Performing quality control procedures on instruments used to determine the activity of dosages and performing check for proper operation of survey meters; 7-052.04 Has obtained written attestation that the individual has satisfactorily completed the requirements in180 NAC 7-052.03, item 1. and 2. and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, 7-052, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A preceptor authorized user, who meets the requirement in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(a) or (b).

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
§ 35.394	Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities greater than 1.22 gigabecquerels (33 millicuries).		B	**In § 35.394, paragraphs (a), (c)(2)(ii) and (c)(3) are revised to read as follows:** * * * * * (a) Is certified by a medical specialty board whose certification process includes all of the requirements in paragraphs (c)(1) and (c)(2) of this section, and whose certification has been recognized by the Commission or an Agreement State, and who meets the requirements in paragraph (c)(3) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.); or * * * * * (c) * * * (2) * * * (ii) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters; * * * * * (3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (c)(1) and (c)(2) of this section, and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under § 35.300. The written attestation must be signed by a preceptor authorized user who meets the requirements in §§ 35.390 or 35.394, or, before October 24, 2005, §§ 35.930 or 35.934, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in § 35.390(b), must also have experience in administering dosages as specified in § 35.390(b)(1)(ii)(G)(1) or (2).	7-053.01 (NRC) NO 7-053.03 NO 7-053.04 NO	7-053.01 Is certified by a medical specialty board whose certification process includes all of the requirements in 180 NAC 7-053.03, item 1. and 2. and whose certification has been recognized an Agreement State or the U.S. Nuclear Regulatory Commission (NRC)and who meets the requirements in 180 NAC 7-053.04. (The name of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's Web page.) or 7-053.03 2.b. Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters; 7-053.04 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-053.03, item 1. and 2. and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized in 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051 or, 7-053, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.(6)(b).

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
§ 35.396	Training for the parenteral administration of unsealed byproduct material requiring a written directive		B	**Section 35.396 is added to read as follows:** Except as provided in § 35.57, the licensee shall require an authorized user for the parenteral administration requiring a written directive, to be a physician who-(a) Is an authorized user under § 35.390 or, before October 24, 2005, § 35.930 for uses listed in §§ 35.390(b)(1)(ii)(G)(3) or 35.390(b)(1)(ii)(G)(4), or equivalent Agreement State requirements; or (b) Is an authorized user under §§ 35.490 or 35.690, or, before October 24, 2005, §§ 35.940 or 35.960, or equivalent Agreement State requirements and who meets the requirements in paragraph (d) of this section; or (c) Is certified by a medical specialty board whose certification process has been recognized by the Commission or an Agreement State under §§ 35.490 or 35.690, or, before October 24, 2005, §§ 35.940 or 35.960; and who meets the requirements in paragraph (d) of this section. (d)(1) Has successfully completed 80 hours of classroom and laboratory training, applicable to parenteral administrations, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training must include— (i) Radiation physics and instrumentation; (ii) Radiation protection; (iii) Mathematics pertaining to the use and measurement of radioactivity; (iv) Chemistry of byproduct material for medical use; and (v) Radiation biology; and	7-054 (NRC) NO 7-054.02 (NRC) NO 7-054.03 (NRC) NO 7-054.04 (NRC) NO	7-054 TRAINING FOR THE PARENTERAL ADMINISTRATION OF UNSEALED RADIOACTIVE MATERIAL REQUIRING A WRITTEN DIRECTIVE Except as provided in 180 NAC 7-026, the licensee must require an authorized user for the parenteral administration requiring a written directive, to be a physician who: 7-054.01 Is an authorized user under 180 NAC 7-051 for uses listed in 7-051.02, item 1.b. (6)(c) or (d),or equivalent Agreement State requirements; or 7-054.02 Is an authorized user under 180 NAC 7-063 or 7-084, or equivalent Agreement State requirements and who meets the requirements in 180 NAC 7-054.04; or 7-054.03 Is certified by a medical specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State under 180 NAC 7-063 or 7-084; and who meets the requirements in 180 NAC 7-054.04. 7-054.04 The physician: 1. Has successfully completed 80 hours of classroom and laboratory training, applicable to parenteral administrations, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training must include: (1) Radiation physics and instrumentation; (2) Radiation protection; (3) Mathematics pertaining to the use and measurement of radioactivity; (4) Chemistry of radioactive material for medical use; and 1. Radiation biology; and

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
				(2) Has work experience, under the supervision of an authorized user who meets the requirements in §§ 35.390 or 35.396, or, before October 24, 2005, § 35.930, or equivalent Agreement State requirements, in the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements in §§ 35.390 or 35.930 must have experience in administering dosages as specified in §§ 35.390(b)(1)(ii)(G)(3) and/or 35.390(b)(1)(ii)(G)(4). The work experience must involve— (i) Ordering, receiving, and unpacking radioactive materials safely, and performing the related radiation surveys; (ii) Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters; (iii) Calculating, measuring, and safely preparing patient or human research subject dosages; (iv) Using administrative controls to prevent a medical event involving the use of unsealed byproduct material; (iv) Using administrative controls to prevent a medical event involving the use of unsealed byproduct material; (v) Using procedures to contain spilled byproduct material safely, and using proper decontamination procedures; and (vi) Administering dosages to patients or human research subjects, that include at least 3 cases involving the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV and/or at least 3 cases involving the parenteral administration of any other radionuclide, for which a written directive is required; and		2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051 or 7-054, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, in the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements in 180 NAC 7-051, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d). The work experience must involve: a. Ordering, receiving, and unpacking radioactive materials safely, and performing the related radiation surveys; b. Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters; c. Calculating, measuring, and safely preparing patient or human research subject dosages; d. Using administrative controls to prevent a medical event involving the use of unsealed radioactive material; e Using procedures to contain spilled radioactive material safely, and using proper decontamination procedures; and f. Administering dosages to patients or human research subjects, that include at least three cases involving the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV and/or at least three cases involving the parenteral administration of any other radionuclide, for which a written directive is required; and

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
				(3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraph (b) or (c) of this section, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed byproduct material requiring a written directive. The written attestation must be signed by a preceptor authorized user who meets the requirements in §§ 35.390, 35.396, or, before October 24, 2005, § 35.930, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in § 35.390, or, before October 24, 2005, § 35.930, must have experience in administering dosages as specified in §§ 35.390(b)(1)(ii)(G)(3) and/or 35.390(b)(1)(ii)(G)(4).		3. Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-054.02 or 7-054.03, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed radioactive material requiring a written directive. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or 7-054, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in 180 NAC 7-051, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d).

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35.490	Training for use of manual brachytherapy sources		B	**In § 35.490, paragraphs (a), (b)(2) and (b)(3) are revised to read as follows:** * * * * * (a) Is certified by a medical specialty board whose certification process has been recognized by the Commission or an Agreement State, and who meets the requirements in paragraph (b)(3) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board shall require all candidates for certification to: (1) Successfully complete a minimum of 3 years of residency training in a radiation oncology program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and (2) Pass an examination, administered by diplomates of the specialty board, that tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use of manual brachytherapy; or (b) * * * (2) Has completed 3 years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements in § 35.490, or, before October 24, 2005, § 35.940, or equivalent Agreement State requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by paragraph (b)(1)(ii) of this section; and	7-063.01 (NRC) NO 7-063.02 (NRC) NO	7-063.01 Is certified by a medical specialty board whose certification has been recognized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission (NRC), and who meets to requirements of 180 NAC 7-063.03. (The names of board certifications which have been recognized an Agreement State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 1. Successfully complete a minimum of three years of residency training in a radiation oncology program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and 2. Pass an examination, administered by diplomats of the specialty board, that tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use manual brachytherapy; or 7-063.02 2. Has completed three years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements in 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements, as a part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdocutoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by 180 NAC 7-063.02, item 1.b.; and

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				(3) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in § 35.490, or, before October 24, 2005, § 35.940, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraphs (a)(1), or (b)(1) and (b)(2) of this section and has achieved a level of competency sufficient to function independently as an authorized user of manual brachytherapy sources for the medical uses authorized under § 35.400.	**7-063.03 (NRC) NO**	7-063.03 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-063, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-063.01, item 1 or 7-063.02, item 2 and has achieved a level of competency sufficient to independently function as an authorized user of manual brachytherapy sources for the medical uses authorized under 180 NAC 7-055.
§ 35.491	Training for ophthalmic use of strontium-90		B	**In § 35.491, paragraph (b)(3) is revised to read as follows:** * * * * * (b) * * * (3) Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in §§ 35.490 or 35.491, or, before October 24, 2005, §§ 35.940 or 35.941, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirements in paragraphs (a) and (b) of this section and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use	7-064.02 (NRC) NO	**7-064.02** 3. Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-063 or 7-064 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-064.01 and 7-064.02 and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use.

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§ 35.590	Training for use of sealed sources for diagnosis		B	**In § 35.590, paragraphs (a) and (b) are revised and paragraph (c) is added to read as follows:** * * * * * (a) Is certified by a specialty board whose certification process includes all of the requirements in paragraphs (b) and (c) of this section and whose certification has been recognized by the Commission or an Agreement State. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's Web page.); *or* (b) Has completed 8 hours of classroom and laboratory training in basic radionuclide handling techniques specifically applicable to the use of the device. The training must include— (1) Radiation physics and instrumentation; (2) Radiation protection; (3) Mathematics pertaining to the use and measurement of radioactivity; and (4) Radiation biology; and (c) Has completed training in the use of the device for the uses requested.	7-066.01 (NRC) NO 7-066.02 (NRC) NO 7-066.03 (NRC) NO	7-066.01 Is certified by a specialty board whose certification includes all of the requirements in 180 NAC 7-066.02 and 7-066.03 whose certification has been recognized by, an Agreement State or the U.S. Nuclear Regulatory Commission (NRC). (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's web page.); or 7-066.02 The physican: 1. Has completed eight hours of classroom and laboratory training in basic radionuclide handling techniques specifically applicable to the use of the device. The training must include: a. Radiation physics and instrumentation; b. Radiation protection; c. Mathematics pertaining to the use and measurement of radioactivity; and d. Radiation biology; and 7-066.03 Has completed training in the use of the device for the uses requested.

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§ 35.690	Training for use of *remote* afterloader units, teletherapy units, and gamma sterotactic radiosurgery units		B	**In § 35.690, paragraphs (a), (b)(2) and (b)(3) are revised, and paragraph (c) is added to read as follows:** * * * * * (a) Is certified by a medical specialty board whose *certification process has been recognized* by the Commission or an Agreement State and who meets the requirements in paragraphs (b)(3) and (c) of this section. (The names of board certifications which have been recognized by the Commission or an Agreement State will be posted on the NRC's web page.) To have its certification process recognized, a specialty board shall require all candidates for certification to: (1) Successfully complete a minimum of 3 years of residency training in a radiation therapy program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and (2) Pass an examination, administered by diplomates of the specialty board, which tests *knowledge and competence in radiation safety*, radionuclide handling, treatment planning, quality assurance, and clinical use of stereotactic radiosurgery, remote afterloaders and external beam therapy; or (b) * * * (2) Has completed 3 years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements in § 35.690, or, before October 24, 2005, § 35.960, or equivalent Agreement State requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This *experience may be obtained concurrently with*	7-084.01 (NRC) NO 7-084.02 NO	7-084.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) and who meets the requirements of 180 NAC 7-084.03 and 7-084.04. (The names of board certifications which have *been recognized the Department, an Agreement* State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's web page.) To be recognized, a specialty board must require all candidates for certification to: 1. Successfully complete a minimum of three years of residency training in a radiation therapy program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and 2. Pass an examination, administered by diplomats of the specialty board, which tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, *and clinical use of stereotactic* radiosurgery, high and low dose-rate brachytherapy, and external beam therapy; or 7-084.02 2. Has completed three years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements in 180 NAC 7-084, or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by 180 NAC 7-084.02, item 1.b.; and 3. Meets the requirements of 180 NAC 7-084.03 and 7-084.04.

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				the supervised work experience required by paragraph (b)(1)(ii) of this section; and (3) Has obtained written attestation that the individual has satisfactorily completed the requirements in paragraphs (a)(1) or (b)(1) and (b)(2), and (c) of this section, and has achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation must be signed by a preceptor authorized user who meets the requirements in § 35.690, or, before October 24, 2005, § 35.960, or equivalent Agreement State requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and (c) Has received training in device operation, safety procedures, and clinical use for the type(s) of use for which authorization is sought. This training requirement may be satisfied by satisfactory completion of a training program provided by the vendor for new users or by receiving training supervised by an authorized user or authorized medical physicist, as appropriate, who is authorized for the type(s) of use for which the individual is seeking authorization	**7-084.03 (NRC) NO** **7-084.04 (NRC) NO**	7-084.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-084.01, item 1 or 7-084.02, item 1 and 2, and 7-084.04 has achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-084 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and 7-084.04 Has received training in device operation, safety procedures, and clinical use of the type(s) of use for which authorization is sought. This training requirement may be satisfied by satisfactory completion of a training program provided by the vendor for new users or by receiving training supervised by an authorized user or authorized medical physicist, as appropriate, who is authorized for the type(s) of use for which the individual is seeking authorization.
§ 35.980	Training for an authorized nuclear pharmacist		D	N/A	NA	

REG SECTION #	SECTION TITLE	Difference	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC& Significant Difference	Nebraska
Increased Controls for Risk-Significant Radioactive Sources (NRC Order EA-05-090 (70 FR 72128, (12/1/05) RATS IF 2005-03 (Due Date 12/01/05 Per letter dated 9-2/05 from Paul H. Lohaus – NRC Order EA-o5-090)						
Nebraska completed this 12/2/2005						

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status

Compatibility With IAEA Transportation Safety Standards (TS-R-1) and Other Transportation Safety Amendments (69 FR 3697, January 26, 2004)
RATS ID 2004-1 Effective date October 1, 2004
Due for State adoption: October 1, 2007

Please Note: The bracket " [ ] " around a compatibility category designation means that the Section may have been adopted elsewhere in a State rules and it is not necessary to adopt it again.

Please Note : Sections of Part 71 reserved for NRC use are not listed in this amendment notice. Please check the Federal Register (69 FR 3697) for those sections.

§71.0	Purpose and scope		D, except paragraph C is [B]	(a) This part establishes— (1) Requirements for packaging, preparation for shipment, and transportation of licensed material; and (2) Procedures and standards for NRC approval of packaging and shipping procedures for fissile material and for a quantity of other licensed material in excess of a Type A quantity. (b) The packaging and transport of licensed material are also subject to other parts of this chapter (e.g., 10 CFR parts 20, 21, 30, 40, 70, and 73) and to the regulations of other agencies (e.g., the U.S. Department of Transportation (DOT) and the U.S. Postal Service)1 having jurisdiction over means of transport. The requirements of this part are in addition to, and not in substitution for, other requirements. (c) The regulations in this part apply to any licensee authorized by specific or general license issued by the Commission to receive, possess, use, or transfer licensed material, if the licensee delivers that material to a carrier for transport Transports the material outside the site of usage as specified in the NRC license, or transports that material on public highways. No provision of this part authorizes possession of licensed material. (d)(1) Exemptions from the requirement for license in § 71.3 are specified in § 71.14. General licenses for which no NRC package approval is required are issued in §§ 71.20 through 71.23. The general license	13-001.03 (NRC NO)	13-001.03 The regulations in 180 NAC 13 apply to any licensee authorized by specific or general license issued by this Department to receive, possess, use, or transfer licensed material, if the licensee delivers that material to a carrier for transport, transport the material outside the site of usage as specified in the Department's license, or transport that material on public highways. No provision of 180 NAC 13 authorizes possession of licensed material.

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				in § 71.17 requires that an NRC certificate of compliance or other package approval be issued for the package to be used under this general license. (2) Application for package approval must be completed in accordance with subpart D of this part, demonstrating that the design of the package to be used satisfies the package approval standards contained in subpart E of this part, as related to the tests of subpart F of this part. (3) A licensee transporting licensed material, or delivering licensed material to a carrier for transport, shall comply with the operating control requirements of subpart G of this part; the quality assurance requirements of subpart H of this part; and the general provisions of subpart A of this part, including DOT regulations referenced in § 71.5. (e) The regulations of this part apply to any person holding, or applying for, a certificate of compliance, issued pursuant to this part, for a package intended for the transportation of radioactive material, outside the confines of a licensee's facility or authorized place of use. pursuant to part 76 of this chapter, if the person delivérs radioactive material to a common or contract carrier for transport or transports the material outside the confines of the person's plant or other authorized place of use. (g) This part also gives notice to all persons who knowingly provide to any licensee, certificate holder, quality assurance program approval holder, applicant for a license, certificate, or or quality assurance program approval, or to a contractor, or subcontractor of any of them, components, equipment, materials, or other goods or services, that relate to a licensee's, certificate holder's, quality assurance program approval holder's, or applicant's activities subject to this part, that they may be individually subject to NRC enforcement action for violation of § 71.8.		
71.1	Communications and records		D	NA	NA	
71.2	Interpretations		D	NA	NA	

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71.3	Requirement for license		[B]	Except as authorized in a general license or a specific license issued by the Commission, or as exempted in this part, no licensee may— (a) Deliver licensed material to a carrier for transport; or (b) Transport licensed material.	13-003 (NRC) NO	13-003 REQUIREMENT FOR LICENSE: Except as authorized in a general or specific license issued by the Department, or as exempted in 180 NAC 13-004, no licensee may: 1. Deliver radioactive material to a carrier for transport; or Transport radioactive material.
71.4	Definitions			The following terms are as defined here for the purpose of this part. To ensure compatibility with international transportation standards, all limits in this part are given in terms of dual units: The International System of Units (SI) followed or preceded by U.S. standard or customary units. The U.S. customary units are not exact equivalents but are rounded to a convenient value, providing a functionally equivalent unit. For the purpose of this part, either unit may be used.	13-002	
			[B]	*A1* means the maximum activity of special form radioactive material permitted in a Type A package. This value is either listed in Appendix A, Table A–1, of this part, or may be derived in accordance with the procedures prescribed in Appendix A of this part.	1-002 (NRC) NO	A_1 means the maximum activity of special form radioactive material permitted in a Type A package. This value is either listed in Appendix A of 180 NAC 13, Table A-1, or may be derived in accordance with the procedure prescribed in Appendix A of 180 NAC 013.
			[B]	*A2* means the maximum activity of radioactive material, other than special form material, LSA, and SCO material, permitted in a Type A package. This value is either listed in Appendix A, Table A–1, of this part, or may be derived in accordance with the procedures prescribed in Appendix A of this part.	1-002 (NRC) NO	A_2 means the maximum activity of radioactive material, other than special form, Low Specific Activity (LSA) and Surface Contaminated Object (SCO) material, permitted in a Type A package. These values are either listed in Appendix A of 180 NAC 13, Table A-1, or may be derived in accordance with the procedure prescribed in Appendix A of 180 NAC 013.
			D-for those State which have no licensees	*Carrier* means a person engaged in the transportation of passengers or property by land or water as a common, contract, or private carrier, or by civil aircraft.	13-002 (NRC) NO	Carrier means a person engaged in the transportation of passengers or property by land or water as a common, contract, or private carrier, or by civil aircraft.

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			that use Type B package or [B]-for those States which have licensees that use Type B packages	Certificate holder means a person who has been issued a certificate of compliance or other package approval by the Commission.	13-002 (NRC) NO	Certificate holder means a person who has been issued a certificate of compliance or other package approval by the U.S. Nuclear Regulatory Com
			D-for those State which have no licensees that use Type B package or [B]-for those States which have licensees that use Type B packages D	*Certificate of Compliance (CoC)* means the certificate issued by the Commission under subpart D of this part which approves the design of a package for the transportation of radioactive material.	13-002 (NRC) NO	Certificate of Compliance (CoC) means the certificate issued by the U.S. Nuclear Regulatory Commission under 10 CFR 71 Subpart D which approves the design of a package for the transportation of radioactive material.
			[B]	*Close reflection by water* means immediate contact by water of sufficient thickness for maximum reflection of neutrons. *Consignment* means each shipment of a package or groups of packages or load of radioactive material offered by a shipper for transport. *Containment system* means the assembly of components of the packaging intended to retain the radioactive material during transport.	13-002 (NRC) NO 13-002 (NRC) NO 13-002 (NRC) NO	Close reflection by water means immediate contact by water of sufficient thickness for maximum reflection of neutrons. Consignment means each shipment of a package or groups of packages or load of radioactive material offered by a shipper for transport. Containment system means the assembly of components of packaging intended to retain the radioactive material during transport.

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			[B]	*Conveyance* means: (1) For transport by public highway or rail any transport vehicle or large freight container; (2) For transport by water any vessel, or any hold, compartment, or defined deck area of a vessel including any transport vehicle on board the vessel; and (3) For transport by any aircraft.	13-002 (NRC) NO	Conveyance means: (1) For transport by public highway or rail any transport vehicle or large freight container; (2) For transport by water any vessel, or any hold, compartment, or defined deck area of a vessel including any transport vehicle on board the vessel; and (3) For transport by aircraft any aircraft.
			B	*Criticality Safety Index (CSI)* means the dimensionless number (rounded up to the next tenth) assigned to and placed on the label of a fissile material package, to designate the degree of control of accumulation of packages containing fissile material during transportation. Determination of the criticality safety index is described in §§ 71.22, 71.23, and 71.59.	13-002 (NRC) NO	Criticality Safety Index (CSI) means the dimensionless number (rounded up to the next tenth) assigned to and placed on the label of a fissile material package, to designate the degree of control of accumulation of packages containing fissile material during transportation. Determination of the criticality safety index is described in 180 NAC 13-011 and 13-012, and 10 CFR 71.59.
			B	*Deuterium* means, for the purposes of §§ 71.15 and 71.22, deuterium and any deuterium compounds, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000.	13-002 (NRC) NO	Deuterium means, for the purposes of 180 NAC 13-004.04 and 13-011, deuterium and any deuterium compounds, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000.
				DOT means the U.S. Department of Transportation.		DOT means the U.S. Department of Transportation.
			D	*Exclusive use* means the sole use by a single consignor of a conveyance for which all initial, intermediate, and final loading and unloading are	13-002 (NRC) NO	Exclusive use means the sole use of a conveyance by a single consignor for which all initial,
			[B]	carried out in accordance with the direction of the consignor or consignee. The consignor and the carrier must ensure that any loading or unloading is performed by personnel having radiological training and resources appropriate for safe handling of the consignment. The consignor must issue specific instructions, in writing, for maintenance of exclusive use shipment controls, and include them with the shipping paper information provided to the carrier by the consignor.	13-002 (NRC) NO	intermediate, and final loading and unloading are carried out in accordance with the direction of the consignor or consignee. The consignor and the carrier must ensure that any loading or unloading performed by personnel having radiological training and resources appropriate for safe handling of the consignment. The consignor must issue specific instructions, in writing, for maintenance of exclusive use shipment controls and include them with the shipping paper information provided to the carrier by the consignor.

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			[B]	*Fissile material* means the radionuclides uranium-233, uranium-235, plutonium-239, and plutonium-241, or any combination of these radionuclides. Fissile material means the fissile nuclides themselves, not material containing fissile nuclides. Unirradiated natural uranium and depleted uranium and natural uranium or depleted uranium, that has been irradiated in thermal reactors only, are not included in this definition. Certain exclusions from fissile material controls are provided in § 71.15.	13-002 (NRC) NO	Fissile material means plutonium-239, plutonium-241, uranium-233, uranium-235, or any combination of these radionuclides. Fissile material means the fissile nuclides themselves, not material containing fissile nuclides. Unirradiated natural uranium and depleted uranium and natural uranium or depleted uranium, that has been irradiated in thermal reactors only, are not included in this definition.[1] Certain exclusions from fissile material control are provided in 180 NAC 13-004.04.
			B	*Graphite* means, for the purposes of §§ 71.15 and 71.22, graphite with a boron equivalent content less than 5 parts per million and density greater than 1.5 grams per cubic centimeter.	13-002 (NRC) NO	Graphite means, for the purposes of 180 NAC 13-004.04 and 13-011, graphite with a boron equivalent content less than 5 parts per million and density greater than 1.5 grams per cubic centimeter.
			[D]	*Licensed material* means byproduct, source, or special nuclear material received, possessed, used, or transferred under a general or specific license issued by the Commission pursuant to the regulations in this chapter.	1-002 (NRC) NO	Licensed material means radioactive material received, possessed, used, transferred or disposed of under a general or specific license issued by the Department.
			[B]	*Low Specific Activity (LSA)* material means radioactive material with limited specific activity which is nonfissile or is excepted under § 71.15, and which satisfies the descriptions and limits set forth below. Shielding materials surrounding the LSA material may not be considered in determining the estimated average specific activity of the package contents. LSA material must be in one of three groups: (1) LSA—I. (i) Uranium and thorium ores, concentrates of uranium and thorium ores, and other ores containing naturally occurring radioactive radionuclides which are not intended to be processed for the use of these radionuclides; (ii) Solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures; (iii) Radioactive material for which the A2 value is unlimited; or	13-002 (NRC) NO	Low specific activity (LSA) Material means radioactive material with limited specific activity which is nonfissile or is excepted under 180 NAC 13-004.04, and which satisfies the descriptions and limits set forth below. Shielding materials surrounding the LSA material may not be considered in determining the estimated average specific activity of the package contents. LSA material must be in one of three groups: (1) LSA-I: (a) Uranium and thorium ores, concentrates of uranium and thorium ores, and other ores containing naturally occurring radioactive radionuclides which are not intended to be processed for the use of these radonuclides; (b) Solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures; (c) Radioactive material for which the A2value is unlimited; or;

[1]Department jurisdiction extends only to "special nuclear material in quantities not sufficient to form a critical mass" as defined in 180 NAC 1-002.

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			[B]	(iv) Other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the value for exempt material activity concentration determined in accordance with Appendix A. (2) LSA—II. (i) Water with tritium concentration up to 0.8 TBq/liter (20.0 Ci/liter); or (ii) Other material in which the activity is distributed throughout and the average specific activity does not exceed 10-4 A2/g for solids and gases, and 10-5A2/g for liquids. (2) LSA—III. Solids (e.g., consolidated wastes, activated materials), excluding powders, that satisfy the requirements of § 71.77, in which: (i) The radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.); (ii) The radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that even under loss of packaging, the loss of radioactive material per package by leaching, when placed in water for 7 days, would not exceed 0.1 A2; and (iii) The estimated average specific activity of the solid does not exceed 2 × 10-3 A2/g. *Low toxicity alpha emitters* means natural uranium, depleted uranium, natural thorium; uranium-235, uranium- 238, thorium-232, thorium-228 or thorium-230 when contained in ores or physical or chemical concentrates or tailings; or alpha emitters with a halflife of less than 10 days.	13-002 (NRC) NO	(d) Other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the value for exempt material activity concentration determined in accordance with Appendix 13-A. (2) LSA-II: (a) Water with tritium concentration up to 0.8 TBq/liter (20.0 Ci/liter); or (b) Other material in which the activity is distributed throughout, and the average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids. (3) LSA-III solids (e g., consolidated wastes, activated materials), excluding powders, that satisfy the requirements of 10 CFR 71.77 in which: (a) The radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.); and (b) The radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that, even under loss of packaging, the loss of radioactive material per package leaching, when placed in water for 7 days, would not exceed 0.1 A_2; and (c) The estimated average specific activity of the solid does not exceed 2 E-3 A_2/g. Low toxicity alpha emitters means natural uranium, depleted uranium, natural thorium; uranium-235, uranium-238, thorium-232, thorium-228 or thorium-230 when contained in ores or physical or chemical concentrates or tailings; or alpha emitters with a half-life of less than 10 days.

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			D	*Maximum normal operating pressure* means the maximum gauge pressure that would develop in the containment system in a period of 1 year under the heat condition specified in § 71.71(c)(1), in the absence of venting, external cooling by an ancillary system, or operational controls during transport.	NA	
				Natural thorium means thorium with the naturally occurring distribution of thorium isotopes (essentially 100 weight percent thorium-232).	13-002 (NRC) NO	Natural thorium means thorium with the naturally occurring distribution of thorium isotopes (essentially 100 weight percent thorium-232).
			[B]	*Normal form radioactive material* means radioactive material that has not been demonstrated to qualify as "special form radioactive material."	13-002 (NRC) NO	Normal form radioactive material means radioactive material which has not been demonstrated to qualify as "special form radioactive material" as defined 180 NAC 1-002.
			D	*Optimum interspersed hydrogenous moderation* means the presence of hydrogenous material between packages to such an extent that the maximum nuclear reactivity results.	13-002 (NRC) NO	Optimum interspersed hydrogenous moderation means the presence of hydrogenous material between packages to such an extent that the maximum nuclear reactivity results.
			[B]	*Package* means the packaging together with its radioactive contents as presented for transport. (1) Fissile material package or Type AF package, Type BF package, Type B(U)F package, or Type B(M)F package means a fissile material packaging together with its fissile material contents. (2) Type A package means a Type A packaging together with its radioactive contents. A Type A package is defined and must comply with the DOT regulations in 49 CFR part 173. (3) Type B package means a Type B packaging together with its radioactive contents. On approval, a Type B package design is designated by NRC as B(U) unless the package has a maximum normal operating pressure of more than 700 kPa (100 lbs/in2) gauge or a pressure relief device that would allow the release of radioactive material to the environment under the tests specified in § 71.73 (hypothetical accident conditions), in which case it will receive a designation B(M). B(U) refers to the need for unilateral approval of international shipments; B(M) refers to the need for multilateral approval of international shipments. There is no distinction made in how packages with these designations may be used in domestic transportation. To	13-002 (NRC) NO	Package means the packaging together with its radioactive contents as presented for transport. (1) Fissile material package or Type AF package, Type BF package, Type B(U)F package or Type B(M)F package means a fissile material packaging together with its fissile material contents. (2) Type A package means a Type A packaging together with its radioactive contents. A type A package is defined and must comply with the DOT regulations in 49 CFR part 173. (3)Type B package means a Type B packaging togeth under the tests specified in 10 CFR Part 71.73 (hypothetical accident conditions), in which it will receive a designation B(M). B(U) refers to the need for unilateral approval of international shipments; B(M) refers to the need for multilateral approval of international shipments. There is no distinction made in how packages with these designations may be used in domestic transportation. To

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				determine their distinction for international transportation, see DOT regulations in 49 CFR Part 173. A Type B package approved before September 6, 1983, was designated only as Type B. Limitations on its use are specified in § 71.19.		determine their distinction for international transportation, see U. S. Department of Transportation (DOT) regulations, 49 CFR Part 173. A Type B package approved before September 6,1983, was designated only as Type B. Limitations on its use are specified 10 CFR 71.19.
			[B]	*Packaging* means the assembly of components necessary to ensure compliance with the packaging requirements of this part. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tiedown system, and auxiliary equipment may be designated as part of the packaging.	13-002 (NRC) NO	Packaging means the assembly of components necessary to ensure compliance with the packaging requirements of 180 NAC 13. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie down system, and auxiliary equipment may be designated as part of the packaging.
			[B]	*Special form radioactive material* means radioactive material that satisfies the following conditions: (1) It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule; (2) The piece or capsule has at least one dimension not less than 5 mm (0.2 in); and (3) It satisfies the requirements of § 71.75. A special form encapsulation designed in accordance with the requirements of § 71.4 in effect on June 30, 1983 (see 10 CFR part 71, revised as of January 1, 1983), and constructed before July 1, 1985, and a special form encapsulation designed in accordance with the requirements of § 71.4 in effect on March 31, 1996 (see 10 CFR part 71, revised as of January 1, 1983), and constructed before April 1, 1998, may continue to be used. Any other special form encapsulation must meet the specifications of this definition.	1-002 (NRC) NO	Special form radioactive material means radioactive material that satisfies the following conditions: (1) It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule; (2) The piece or capsule has at least one dimension not less than 5 millimeters (0.2 inch); and (3) It satisfies the test requirements specified by the U.S. Nuclear Regulatory Commission. A special form encapsulation designed in accordance with the U.S. Nuclear Regulatory Commission requirements in effect on June 30, 1983, and constructed prior to July 1, 1985, may continue to be used. A special form encapsulation either designed in accordance with the Nuclear Regulatory Commission requirements in effect on March 31, 1996, and constructed prior to April 1, 1998, may continue to be used. A special form encapsulation either designed or constructed after April 1, 1998, must meet requirements of this definition applicable at the time of its design or construction.
			[B]	*Specific activity of a radionuclide* means the radioactivity of the radionuclide per unit mass of that nuclide. The specific activity of a material in which the radionuclide is essentially uniformly distributed is the radioactivity per unit mass of the material.	13-002 (NRC) NO	Specific activity of a radionuclide means the radioactivity of a radionuclide per unit mass of that nuclide. The specific activity of a material in which the radionuclide is essentially uniformly distributed is the radioactivity per unit mass of the material.

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			D	*Spent nuclear fuel or Spent fuel* means fuel that has been withdrawn from a nuclear reactor following irradiation, has undergone at least 1 year's decay since being used as a source of energy in a power reactor, and has not been chemically separated into its constituent elements by reprocessing. Spent fuel includes the special nuclear material, byproduct material, source material, and other radioactive materials associated with fuel assemblies.	1-002 (NRC) NO	Spent nuclear fuel means fuel that has been withdrawn from a nuclear reactor following irradiation, has undergone at least one year of decay since being used as a source of energy in a power reactor, and has not been chemically separated into its constituent elements by reprocessing. Spent nuclear fuel includes the special nuclear material, byproduct material, source material, and other radioactive material associated with fuel assemblies.
			D	*State* means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.	NA	
			[B]	*Surface Contaminated Object (SCO)* means a solid object that is not itself classed as radioactive material, but which has radioactive material distributed on any of its surfaces. SCO must be in one of two groups with surface activity not exceeding the following limits: (1) SCO–I: A solid object on which: (i) The nonfixed contamination on the accessible surface averaged over 300 Cm2 (or the area of the surface if less than 300 Cm2) does not exceed 4 Bq/Cm2 (10-4 microcurie/Cm2) for beta and gamma and low toxicity alpha emitters, or 0.4 Bq/Cm2 (10-5 microcurie/Cm2) for all other alpha emitters; (ii) The fixed contamination on the accessible surface averaged over 300 Cm2 (or the area of the surface if less than 300 Cm2) does not exceed 4 × 10-4 Bq/Cm2 (1.0 microcurie/Cm2) for beta and gamma and low toxicity alpha emitters, or 4 × 103 Bq/Cm2 (0.1 microcurie/Cm2) for all other alpha emitters; and (iii) The nonfixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 Cm2 (or the area of the surface if less than 300 Cm2) does not exceed 4 × 104 Bq/Cm2 (1 microcurie/Cm2) for beta and gamma and low toxicity alpha emitters, or 4 × 103 Bq/Cm2 (0.1 microcurie/Cm2) for all other alpha emitters.	13-002 (NRC) NO	Surface contaminated object (SCO) means a solid object that is not itself classed as radioactive material, but which has radioactive material distributed on any of its surfaces. SCO must be in one of two groups with surface activity not exceeding the following limits: (1) SCO-1: A solid object on which: (a) The non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4 Bq/cm^2 (10^{-4} $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 0.4 Bq/cm^2 (10^{-5} $\mu Ci/cm^2$) for all other alpha emitters. (b) The fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4E+4 Bq/cm^2 (1.0 $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 4E+3 Bq/cm^2 (0.1 $\mu Ci/cm^2$) for all other alpha emitters; and (c) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4E+4 Bq/cm^2 (1.0 $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 4E+3 Bq/cm^2 (0.1 $\mu Ci/cm^2$) for all other alpha emitters.

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				(2) SCO–II: A solid object on which the limits for SCO–I are exceeded and on which: (i) The nonfixed contamination on the accessible surface averaged over 300 Cm2 (or the area of the surface if less than 300 Cm2) does not exceed 400 Bq/Cm2 (10-2 microcurie/Cm2) for beta and gamma and low toxicity alpha emitters or 40 Bq/Cm2 (10-3 microcurie/Cm2) for all other alpha emitters; (ii) The fixed contamination on the accessible surface averaged over 300 Cm2 (or the area of the surface if less than 300 Cm2) does not exceed 8 × 105 Bq/Cm2 (20 microcuries/Cm2) for beta and gamma and low toxicity alpha emitters, or 8 × 104 Bq/Cm2 (2 microcuries/Cm2) for all other alpha emitters; and (iii) The nonfixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 Cm2 (or the area of the surface if less than 300 2) does not exceed 8 × 105 Bq/ Cm2 (20 microcuries/Cm2) for beta and gamma and low toxicity alpha emitters, or 8 × 104 Bq/Cm2 (2 microcuries/Cm2) for all other alpha emitters. *Transport index (TI)* means the dimensionless number (rounded up to the next tenth) placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. The transport index is the number determined by multiplying the maximum radiation level in millisievert (mSv) per hour at 1 meter (3.3 ft) from the external surface of the package by 100 (equivalent to the maximum radiation level in millirem per hour at 1 meter (3.3 ft)).		(2) SCO-II: A solid object on which the limits for SCO-1 are exceeded and on which: (a) The non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 400 Bq/cm^2 (10^{-2} $\mu Ci/cm^2$) or beta and gamma and low toxicity alpha emitters or 40 Bq/cm^2 (10^{-3} $\mu Ci/cm^2$) for all other alpha emitters; (b) The fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8E+5 Bq/cm^2 (20 $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 8E+4 Bq/cm^2 (2 $\mu Ci/cm^2$) for all other alpha emitters; (c) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8E+5 Bq/cm^2 (20 $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 8E+4 Bq/cm^2 (2 $\mu Ci/cm^2$) for all other alpha emitters. Transport index means the dimensionless number (rounded up to the next tenth) placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. The transport index is the number determined by multiplying the maximum radiation level in millisievert (mSv) per hour at 1 meter (3.3 ft) from the external surface of the package by 100 (equivalent to the maximum radiation level in millirem per hour at 1 meter (3.3 ft))
			[B]		13-002 (NRC) NO	

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			[B]	*Type A quantity* means a quantity of radioactive material, the aggregate radioactivity of which does not exceed A1for special form radioactive material, or A2, for normal form radioactive material, where A1 and A2 are given in Table A–1 of this part, or may be determined by procedures described in Appendix A of this part.	13-002 (NRC) NO	Type A quantity means a quantity of radioactive material, the aggregate radioactivity of which does not exceed A_1 for special form radioactive material, or A_2, for normal form radioactive material, where A_1 and A_2 are given in Appendix 13-A, Table A-1 , or may be determined by procedures described in Appendix 13-AA.
			[B]	*Type B quantity* means a quantity of radioactive material greater than a Type A quantity.	13-002 (NRC) NO	Type B quantity means a quantity of radioactive material greater than a Type A quantity.
			[B]	*Unirradiated uranium* means uranium containing not more than 2 × 103 Bq of plutonium per gram of uranium-235, not more than 9 × 106 Bq of fission products per gram of uranium-235, and not more than 5 × 10-3 g of uranium-236 per gram of uranium-235.	13-002 (NRC) NO	Unirradiated uranium means uranium containing not more than 2×10^3 Bq of plutonium per gram of uranium-235, not more than 9×10^6 Bq of fission products per gram of uranium-235, and not more than 5×10^{-3} g of uranium-236 per gram of uranium-235.
			[B]	*Uranium—natural, depleted, enriched*: (1) Natural uranium means uranium with the naturally occurring distribution of uranium isotopes (approximately 0.711 weight percent uranium-235, and the remainder by weight essentially uranium-238). (2) Depleted uranium means uranium containing less uranium-235 than the naturally occurring distribution of uranium isotopes. (3) Enriched uranium means uranium containing more uranium-235 than the naturally occurring distribution of uranium isotopes.§ 71.5 Transportation of licensed material.	13-002 (NRC) NO	Uranium - natural, depleted, enriched (1) Natural uranium means uranium with the naturally occurring distribution of uranium isotopes (approximately 0.711 weight percent uranium-235, and the remainder by weight essentially uranium-238). (2) Depleted uranium means uranium containing less uranium-235 than the naturally occurring distribution of uranium isotopes. (3) Enriched Uranium means uranium containing more uranium-235 than the naturally occurring distribution of uranium isotopes.

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71.5	Transportation of licensed material		[B]	a) Each licensee who transports licensed material outside the site of usage, as specified in the NRC license, or where transport is on public highways, or who delivers licensed material to a carrier for transport, shall complywith the applicable requirements of the DOT regulations in 49 CFR parts 170 through 189 appropriate to the mode of transport. (1) The licensee shall particularly note DOT regulations in the following areas: (i) Packaging—49 CFR part 173: subparts A, B, and I. (ii) Marking and labeling—49 CFR part 172: subpart D, §§ 172.400 through 172.407, §§ 172.436 through 172.440, and subpart E. (iii) Placarding—49 CFR part 172: subpart F, especially §§ 172.500 through 172.519, 172.556, and appendices B and C. (iv) Accident reporting—49 CFR part 171: §§ 171.15 and 171.16. v) Shipping papers and emergency information—49 CFR part 172: subparts C and G. (vi) Hazardous material employee training—49 CFR part 172: subpart H. (vii) Hazardous material shipper/carrier registration—49 CFR part 107: subpart G. (i) Rail—49 CFR part 174: subparts A through D and K. (ii) Air—49 CFR part 175. (iii) Vessel—49 CFR part 176: subparts A through F and M. (iv) Public Highway—49 CFR part 177 and parts 390 through 397.	13-005.01 (NRC) NO	13-005 TRANSPORTATION OF LICENSED MATERIAL 13-005.01 Each licensee who transports licensed material outside of the site of usage, as specified in the Department license, or where transport is on public highways, or who delivers licensed material to a carrier for transport, must comply with the applicable requirements of the DOT regulation in 49 CFR part 170 through 189 appropriate to mode of transport 1. The licensee must comply with the applicable DOT regulations in the following areas: a. Packaging - 49 CFR Part 173: Subparts A and B and I. b. Marking and labeling - 49 CFR Part 172: Subpart D, §§ 172.400 through 172.407, §§ 172.436 through 172.440, and Subpart E. c. Placarding - 49 CFR Part 172: Subpart F, especially §§ 172.500 through 172.519, 172.556, and Appendices B and C. d. Accident Reporting - 49 CFR Part 171: §§ 171.15 and 171.16. e. Shipping papers and emergency information - 49 CFR Part 172: Subparts C and G. f. Hazardous material employee training - 49 CFR Part 172: Subpart H. g. Hazardous material shipper/carrier registration - 49 CFR Part 107: Subpart G. 2. The licensee must also comply with applicable DOT regulations pertaining to the following modes of transportation: a. Rail - 49 CFR Part 174: Subparts A through D and K. b. Air - 49 CFR Part 175 c. Vessel - 49 CFR Part 176: Subparts A through F and M. d. Public Highway - 49 CFR Part 177 and Parts 390 through 397. 3. Assure that any special instructions needed to safely open the package are sent to or have been made available to the consignee in accordance with 180 NAC 4-038.	

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				(b) If DOT regulations are not applicable to a shipment of licensed material, the licensee shall conform to the standards and requirements of the DOT specified in paragraph (a) of this section to the same extent as if the shipment or transportation were subject to DOT regulations. A request for modification, waiver, or exemption from those requirements, and any notification referred to in those requirements, must be filed with, or made to, the Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001.	13-005.02 NO	13-005.02 If, for any reason, the regulations of the DOT are not applicable to a shipment of licensed material, the licensee must conform to the standards and requirements of 49 CFR Parts 170 through 189 appropriate to the mode of transport to the same extent as if the shipment was subject to the regulations.
71.6	Information collection requirements: OMB approval		D	NA	NA	
71.7	Completeness and accuracy of information		D	NA	NA	

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71.8	Deliberate misconduct		C	(a) This section applies to any— (1) Licensee; (2) Certificate holder; (3) Quality assurance program approval holder; (4) Applicant for a license, certificate, or quality assurance program approval; (5) Contractor (including a supplier or consultant) or subcontractor, to any person identified in paragraph (a)(4) of this section; or (6) Employees of any person identified in paragraphs (a)(1) through (a)(5) of this section. (b) A person identified in paragraph (a) of this section who knowingly provides to any entity, listed in paragraphs (a)(1) through (a)(5) of this section, any components, materials, or other goods or services that relate to a licensee's, certificate holder's, quality assurance program approval holder's, or applicant's activities subject to this part may not:	17-010 NO	17-0010 DELIBERATE MISCONDUCT: 17-0010.01 Any licensee, registrant, applicant for a license or registration, employee of a licensee or registrant, contractor or subcontractor to a licensee, registrant, or applicant for a licensee or registration, or employee of any contractor or subcontractor to a licensee, registrant, or applicant for a license or registration, who knowingly provides to any licensee, registrant, applicant, contractor, or subcontractor, any components, equipment, materials, or other goods or services that relate to a licensee's, registrant's or applicant's activities covered by the Radiation Control Act, will not: 1. Engage in deliberate misconduct that causes or would have caused, if not detected, a licensee, registrant, or applicant to be in violation of any rule, regulation, or order; or any term, condition, or limitation of any license or registration issued by the Department; or 2. Intentionally submit to the Department, a licensee, a registrant, an applicant, or a licensee's, registrant's or applicant's contractor or subcontractor, information that the person submitting the information knows to be incomplete or inaccurate in some respect material to the Department. 17-0010.02 Any person who violates 180 NAC 17-0010, is subject to the provisions of 180 NAC 17-005.

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				1) Engage in deliberate misconduct that causes or would have caused, if not detected, a licensee, certificate holder, quality assurance program approval holder, or any applicant to be in violation of any rule, regulation, or order; or any term, condition or limitation of any license, certificate, or approval issued by the Commission; or (2) Deliberately submit to the NRC, a licensee, a certificate holder, quality assurance program approval holder, an applicant for a license, certificate or quality assurance program approval, or a licensee's, applicant's, certificate holder's, or quality assurance program approval holder's contractor or subcontractor, information that the person submitting the information knows to be incomplete or inaccurate in some respect material to the NRC. (c) A person who violates paragraph (b)(1) or (b)(2) of this section may be subject to enforcement action in accordance with the procedures in 10 CFR part 2, subpart B. (d) For the purposes of paragraph (b)(1) of this section, deliberate misconduct by a person means an intentional act or omission that the person knows: (1) Would cause a licensee, certificate holder, quality assurance program approval holder, or applicant for a license, certificate, or quality assurance program approval to be in violation of any rule, regulation, or order; or any term, condition, or limitation of any license or certificate issued by the Commission; or (2) Constitutes a violation of a requirement, procedure, instruction, contract, purchase order, or policy of a licensee, certificate holder, quality assurance program approval holder, applicant, or the contractor or subcontractor of any of them.		
71.9	Employee protection		D	NA	NA	
71.10	Public inspection of application		D	NA	NA	
71.11				[Reserved]		
71.12	Specific exemptions		D	NA	NA	

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71.13	Exemption of physicians		[B]	Any physician licensed by a State to dispense drugs in the practice of medicine is exempt from § 71.5 with respect to transport by the physician of licensed material for use in the practice of medicine. However, any physician operating under this exemption must be licensed under 10 CFR part 35 or the equivalent Agreement State regulations.	13.004.02 (NRC) NO	13-004.02 Exemption of physicians: Any physician licensed by the State of Nebraska to dispense drugs in the practice of medicine is exempt from 180 NAC 13-003 with respect to transport by the physician of radioactive material for use in the practice of medicine. However, any physician operating under this exemption must be licensed under 180 NAC 7 or equivalent U.S. Nuclear Regulatory Commission or Agreement State regulations.
71.14	Exemption for low-level material		[B] paragraph (a) NRC-paragraph (b)	(a) A licensee is exempt from all the requirements of this part with respect to shipment or carriage of the following low-level materials: (1) Natural material and ores containing naturally occurring radionuclides that are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in Appendix A, Table A–2, of this part. (2) Materials for which the activity concentration is not greater than the activity concentration values specified in Appendix A, Table A–2 of this part, or for which the consignment activity is not greater than the limit for an exempt consignment found in Appendix A, Table A–2, of this part. (b) A licensee is exempt from all the requirements of this part, other than §§ 71.5 and 71.88, with respect to shipment or carriage of the following packages, provided the packages do not contain any fissile material, or the material is exempt from classification as fissile material under § 71.15 (1) A package that contains no more than a Type A quantity of radioactive material; (2) A package transported within the United States that contains no more than 0.74 TBq (20 Ci) of special form plutonium-244; or (3) The package contains only LSA or SCO radioactive material, provided— (i) That the LSA or SCO material has an external radiation dose of less than or equal to 10 mSv/h (1 rem/h), at a distance of 3 m from the unshielded material; or (ii) That the package contains only LSA–I or SCO–I material	13-004.03 (NRC) NO	13-004.03 Exemption for low-level materials: Any licensee is exempt from the requirements of 180 NAC 13 with respect to shipment or carriage of the following low-level materials: 1. Natural material and ores containing naturally occurring radionuclides that are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in Appendix 13-A, Table A-2. 2. Materials for which the activity concentration is not greater than the activity concentration values specified in Appendix 13-A, Table A-2, or for which the consignment activity is not greater than the limit for an exempt consignment found in Appendix 13-A, Table A-2.

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71.15	Exemption from classification as fissile material		[B]	Fissile material meeting the requirements of at least one of the paragraphs (a) through (f) of this section are exempt from classification as fissile material and from the fissile material package standards of §§ 71.55 and 71.59, but are subject to all other requirements of this part, except as noted. (a) Individual package containing 2 grams or less fissile material. (b) Individual or bulk packaging containing 15 grams or less of fissile material provided the package has at least 200 grams of solid nonfissile material for every gram of fissile material. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass for solid nonfissile material. (c)(1) Low concentrations of solid fissile material commingled with solid nonfissile material, provided that: (i) There is at least 2000 grams of solid nonfissile material for every gram of fissile material, and (ii) There is no more than 180 grams of fissile material distributed within 360 kg of contiguous nonfissile material. (2) Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass of solid nonfissile material. d) Uranium enriched in uranium-235 to a maximum of 1 percent by weight, and with total plutonium and uranium- 233 content of up to 1 percent of the mass of uranium-235, provided that the mass of any beryllium, graphite, and hydrogenous material enriched in deuterium constitutes less than 5 percent of the uranium mass.	13-004.04 (NRC) NO	13-004.04 Exemption from classification as fissile material: Fissile material meeting the requirements of at least one of the items of 180 NAC 13-004.04, item 1 through 6 are exempt from classification as fissile material and from the fissile material package standards of 10 CFR 71.55 and 71.59, but are subject to all other requirements of 180 NAC 13, except as noted. 1. ndividual package containing 2 grams or less fissile material. 2. Individual or bulk packaging containing 15 grams or less of fissile material provided the package has at least 200 grams of solid nonfissile material for every gram of fissile material. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass for solid nonfissile material. 3. Packages containing: a. Low concentrations of solid fissile material commingled with solid nonfissile material, provided that: (1) There is at least 2000 grams of solid nonfissile material for every gram of fissile material, and (2) There is no more than 180 grams of fissile material distributed within 360 kg of contiguous nonfissile material. b. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass of solid nonfissile material. 4. Uranium enriched in uranium-235 to a maximum of 1% by weight, and with total plutonium and uranium-233 content of up to 1 percent of the mass of uranium-235, provided that the mass of any beryllium, graphite, and hydrogenous material enriched in deuterium constitutes less than 5% of the uranium mass.	

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				(e) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 percent by mass, with a total plutonium and uranium-233 content not exceeding 0.002 percent of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2. The material must be contained in at least a DOT Type A package. (f) Packages containing, individually, a total plutonium mass of not more than 1000 grams, of which not more than 20 percent by mass may consist of plutonium-239, plutonium-241, or any combination of these radionuclides.		5. Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2% by mass, with a total plutonium and uranium-233 content not exceeding 0.002% of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2. The material must be contained in at least a DOT Type A package. 6. Packages containing, individually, a total plutonium mass of not more than 1000 grams, of which not more than 20% by mass may consist of plutonium-239, plutonium-241, or any combination of these radionuclides.
71.16				[Reserved]		
71.17	General license: NRC-approved package		[B]	(a) A general license is issued to any licensee of the Commission to transport, or to deliver to a carrier for transport, licensed material in a package for which a license, certificate of compliance (CoC), or other approval has been issued by the NRC. (b) This general license applies only to a licensee who has a quality assurance program approved by the Commission as satisfying the provisions of subpart H of this part. (c) This general license applies only to a licensee who— (1) Has a copy of the CoC, or other approval of the package, and has the drawings and other documents referenced in the approval relating to the use and maintenance of the packaging and to the actions to be taken before shipment; (2) Complies with the terms and conditions of the license, certificate, or other approval, as applicable, and the applicable requirements of subparts A, G, and H of this part; and	13-007.01 (NRC) NO 13-007.02 (NRC) NO	13-007 GENERAL LICENSE: U.S. NUCLEAR REGULATORY COMMISSION NRC APPROVED PACKAGES 13-007.01 A general license is hereby issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a package for which a license, certificate of compliance, or other approval has been issued by the NRC. 13-007.02 This general license applies only to a licensee who: 1. Has a copy of the specific license, certificate of compliance, or other approval by the NRC of the package and has the drawings and other documents referenced in the approval relating to the use and maintenance of the packaging and to the actions to be taken prior to shipment; 2. Complies with the terms and conditions of the license, certificate, or other approval by the NRC, as applicable, and the applicable requirements of 180 NAC 13;

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				(3) Before the licensee's first use of the package, submits in writing to: ATTN: Document Control Desk, Director, Spent Fuel Project Office, Office of Nuclear Material Safety and Safeguards, using an appropriate method listed in § 71.1(a), the licensee's name and license number and the package identification number specified in the package approval. (d) This general license applies only when the package approval authorizes use of the package under this general license. (e) For a Type B or fissile material package, the design of which was approved by NRC before April 1, 1996, the general license is subject to the additional restrictions of § 71.19.	13-007.03 (NRC) NO 13-007.04 (NRC) NO	3. Prior to the licensee's first use of the package, has registered with the NRC; and 4. Has a quality assurance program required by 180 NAC 13-021. 13-007.03 The general license in 180 NAC 13-007.01 applies only when the package approval authorizes use of the package under this general license. 13-007.04 For a Type B or fissile material package, the design of which was approved before April1, 1996 the general license is subject to the additional restrictions of 10 CFR 71.19.
71.18				[Reserved]		

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71.20	General license: DOT specification container		[B]	(a) A general license is issued to any licensee of the Commission to transport, or to deliver to a carrier for transport, licensed material in a specification container for fissile material or for a Type B quantity of radioactive material as specified in DOT regulations at 49 CFR parts 173 and 178. (b) This general license applies only to a licensee who has a quality assurance program approved by the Commission as satisfying the provisions of subpart H of this part. (c) This general license applies only to a licensee who— (1) Has a copy of the specification; and (2) Complies with the terms and conditions of the specification and the applicable requirements of subparts A, G, and H of this part. (d) This general license is subject to the limitation that the specification container may not be used for a shipment to a location outside the United States, except by multilateral approval, as defined in DOT regulations at 49 CFR 173.403. (e) This section expires October 1, 2008.	13-009.01 (NRC) NO 13-009.02 (NRC) NO 13-009.03 (NRC) NO 13-009.04 (NRC) NO But will add (e) in 180 NAC 13.009	13-009 GENERAL LICENSE: DOT SPECIFICATION CONTAINER 13-009.01 A general license is issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a specification container for fissile material or for a Type B quantity of radioactive material as specified in 49 CFR Parts 173 and 178. 13-009.02 Except as otherwise provided in 180 NAC 13, the general license applies only to a licensee who has a quality assurance program approved by the Department as satisfying the applicable provision of 180 NAC 13-021. 13-009.03 This general license applies only to a licensee who: 1. Has a copy of the specification; 2. Complies with the terms and conditions of the specification and the applicable requirements of 180 NAC 13; and 3. Has a quality assurance program required by 180 NAC 13-021. 13-009.04- The general license in 180 NAC 13-009.01 is subject to the limitation that the specification container may not be used for a shipment to a location outside the United States except by multilateral approval as defined in 49 CFR 173.403.

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71.21	General license: Use of foreign approved package		[B]	(a) A general license is issued to any licensee of the Commission to transport, or to deliver to a carrier for transport, licensed material in a package, the design of which has been approved in a foreign national competent authority certificate, that has been revalidated by DOT as meeting the applicable requirements of 49 CFR 171.12. (b) Except as otherwise provided in this section, the general license applies only to a licensee who has a quality assurance program approved by the Commission as satisfying the applicable provisions of subpart H of this part. (c) This general license applies only to shipments made to or from locations outside the United States. (d) This general license applies only to a licensee who— (1) Has a copy of the applicable certificate, the revalidation, and the drawings and other documents referenced in the certificate, relating to the use and maintenance of the packaging and to the actions to be taken before shipment; and (2) Complies with the terms and conditions of the certificate and revalidation, and with the applicable requirements of subparts A, G, and H of this part. With respect to the quality assurance provisions of subpart H of this part, the licensee is exempt from design, construction, and fabrication considerations.	13-010.1 (NRC) NO 13-010.02 (NRC) NO 13-010.03 (NRC) NO 13-010.04 (NRC) Need to add to 180 NAC 13.010.04*	13-010 GENERAL LICENSE: USE OF FOREIGN APPROVED PACKAGE 13-010.01 A general license is issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a package the design of which has been approved in a foreign national competent authority certificate which has been revalidated by the DOT as meeting the applicable requirements of 49 CFR 171.12. 13-010.02 Except as otherwise provided in this section, the general license applies only to a licensee who has a quality assurance program approved by the U.S. Nuclear Regulatory Commission as satisfying the applicable provisions of 10 CFR 71, subpart H. 13-010.03 This general license applies only to international shipments. 13-010.04 This general license applies only to a licensee who: 1. Has a copy of the applicable certificate, the revalidation, and the drawings and other documents referenced in the certificate relating to the use and maintenance of the packaging and to the actions to be taken prior to shipment; and 2. Complies with the terms and conditions of the certificate and revalidation and with the applicable requirements of 180 NAC 13. 3. Has a quality assurance program approved by the Department. *"With respect to the quality assurance provision of 180 NAC 7-021, the licensee is exempt from design, construction, and fabrication considerations.

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71.22	General license: Fissile material		[B]	**REFERENCE 10CFR71 for Tables 71-1 and 71-2** (a) A general license is issued to any licensee of the Commission to transport fissile material, or to deliver fissile material to a carrier for transport, if the material is shipped in accordance with this section. The fissile material need not be contained in a package which meets the standards of subparts E and F of this part; however, the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 49 CFR 173.417(a). (b) The general license applies only to a licensee who has a quality assurance program approved by the Commission as satisfying the provisions of subpart H of this part. (c) The general license applies only when a package's contents: (1) Contain less than a Type A quantity of fissile material; and (2) Contain less than 500 total grams of beryllium, graphite, or hydrogenous material enriched in deuterium. (d) The general license applies only to packages containing fissile material that are labeled with a CSI which: (1) Has been determined in accordance with paragraph (e) of this section; (2) Has a value less than or equal to 10; and (3) For a shipment of multiple packages containing fissile material, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and less than or equal to 100 (for shipment on an exclusive use	13-011.01 (NRC) NO 13-011.02 (NRC) 13-011.03 (NRC) 13-011.04 (NRC)	13-011 GENERAL LICENSE: FISSILE MATERIAL 13-011.01 A general license is hereby issued to any licensee to transport fissile material, or to deliver fissile material to a carrier for transport, if the material is shipped in accordance with this 180 NAC 13-011. The fissile material need not be contained in a package which meets the standards of 10 CFR 71 subparts E and F; however the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 49 CFR 173.417(a). 13-011.02 The general license applies only to a licensee who has a quality assurance program approved by the Department. 13-11.03 he general license applies only when a package's contents: 1. Contains less than a Type A quantity of fissile material; and 2. Contain less than 500 total grams of beryllium, graphite, or hydrogenous material enriched in deuterium 13-011.04 The general license applies only to packages containing fissile material that are labeled with a CSI which 1. Has been determined in accordance with 180 NAC 13-011.05; 2. Has a value less than or equal to 10; and 3. For a shipment of multiple packages containing fissile material, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and less than or equal to 100 (for shipment on an exclusive use conveyance)		

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				conveyance). (e)(1) The value for the CSI must be greater than or equal to the number calculated by the following equation: (2) The calculated CSI must be rounded up to the first decimal place; (3) The values of X, Y, and Z used in the CSI equation must be taken from Tables 71–1 or 71–2, as appropriate; (4) If Table 71–2 is used to obtain the value of X, then the values for the terms in the equation for uranium-233 and plutonium must be assumed to be zero; and (5) Table 71–1 values for X, Y, and Z must be used to determine the CSI if: (i) Uranium-233 is present in the package; (ii) The mass of plutonium exceeds 1 percent of the mass of uranium-235; (iii) The uranium is of unknown uranium-235 enrichment or greater than 24 weight percent enrichment; or (iv) Substances having a moderating effectiveness (i.e., an average hydrogen density greater than H2O) (e.g., certain hydrocarbon oils or plastics) are present in any form, except as polyethylene used for packing or wrapping.	13-011.05 (NRC) NO	13-011.05 CSI determination: 1. The value for the CSI must be greater than or equal to the number calculated by the following equation: $CSI = 10\left[\frac{\text{grams of } ^{235}U}{X} + \frac{\text{grams of } ^{233}U}{Y} + \frac{\text{grams of Pu}}{Z}\right]$ 2. The calculated CSI must be rounded up to the first decimal place; 3. The values of X, Y, and Z used in the CSI equation must be taken from Table 13 -1 or Table 13-2, as appropriate; 4. If Table 13-2 is used to obtain the value of X, then the values for the terms in the equation for uranium-233 and plutonium must be assumed to be zero; and 5. Table 13-1 values for X, Y., and Z must be used to determine the CSI if: a. Uranium-233 is present in the package; b. The mass of the plutonium exceeds 1% of the mass of uranium-235; c. The uranium is unknown uranium-235 enrichment or greater than 24 weight percent enrichment; or d. Substances having a moderating effectiveness (that is, an average hydrogen density greater that H_2O (for example, certain hydrocarbon oils or plastics) are present in any form, except as polyethylene used for packing or wrapping.

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71.23	General license: Plutoniumberyllium special form material		[B]	(a) A general license is issued to any licensee of the Commission to transport fissile material in the form of plutonium-beryllium (Pu-Be) special form sealed sources, or to deliver Pu-Be sealed sources to a carrier for transport, if the material is shipped in accordance with this section. This material need not be contained in a package which meets the standards of subparts E and F of this part; however, the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 49 CFR 173.417(a).	13-012 13-012.01 (NRC) NO	13-012 GENERAL LICENSE: PLUTONIUM-BERYLLIUM SPECIAL FORM MATERIAL 13-012.01 A general license is hereby issued to any licensee to transport fissile material, or to deliver fissile material in the form of plutonium-beryllium (Pu-Be) special form sealed sources, or to deliver Pu-Be sealed sources to a carrier for transport, if the material is shipped in accordance with this subsection. This material need not be contained in package which meets the standards of 10 CFR 71 subpart E and F; however the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 40 CFR 173.417(a).

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					13-012.02	13-012.02 This general license applies only when all of the following requirements are met: 1. The package contains no more than a Type A quantity of radioactive material; and 2. Contain less than 1000 g of plutonium, provided that: plutonium-239, plutonium-241, or any combination of these radionuclides, constitutes less than 240 g of the total quantity of plutonium in the package
				(b) The general license applies only to a licensee who has a quality assurance program approved by the Commission as satisfying the provisions of subpart H of this part.	13-012.03 (NRC) NO	13-012.03 The general license applies only to a licensee who has a quality assurance program approved by the Department.
				(c) The general license applies only when a package's contents: (1) Contain less than a Type A quantity of material; and (2) Contain less than 1000 g of plutonium, provided that: plutonium-239, plutonium-241, or any combination of these radionuclides, constitutes less than 240 g of the total quantity of plutonium in the package.	13-012.04 (NRC) NO	13-012.04 The general license applies only to packages labeled with a CSI which: 1. Has been determined per 180 NAC 13-012.05; 2. Has a value less than or equal to 100; and 3. For a shipment of multiple packages containing Pu-Be sealed sources, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and less than or equal to 100 (for shipment on an exclusive use conveyance).
				(d) The general license applies only to packages labeled with a CSI which: (1) Has been determined in accordance with paragraph (e) of this section; (2) Has a value less than or equal to 100; and (3) For a shipment of multiple packages containing Pu-Be sealed sources, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and and less than or equal to 100 (for shipment on an exclusive use conveyance). (e)(1) The value for the CSI must be greater than or equal to the number calculated by the following equation: (2) The calculated CSI must be rounded up to the first decimal place.	13-012.05 (NRC) NO	13-012.05 CSI determination: 1. The value for the CSI must be greater than or equal to the number calculated by the following equation: ;and (see equation in text of 180 NAC 13-0`1.05) 2. The calculated CSI must be rounded up to the first decimal place.
71.24				[Reserved]		

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71.25				[Reserved]		
71.47	External radiation standards for all packages		[B]	(a) Except as provided in paragraph (b) of this section, each package of radioactive materials offered for transportation must be designed and prepared for shipment so that under conditions normally incident to transportation the radiation level does not exceed 2 mSv/h (200 mrem/h) at any point on the external surface of the package, and the transport index does not exceed 10. (b) A package that exceeds the radiation level limits specified in paragraph (a) of this section must be transported by exclusive use shipment only, and the radiation levels for such shipment must not exceed the following during transportation: (1) 2 mSv/h (200 mrem/h) on the external surface of the package, unless the following conditions are met, in which case the limit is 10 mSv/h (1000 mrem/h): (i) The shipment is made in a closed transport vehicle; (ii) The package is secured within the vehicle so that its position remains fixed during transportation; and (iii) There are no loading or unloading operations between the beginning and end of the transportation; (2) 2 mSv/h (200 mrem/h) at any point on the outer surface of the vehicle, including the top and underside of the vehicle; or in the case of a flat-bed style vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load or enclosure, if used, and on the lower external surface of the vehicle; and (3) 0.1 mSv/h (10 mrem/h) at any point 2 meters (80 in) from the outer lateral surfaces of the vehicle (excluding the top and underside of the vehicle); or in the case of a flat-bed style vehicle, at any point 2 meters (6.6 feet) from the vertical planes projected by the outer edges of the vehicle (excluding the top and underside of the vehicle); and	13-015.10 (need to add external standards, see 71.47 (a))	13-015.10 For a package transported in exclusive use by rail, highway or water, radiation levels external to the package may exceed the limits specified in 180 NAC 13-015.09 but must not exceed any of the following: 1. 2 mSv/h (200 mrem/hr) on the accessible external surface of the package unless the following conditions are met, in which case the limit is 10 mSv/h (1000 mrem/hr); a. The shipment is made in a closed transport vehicle, b. Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation, and c. There are no loading or unloading operations between the beginning and end of the transportation. 2. 2 mSv/h (200 mrem/hr) at any point on the outer surface of the vehicle, including the upper and top and underside of the vehicle, or, in the case of a flat-bed style vehicle, with a personnel barrier*, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load [or enclosure, if used], and on the lower external surface of the vehicle[2] ; 3. 0.1 mSv/h (10 mrem/hr) at any point 2 meters from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of a flat-bed style vehicle, at any point 2 meters from the vertical planes projected from the outer edges of the vehicle; and

[2]A flat-bed style vehicle with a personnel barrier must have radiation levels determined at vertical planes. If no personnel barrier, the package cannot exceed 2 mSv/h (200 mrem/hr) at the surface.*

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				(4) 0.02 mSv/h (2 mrem/h) in any normally occupied space, except that this provision does not apply to private carriers, if exposed personnel under their control wear radiation dosimetry devices in conformance with 10 CFR 20.1502. (c) For shipments made under the provisions of paragraph (b) of this section, the shipper shall provide specific written instructions to the carrier for maintenance of the exclusive use shipment controls. The instructions must be included with the shipping paper information. (d) The written instructions required for exclusive use shipments must be sufficient so that, when followed, they will cause the carrier to avoid actions that will unnecessarily delay delivery or unnecessarily result in increased radiation levels or radiation exposures to transport workers or members of the general public.		4. 0.02 mSv/h (2 mrem/hr) in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and training in accordance with 180 NAC 10-003; and 13-015.11 A package must be prepared for transport so that in still air at 100 degrees Fahrenheit (38 degrees Celsius) and in the shade, no accessible surface of a package would have a temperature exceeding 122 degrees Fahrenheit (50 degrees Celsius) in a nonexclusive use shipment or 185 degrees Fahrenheit (85 degrees Celsius) in an exclusive use shipment. Accessible package surface temperatures must not exceed these limits at any time during transportation. 13-015.12 A package may not incorporate a feature intended to allow continuous venting during transport.
71.53				[Reserved]		
71.81	Applicability of operating controls and procedures		D	NA	NA	
71.83	Assumptions as to unknown properties		[B]	When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee shall package the fissile material as if the unknown properties have credible values that will cause the maximum neutron multiplication.	7-013 (NRC) NO	13-013 ASSUMPTIONS AS TO UNKNOWN PROPERTIES When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee must package the fissile material as if the unknown properties have credible values that will cause the maximum neutron multiplication.

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
71.85	Preliminary determinations		[B]	Before the first use of any packaging for the shipment of licensed material -- (a) The licensee shall ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects that could significantly reduce the effectiveness of the packaging; (b) Where the maximum normal operating pressure will exceed 35 kPa (5 lbf/in2) gauge, the licensee shall test the containment system at an internal pressure at least 50 percent higher than the maximum normal operating pressure, to verify the capability of that system to maintain its structural integrity at that pressure; and (c) The licensee shall conspicuously and durably mark the packaging with its model number, serial number, gross weight, and a package identification number assigned by NRC. Before applying the model number, the licensee shall determine that the packaging has been fabricated in accordance with the design approved by the Commission.	7-014.01 (NRC) NO 7-014.02 (NRC) NO 7-014.0 NO	13-014 PRELIMINARY DETERMINATIONS: Prior to the first use of any packaging for the shipment of licensed material: 13-014.01 The licensee must ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects which could significantly reduce the effectiveness of the packaging; 13-014.02 Where the maximum normal operating pressure will exceed 35 kilopascal (5 lbf/in^2) gauge, the licensee must test the containment system at an internal pressure at least 50% higher than the maximum normal operating pressure to verify the capability of that system to maintain its structural integrity at that pressure; 13-014.03 The licensee must determine that the packaging has been fabricated in accordance with the design approved by the NRC; and 13-014.04 The licensee must conspicuously and durably mark the packaging with its model number, serial number, gross weight, and a package identification number assigned by the NRC.

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
71.87	Routine determinations		[B]	Before each shipment of licensed material, the licensee shall ensure that the package with its contents satisfies the applicable requirements of this part and of the license. The licensee shall determine that -- (a) The package is proper for the contents to be shipped; (b) The package is in unimpaired physical condition except for superficial defects such as marks or dents; (c) Each closure device of the packaging, including any required gasket, is properly installed and secured and free of defects; (d) Any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid; (e) Any pressure relief device is operable and set in accordance with written procedures; (f) The package has been loaded and closed in accordance with written procedures; (g) For fissile material, any moderator or neutron absorber, if required, is present and in proper condition;	13-015 (NRC) NO 7-015.01 NO 7-015.02 NO 7-015.03 NO 7-015.04 NO 13-015.05 (NRC) NO 13-015.06 *Need to add 71.87 (g)*	13-015 ROUTINE DETERMINATIONS: Prior to each shipment of licensed material, the licensee must determine that: 13-015.01 The package is proper for the contents to be shipped; 13-015.02 The package is in unimpaired physical condition except for superficial defects such as marks or dents; 13-015.03 Each closure device of the packaging, including any required gasket, is properly installed and secured and free of defects; 13-015.04 Any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid; 13-015.05 Any pressure relief device is operable and set in accordance with written procedures; 13-015.06 The package has been loaded and closed in accordance with written procedures; ; NEED TO ADD *For fissile material, any moderator or neutron absorber, if required, is present and in proper condition.

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
71.87	Routine determinations		[B]	(h) Any structural part of the package that could be used to lift or tie down the package during transport is rendered inoperable for that purpose, unless it satisfies the design requirements of § 71.45; (i) The level of non-fixed (removable) radioactive contamination on the external surfaces of each package offered for shipment is as low as reasonably achievable, and within the limits specified in DOT regulations in 49 CFR 173.443; (j) External radiation levels around the package and around the vehicle, if applicable, will not exceed the limits specified in § 71.47 at any time during transportation; and	13-015.07 (NRC) N) 13-015.08 NO (NRC) 13-015.09 (NRC) NO	13-015.07 Any structural part of the package which could be used to lift or tie down the package during transport is rendered inoperable for that purpose unless it satisfies design requirements specified in 10 CFR 71.45; 13-015.08 The level of removable radioactive contamination on the external surfaces of each package offered for shipment is as low as reasonably achievable. The level of removable radioactive contamination may be determined by wiping an area of 300 square centimeters of the surface concerned with an absorbent material, using moderate pressure, and measuring the activity on the wiping material. Sufficient measurements must be taken in the most appropriate locations to yield a representative assessment of the removable contamination levels. Except as provided in 180 NAC 13-015.08, item (1), the amount of radioactivity measured on any single wiping material, when averaged over the surface wiped, must not exceed the limits given in TABLE 13-3 of 180 NAC 13-015 at any time during transport. Other methods of assessment of equal or greater efficiency may be used. When other methods are used, the detection efficiency of the method used must be taken into account and in no case may the removable contamination on the external surfaces of the package exceed 10 times the limits listed in TABLE 13-3. 1. In the case of packages transported as exclusive use shipments by rail or highway only, the removable radioactive contamination at any time during transport must not exceed 10 times the levels prescribed in 180 NAC 13-015.08. The levels at the beginning of transport must not exceed the levels in 180 NAC 13-015.08; 13-015.09 External radiation levels around the package and around the vehicle, if applicable, will not exceed 2 mSv/h (200 mrem/hr) at any point on the external surface of the package at any time during transportation. The transport index must not exceed 10.;

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				(k) Accessible package surface temperatures will not exceed the limits specified in § 71.43(g) at any time during transportation.	13-015.11 NO	13-015.11 A package must be prepared for transport so that in still air at 100 degrees Fahrenheit (38 degrees Celsius) and in the shade, no accessible surface of a package would have a temperature exceeding 122 degrees Fahrenheit (50 degrees Celsius) in a nonexclusive use shipment or 185 degrees Fahrenheit (85 degrees Celsius) in an exclusive use shipment. Accessible package surface temperatures must not exceed these limits at any time during transportation.

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71.88	Air transport of plutonium		[B]	(a) Notwithstanding the provisions of any general licenses and notwithstanding any exemptions stated directly in this part or included indirectly by citation of 49 CFR chapter I, as may be applicable, the licensee shall assure that plutonium in any form, whether for import, export, or domestic shipment, is not transported by air or delivered to a carrier for air transport unless: (1) The plutonium is contained in a medical device designed for individual human application; or (2) The plutonium is contained in a material in which the specific activity is less than or equal to the activity concentration values for plutonium specified in Appendix A, Table A-2, of this part, and in which the radioactivity is essentially uniformly distributed; or (3) The plutonium is shipped in a single package containing no more than an A2 quantity of plutonium in any isotope or form, and is shipped in accordance with § 71.5; or (4) The plutonium is shipped in a package specifically authorized for the shipment of plutonium by air in the Certificate of Compliance for that package issued by the Commission. (b) Nothing in paragraph (a) of this section is to be interpreted as removing or diminishing the requirements of § 73.24 of this chapter. (c) For a shipment of plutonium by air which is subject to paragraph (a)(4) of this section, the licensee shall, through special arrangement with the carrier, require compliance with 49 CFR 175.704, U.S. Department of Transportation regulations applicable to the air transport of plutonium.	13-016.01 (NRC) NO 13-016.02 (NRC) NO 13-015.03 (NRC) NO	13-016 AIR TRANSPORT OF PLUTONIUM 13-016.01 Notwithstanding the provisions of any general licenses and notwithstanding any exemptions stated directly in this Section or included indirectly by citation of the DOT regulations, as may be applicable, the licensee must assure that plutonium in any form is not transported by air, or delivered to a carrier for air transport, unless: 1. *The plutonium is contained in a medical* device designed for individual human application; or 2. The plutonium is contained in a material in which the specific activity is less than or equal to the activity concentration values for plutonium specified in Appendix 13-A, Table A-2, and in which the radioactivity is essentially uniformly distributed; or 3. The plutonium is shipped in a single package containing no more than an A_2 quantity of plutonium in any isotope or form and is shipped in accordance with 180 NAC 13-005; or 4. The plutonium is shipped in a package specifically authorized for the shipment of plutonium by air in the Certificate of Compliance for that package issued by the NRC. 13-016.02 Nothing in 180 NAC 13-016.01 is to be interpreted as removing or diminishing the requirements of 10 CFR 73.24. 13-016.03 For a shipment of plutonium by air which is subject to 180 NAC 13-015.04, the licensee must, through special arrangement with the carrier, require compliance with 49 CFR 175.704, the DOT regulations applicable to the air transport of plutonium.	

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71.89	Opening instructions		[B]	Before delivery of a package to a carrier for transport, the licensee shall ensure that any special instructions needed to safely open the package have been sent to, or otherwise made available to, the consignee for the consignee's use in accordance with 10 CFR 20.1906(e).	3-017 (NRC) NO	13-017 OPENING INSTRUCTIONS: Before delivery of a package to a carrier for transport, the licensee must ensure that any special instructions needed to safely open the package have been sent to, or otherwise made available to, the consignee for the consignee's use in accordance with 180 NAC 4-038.
71.91	Records		D	NA	13-018	
71.93	Inspection and tests		D	NA		

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71.95	Reports		D	NA	13-019	

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71.97	Advance notification of shipment of irradiated reactor fuel and nuclear waste		B	(a) As specified in paragraphs (b), (c) and (d) of this section, each licensee shall provide advance notification to the governor of a State, or the governor's designee, of the shipment of licensed material, through, or across the boundary of the State, before the transport, or delivery to a carrier, for transport, of licensed material outside the confines of the licensee's plant or other place of use or storage. (b) Advance notification is required under this section for shipments of irradiated reactor fuel in quantities less than that subject to advance notification requirements of § 73.37(f) of this chapter. Advance notification is also required under this section for shipment of licensed material, other than irradiated fuel, meeting the following three conditions: (1) The licensed material is required by this part to be in Type B packaging for transportation; (2) The licensed material is being transported to or across a State boundary en route to a disposal facility or to a collection point for transport to a disposal facility; and (3) The quantity of licensed material in a single package exceeds the least of the following: (i) 3000 times the A1 value of the radionuclides as specified in appendix A, Table A-1 for special form radioactive material; (ii) 3000 times the A2 value of the radionuclides as specified in appendix A, Table A-1 for normal form radioactive material; or (iii) 1000 TBq (27,000 Ci). (c) Procedures for submitting advance notification. (1) The notification must be made in writing to the office of each appropriate governor or governor's designee and to the Director, Division of Nuclear Security, Office of Nuclear Security and Incident Response. (2) A notification delivered by mail must be postmarked at least 7 days before the beginning of the 7-day period during which departure of the shipment is estimated to occur.	13-020 13-020.02 (Will need to change 13-20 to read as 71.97)	13-020 ADVANCE NOTIFICATION OF TRANSPORT OF NUCLEAR WASTE 13-020.01 Prior to the transport of any nuclear waste outside of the confines of the licensee's facility or other place of use or storage, or prior to the delivery of any nuclear waste to a carrier for transport, each licensee must provide advance notification of such transport to the governor, or governor's designee, of each state within or through which the waste will be transported.[3] 13-020.02 Advance notification is required only when: 1. The nuclear waste is required to be in Type B packaging for transportation; 2. The nuclear waste is being transported into, within, or through, a state enroute to a disposal facility or to a collection point for transport to a disposal facility; and 3. The quantity of licensed material in a single package exceeds: a. 3000 times the A_1 value of the radionuclides as specified in Appendix 13-A, Table I for special form radioactive material; b. 3000 times the A_2 value of the radionuclides as specified in Appendix 13-A, Table I for normal form radioactive material; or c. 1000 TBq (27,000 Ci).	

[3]A list of the mailing addresses of the governors and governors' designees is available upon request from the Director, Office of State Programs, NRC, Washington, D.C. 20555. The list will be published annually in the Federal register on or about June 30 to reflect any changes in

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				(3) A notification delivered by any other means than mail must reach the office of the governor or of the governor's designee at least 4 days before the beginning of the 7-day period during which departure of the shipment is estimated to occur. (i) A list of the names and mailing addresses of the governors' designees receiving advance notification of transportation of nuclear waste was published in the Federal Register on June 30, 1995 (60 FR 34306). (ii) The list will be published annually in the Federal Register on or about June 20 to reflect any changes in information. (iii)A list of the names and mailing addresses of the governors' designees is available on requests from the Director, Office of State Programs, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001 (4) The licensee shall retain a copy of the notification as a record for 3 years. (d) Information to be furnished in advance notification of shipment. Each advance notification of shipment of irradiated reactor fuel or nuclear waste must contain the following information: (1) The name, address, and telephone number of the shipper, carrier, and receiver of the irradiated reactor fuel or nuclear waste shipment; (2) A description of the irradiated reactor fuel or nuclear waste contained in the shipment, as specified in the regulations of DOT in 49 CFR 172.202 and 172.203(d);	13-020.03 NO	13-020.03 Each advance notification required by 180 NAC 13-020.01 must contain the following information: 1. The name, address, and telephone number of the shipper, carrier, and receiver of the shipment; 2. A description of the nuclear waste contained in the shipment as required by 49 CFR 172.202 and 172.203(d);

information.

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				(3) The point of origin of the shipment and the 7-day period during which departure of the shipment is estimated to occur; (4) The 7-day period during which arrival of the shipment at State boundaries is estimated to occur; (5) The destination of the shipment, and the 7-day period during which arrival of the shipment is estimated to occur; and (6) A point of contact, with a telephone number, for current shipment information.		3. The point of origin of the shipment and the seven-day period during which departure of the shipment is estimated to occur; 4. The seven-day period during which arrival of the shipment at state boundaries is estimated to occur; 5. The destination of the shipment, and the seven-day period during which arrival of the shipment is estimated to occur; and 6. A point of contact with a telephone number for current shipment information.
71.100	Criminal penalties.		D	NA		
71.101	Quality assurance requirements		D- Paragraphs (a), (b), and (c)(1) are designated D for those States which have no users of Type B packages- other than Industrial Radiography** C- Paragraphs (a), (b)	(a) Purpose. This subpart describes quality assurance requirements applying to design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation maintenance, repair, and modification of components of packaging that are important to safety. As used in this subpart, "quality assurance"comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of the material or component to predetermined requirements. The licensee, certificate holder, and applicant for a CoC are responsible for the quality assurance requirements as they apply to design, fabrication, testing, and modification of packaging. Each licensee is responsible for the quality assurance provision which applies to its use of a packaging for the shipment of licensed material subject to this subpart.	13-021	**No licensees that use type B containers**

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			and (c)(1) are designated C for those States which have users of Type B packages other than Industrial Radiography.** D-paragraph (f) C-paragraph (g) NRC-paragraphs (c)(2), (d) and (e) **Note: 10 CFR Part 71.101 (g) indicates that QA programs for industrial radiography Type B Package users are covered	(b) Establishment of program. Each licensee, certificate holder, and applicant for a CoC shall establish, maintain, and execute a quality assurance program satisfying each of the applicable criteria of §§ 71.101 through 71.137 and satisfying any specific provisions that are applicable to the licensee's activities including procurement of packaging. The licensee, certificate holder, and applicant for a CoC shall execute the applicable criteria in a graded approach to an extent that is commensurate with the quality assurance requirement's importance to safety. (c) Approval of program (1) Before the use of any package for the shipment of licensed material subject to this subpart, each licensee shall obtain Commission approval of its quality assurance program. Using an appropriate method listed in § 71.1(a), each licensee shall file a description of its quality assurance program, including a discussion of which requirements of this subpart are applicable and how they will be satisfied, by submitting the description to: ATTN: Document Control Desk, Director, Spent Fuel Project Office, Office of Nuclear Material Safety and Safeguards. (2) Before the fabrication, testing, or modification of any package for the shipment of licensed material subject to this subpart, each licensee, certificate holder, or applicant for a CoC shall obtain Commission approval of its quality assurance program. Each certificate holder or applicant for a CoC shall, in accordance with § 71.1, file a description of its quality assurance program, including a discussion of which requirements of this subpart are applicable and how they will be satisfied. (d) Existing package designs. The provisions of this paragraph deal with packages that have been approved for use in accordance with this part before January 1, 1979, and which have been designed in accordance with the provisions of this part in effect at		

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			by 10 CFR 34.31(b). It is also indicated that this section satisfies § 71.12 (b) and thus would satisfy those sections referenced in this provision (§§ 71.101 through 71.137)	the time of application for package approval. Those packages will be accepted as having been designed in accordance with a quality assurance program that satisfies the provisions of paragraph (b) of this section. (e) Existing packages. The provisions of this paragraph deal with packages that have been approved for use in accordance with this part (before January 1, 1979, have been at least partially fabricated before that date, and for which the fabrication is in accordance with the provisions of this part in effect at the time of application for approval of package design. These packages will be accepted as having been fabricated and assembled in accordance with a quality assurance program that satisfies the provisions of paragraph (b) of this section. (f) Previously approved programs. A Commission-approved quality assurance program that satisfies the applicable criteria of subpart H of this part, Appendix B of part 50 of this chapter, or subpart G of part 72 of this chapter, and that is established, maintained, and executed regarding transport packages, will be accepted as satisfying the requirements of paragraph (b) of this section. Before first use, the licensee, certificate holder, and applicant for a CoC shall notify the NRC, in accordance with § 71.1, of its intent to apply its previously approved subpart H, Appendix B, or subpart G quality assurance program to transportation activities. The licensee, certificate holder, and applicant for a CoC shall identify the program by date of submittal to the Commission, Docket Number, and date of Commission approval. (g) Radiography containers. A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of § 34.31(b) of this chapter or equivalent Agreement State requirement, is deemed to satisfy the requirements of §§ 71.17(b) and 71.101(b).	13-021.06 (NRC) NO	13-021.06 The licensee, certificate holder and applicant for a CoC must maintain a program for transport container inspection and maintenance limited to radiographic exposure devices, source changer, or packages transporting these devices and meeting the requirements of 180 NAC 5-011 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements.

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71.103	Quality assurance organization		D- for those States which have no users of Type B packages- other than Industrial Radiography** [C]- Paragraph (a) is designated [C] for those States which have users of Type B packages other than Industrial Radiography**	(a) The licensee , certificate holder, and applicant for a CoC shall be responsible for the establishment and execution of the quality assurance program. The licensee, certificate holder, and applicant for a CoC may delegate to others, such as contractors, agents, or consultants, the work of establishing and executing the quality assurance program, or any part of the quality assurance program, but shall retain responsibility for the program. These activities include performing the functions associated with attaining quality objectives and the quality assurance functions. (b) The quality assurance functions are— (1) Assuring that an appropriate quality assurance program is established and effectively executed; and (2) Verifying, by procedures such as checking, auditing, and inspection, that activities affecting the functions that are important to safety have been correctly performed. (c) The persons and organizations performing quality assurance functions must have sufficient authority and organizational freedom to— (1) Identify quality problems; (2) Initiate, recommend, or provide solutions; and (3) Verify implementation of solutions. (d) The persons and organizations performing quality assurance functions shall report to a management level that assures that the required authority and organizational freedom, including sufficient independence from cost and schedule, when opposed to safety considerations, are provided. or subpart G quality assurance program to transportation activities. The licensee, certificate holder, and applicant for a CoC shall identify the program by date of submittal to the Commission, Docket Number, and date of Commission approval. (g) Radiography containers. A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or	N-A	**No licensee using type B packaging**

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			C-Paragraph (b) is designated C for those States which have users of Type B packages-other than Industrial Radiography** D-paragraphs (d), (e), and (f) **Note: 10 CFR Part 71.101 (g) indicates that QA programs for industrial radiography Type B package users are covered by 10 CFR 34.31 (b). It also indicated that this section	(e) Because of the many variables involved, such as the number of personnel, the type of activity being performed, and the location or locations where activities are performed, the organizational structure for executing the quality assurance program may take various forms, provided that the persons and organizations assigned the quality assurance functions have the required authority and organizational freedom. (f) Irrespective of the organizational structure, the individual(s) assigned the responsibility for assuring effective execution of any portion of the quality assurance program, at any location where activities subject to this section are being performed, must have direct access to the levels of management necessary to perform this function. --- 2 While the term "licensee" is used in these criteria, the requirements are applicable to whatever design, fabrication, assembly, and testing of the package is accomplished with respect to a package before the time a package approval is issued.		

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			satisfies §71.12 (b) and thus would satisfy those sections referenced in this provision (§§71.101 through 71.137.)			
71.105	Quality assurance program		D- for those States which have no users of Type B packages- other than Industrial Radiography** or C- Paragraphs (a), (c), and (d) and [C] - paragraph b for those States which have users of	a) The licensee, certificate holder, and applicant for a CoC shall establish, at the earliest practicable timeconsistent with the schedule for accomplishing the activities, a quality assurance program that complies with the requirements of §§ 71.101 through 71.137. The licensee, certificate holder, and applicant for a CoC shall document the quality assurance program by written procedures or instructions and shall carry out the program in accordance with those procedures throughout the period during which the packaging is used. The licensee, certificate holder, and applicant for a CoC shall identify the material and components to be covered by the quality assurance program, the major organizations participating in the program, and the designated functions of these organizations. b) The licensee, certificate holder, and applicant for a CoC, through its quality assurance program, shall provide control over activities affecting the quality of the identified materials and components to an extent consistent with their importance to safety, and as necessary to assure conformance to the approved design of each individual package used for the shipment of radioactive material. The licensee,	NA	**No licensees that use type B containers**

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			Type B packages-other than Industrial Radiography** **Note: 10 CFR Part 71.101 (g) indicates that QA programs for industrial radiography Type B package users are covered by 10 CFR 34.31 (b). It also indicated that this section satisfies §71.12 (b) and thus would satisfy those sections referenced in this provision (§§71.101 through 71.137.)	certificate holder, and applicant for a CoC shall assure that activities affecting quality are accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanliness; and assurance that all prerequisites for the given activity have been satisfied. The licensee, certificate holder, and applicant for a CoC shall take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality, and the need for verification of quality by inspection and test. (c) The licensee, certificate holder, and applicant for a CoC shall base the requirements and procedures of its quality assurance program on the following considerations concerning the complexity and proposed use of the package and its components: (1) The impact of malfunction or failure of the item to safety; (2) The design and fabrication complexity or uniqueness of the item; (3) The need for special controls and surveillance over processes and equipment; (4) The degree to which functional compliance can be demonstrated by inspection or test; and (5) The quality history and degree of standardization of the item. (d) The licensee, certificate holder, and applicant for a CoC shall provide for indoctrination and training of personnel performing activities affecting quality, as necessary to assure that suitable proficiency is achieved and maintained. The licensee, certificate holder, and applicant for a CoC shall review the status and adequacy of the quality assurance program at established intervals. Management of other organizations participating in the quality assurance program shall review regularly the status and adequacy of that part of the quality assurance program they are executing.		

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
71.127	Handling, storage, and shipping control		D- for those States which have no users of Type B packages- other than Industrial Radiography** [C]- for those States which have users of Type B packages- other than Industrial Radiography** **Note: 10 CFR Part 71.101 (g) indicates that QA programs for industrial radiography Type B package users are covered by 10 CFR 34.31 (b).	The licensee, certificate holder, and applicant for a CoC shall establish measures to control, in accordance with instructions, the handling, storage, shipping, cleaning, and preservation of materials and equipment to be used in packaging to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere, and specific moisture content and temperature levels must be specified and provided.	NA	**No licensees that use type B containers**

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			It also indicated that this section satisfies §71.12 (b) and thus would satisfy those sections referenced in this provision (§§71.101 through 71.137.			
71.129	Inspection, test, and operating status		D- for those States which have no users of Type B packages- other than Industrial Radiography** [C]- for those States which have users of Type B packages- other than Industrial	(a) The licensee, certificate holder, and applicant for a CoC shall establish measures to indicate, by the use of markings such as stamps, tags, labels, routing cards, or other suitable means, the status of inspections and tests performed upon individual items of the packaging. These measures must provide for the identification of items that have satisfactorily passed required inspections and tests, where necessary to preclude inadvertent bypassing of the inspections and tests. (b) The licensee shall establish measures to identify the operating status of components of the packaging, such as tagging valves and switches, to prevent inadvertent operation	NA	**No licensees that use type B containers**

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			Radiography** **Note: 10 CFR Part 71.101 (g) programs for industrial radiography Type B package users are covered by 10 CFR 34.31 (b). It also indicated that this section satisfies §71.12 (b) and thus would satisfy those sections referenced in this provision (§§71.101 through 71.137.)		NA	

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
71.131	Nonconforming materials, parts, or components		D- for those States which have no users of Type B packages- other than Industrial Radiography** [C]- for those States which have users of Type B packages- other than Industrial Radiography** **Note: 10 CFR Part 71.101 (g) indicates that QA programs for industrial radiography Type B package users are covered by 10 CFR 34.31 (b).	The licensee, certificate holder, and applicant for a CoC shall establish measures to control materials, parts, or components that do not conform to the licensee's requirements to prevent their inadvertent use or installation. These measures must include, as appropriate, procedures for identification, documentation, segregation, disposition, and notification to affected organizations. Nonconforming items must be reviewed and accepted, rejected, repaired, or reworked in accordance with documented procedures.	NA	**No licensees that use type B containers**

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			It also indicated that this section satisfies §71.12(b) and thus would satisfy those sections referenced in this provision (§§71.101 through 71.137.)			
71-135	Quality assurance records		D- for those States which have no users of Type B packages- other than Industrial Radiography** C- for those States which have users of Type B packages- other than	The licensee, certificate holder, and applicant for a CoC shall maintain sufficient written records to describe the activities affecting quality. The records must include the instructions, procedures, and drawings required by §71.111 to prescribe quality assurance activities and must include closely related specifications such as required qualifications of personnel, procedures, and equipment. The records must include the instructions or procedures which establish a records retention program that is consistent with applicable regulations and designates factors such as duration, location, and assigned responsibility. The licensee, certificate holder, and applicant for a CoC shall retain these records for 3 years beyond the date when the licensee, certificate holder, and applicant for a CoC last engage in the activity for which the quality assurance program was developed. If any portion of the written procedures or instructions is superseded, the licensee, certificate holder, and applicant for a CoC shall retain the superseded material for 3 years after it is superseded.	NA	**No licensees that use type B containers**

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			Industrial Radiography** **Note: 10 CFR Part 71.101 (g) indicates that QA programs programs for industrial radiography Type B package users are covered by 10 CFR 34.31 (b). It also indicated that this section satisfies §71.12 (b) and thus would satisfy those sections referenced in this provision(§§71.101 through 71.137.)			

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
71.137	Audits		D- for those States which have no users of Type B packages- other than Industrial Radiography** C - for those States which have users of Type B packages- other than Industrial Radiography** **Note: 10 CFR Part 71.101 (g) indicates that QA programs for industrial radiography Type B package users are covered by 10 CFR	The licensee, certificate holder, and applicant for a CoC shall carry out a comprehensive system of planned and periodic audits to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. The audits must be performed in accordance with written procedures or checklists by appropriately trained personnel not having direct responsibilities in the areas being audited. Audited results must be documented and reviewed by management having responsibility in the area audited. Followup action, including reaudit of deficient areas, must be taken where indicated.	NA	**No licensees that use type B containers**

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
			34.31 (b). It also indicated that this section satisfies §71.12 (b) and thus would satisfy those sections referenced in this provision (§§71.101 through 71.137.)			

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
Appendix A to Part 71	Determination of A1 and A2		[B]	**REFERENCE 10CFR71 FOR TABLES A-1, A-2, A-3, and A-4** I. Values of A1 and A2 for individual radionuclides, which are the bases for many activity limits elsewhere in these regulations, are given in Table A–1. The curie (Ci) values specified are obtained by converting from the Terabecquerel (TBq) figure. The curie values are expressed to three significant figures to assure that the difference in the TBq and Ci quantities is one tenth of one percent or less. Where values of A1 and A2 are unlimited, it is for radiation control purposes only. For nuclear criticality safety, some materials are subject to controls placed on fissile material. II. a. For individual radionuclides whose identities are known, but which are not listed in Table A–1, the A1 and A2 values contained in Table A–3 may be used. Otherwise, the licensee shall obtain prior Commission approval of the A1 and A2 values for radionuclides not listed in Table A–1, before shipping the material. b. For individual radionuclides whose identities are known, but which are not listed in Table A–2, the exempt material activity concentration and exempt consignment activity values contained in Table A–3 may be used. Otherwise, the licensee shall obtain prior Commission approval of the exempt material activity concentration and exempt consignment activity values for radionuclides not listed in Table A–2, before shipping the material. c. The licensee shall submit requests for prior approval, described under paragraphs II.a. and II.b. of this Appendix, to the Commission, in accordance with § 71.1 of this part.	180 NAC 13 Appendix 13-A (NRC) NO	**See Appendix 13-** DETERMINATION OF A_1 AND A_2 I. Values of A_1 and A_2 for individual radionuclides, which are the bases for many activity limits elsewhere in these regulations are given in Table A-1. The curie (Ci) values specified are obtained by converting from the Terabecquerel (TBq) value. The curie values are expressed to three significant figures to assure that the difference in the TBq and Ci quantities is one tenth of one percent or less. Where values of A_1 or A_2 are unlimited, it is for radiation control purposes only. For nuclear criticality safety, some materials are subject to controls placed on fissile material. II. a, For individual radionuclides whose identities are known, but which are not listed in Table A-1, the A_1 and A_2 values contained in Table A-3 may be used. Otherwise the licensee must obtain prior Department approval of the A_1 and A_2 values for radionuclides not listed in Table A-1, before shipping the material. b. For individual radionuclides whose identities are known, but which are not listed in Table A-2, the exempt material activity concentration and exempt consignment activity values contained in Table A-3 may be used. Otherwise, the licensee must obtain prior Department approval of the exempt material activity concentration and exempt consignment activity values for radionuclides not listed in Table A-2, before shipping the material. c. The licensee must submit requests for prior approval, described under paragraphs II.a. and II.b. of this Appendix, to the Department, in accordance with 180 NAC 1-012.	

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				III. In the calculations of A1 and A2 for a radionuclide not in Table A–1, a single radioactive decay chain, in which radionuclides are present in their naturally occurring proportions, and in which no daughter radionuclide has a half-life either longer than 10 days, or longer than that of the parent radionuclide, shall be considered as a single radionuclide, and the activity to be taken into account, and the A1 and A2 value to be applied, shall be those corresponding to the parent radionuclide of that chain. In the case of radioactive decay chains in which any daughter radionuclide has a half-life either longer than 10 days, or greater than that of the parent radionuclide, the parent and those daughter radionuclides shall be considered as mixtures of different radionuclides.		III. In the calculations of A_1 and A_2 for a radionuclide not in Table A-1, a single radioactive decay chain, in which radionuclides are present in their naturally occurring proportions, and in which no daughter radionuclide has a half-life either longer than 10 days, or longer than that of the parent radionuclide, must be considered as a single radionuclide, and the activity to be taken into account, and the A_1 and A_2 value to be applied must be those corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter radionuclide has a half-life either longer than 10 days, or greater than that of the parent radionuclide, the parent and those daughter radionuclides must be considered as mixtures of different nuclides.

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IV. For mixtures of radionuclides whose identities and respective activities are known, the following conditions apply:
a. For special form radioactive material, the maximum quantity transported in a Type A package is as follows:

where B(i) is the activity of radionucli (i) is the A1 value for radionuclide I.
b. For normal form radioactive material, the maximum quantity transported in a Type
A package is as follows:

where B(i) is the activity of radionuclide I the A2(i) value for radionuclide I.
c. Alternatively, the A1 value for mixtures of special form material may be determined as follows:

where f(i) is the fraction of activity for r the mixture, and A1(i) is the appropriat radionuclide I.
d. Alternatively, the A2 value for mixtures of normal form material may be determined as follows:

where f(i) is the fraction of activity for r the mixture, and A2(i) is the appropriat radionuclide I.

IV. For mixtures of radionuclides whose identities and respective activities are known, the following conditions apply:
a. For special form radioactive material, the maximum quantity transported in a Type A package is as follows:

$$\sum_i \frac{B(i)}{A_1(i)}$$

where B(i) is the activity of radionuclide i, and $A_1(i)$ is the A_1 value for radionuclide I.

b. For normal form radioactive material, the maximum quantity transported in a Type A package is a follows:

$$\sum B(i)/A2(i) \leq$$

where B(i) is the activity of radionuclide i and $A_2(i)$ is the $A_2(i)$ value for radionuclide I.
c. Alternatively, the A_1 value for mixtures of special form material may be determined as follows:

$$A_1 \text{ for mixture} = \frac{1}{\sum_i \frac{f(i)}{A_1(i)}}$$

where f(i) is the fraction of activity for radionuclide I in the mixture and A_1 (i) is the appropriate A_1 value for radionuclidel.
d. Alternatively, the A_2 value for mixtures of normal form material may be determined as follows:

$$A_2 \text{ for mixture} = \frac{1}{\sum_i \frac{f(i)}{A_2(i)}}$$

where f(i) is the fraction of activity of radionuclide I in the mixture and $A_1(i)$ is the appropriate A value for radionuclide I.

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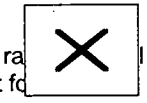
				e. The exempt activity concentration for mixtures of nuclides may be determined as follows: Exempt activity concentration for mixture where f(i) is the fraction of activity concentration of radionuclide I in the mixture, and [A] is the activity concentration for exempt material containing radionuclide I. f. The activity limit for an exempt consignment for mixtures of radionuclides may be determined as follows: Exempt consignment activity limit for mixture  where f(i) is the fraction of activity of ra I in the mixture, and A is the activity limit fo consignments for radionuclide I. V. When the identity of each radionuclide is known, but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped, and the lowest A1 or A2 value, as appropriate, for the radionuclides in each group may be used in applying the formulas in paragraph IV. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest A1 or A2 values for the alpha emitters and beta/gamma emitters.		e. The exempt activity concentration for mixture of nuclides may be determined as follows: $\text{Exempt activity concentration for mixture} = \frac{1}{\sum_i \frac{f(i)}{[A](i)}}$ Where f(i) is the fraction of activity concentration of radionuclide I in the mixture, and [A] is the activity concentration for exempt material containing radionuclide I. f. The activity limit for an exempt consignment for mixtures of radionuclides may be determined as follows: $\text{Exempt consignment activity limits for mixture} = \frac{1}{\sum_i \frac{f(i)}{A(i)}}$ where f(i) is the fraction of activity of radionuclide I in the mixture, and A is the activity limit for exempt consignments for radionuclide I. V. When the identity of each radionuclide is known, but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest A_1 or A_2 value, as appropriate, for the radionuclides in each group may be used in applying the formulas in paragraph IV. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest A_1 or A_2 values for the alpha emitters and beta/gamma emitters.

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Summary of Change for Amendment 2003-1

Financial Assurance for Materials Licensees – Parts 30, 40, 70
(68 FR 57327, October 3, 2003)
RATS ID 2003-1 Effective December 3, 2003
Due for State adoption on December 3, 2006

30.35		Financial assurance and recordkeeping for decommissioning	D--paragraphs (c), (e), (f) H&S--paragraphs (a), (b), (d), and (g).	In Sec. 30.35, paragraphs (a), (c)(2), (d), and (e) are revised and a new paragraph (c)(5) is added to read as follows: (a)(1) Each applicant for a specific license authorizing the possession and use of unsealed byproduct material of half-life greater than 120 days and in quantities exceeding 10^5 times the applicable quantities set forth in appendix B to part 30 shall submit a decommissioning funding plan as described in paragraph (e) of this section. The decommissioning funding plan must also be submitted when a combination of isotopes is involved if R divided by 10^5 is greater than 1 (unity rule), where R is defined here as the sum of the ratios of the quantity of each isotope to the applicable value in appendix B to part 30. (2) Each holder of, or applicant for, any specific license authorizing the possession and use of sealed sources or plated foils of half-life greater than 120 days and in quantities exceeding 10^{12} times the applicable quantities set forth in appendix B to part 30 (or when a combination of isotopes is involved if R, as defined in Sec. 30.35(a)(1), divided by 10^{12} is greater than 1), shall submit a decommissioning funding plan as described in paragraph (e) of this section. The decommissioning funding plan must be submitted to NRC by December 2, 2005. * * * * * (c) * * * (2) Each holder of a specific license issued before July 27, 1990, and of a type described in paragraph (a) of this section shall submit a decommissioning funding plan as described in	3-018.01 item 1 (NRC) NO 3-018.03 (NRC) NO	3-018 FINANCIAL ASSURANCE AND RECORDKEEPING FOR DECOMMISSIONING 3-018.01 Each: 1. Applicant for a specific license authorizing the possession and use of unsealed byproduct material of half-life greater than 120 days and in quantities exceeding 10^5 times the applicable quantities set forth in 180 NAC 4, Appendix 4-F must submit a decommissioning funding plan as described in 180 NAC 3-018.05. The decommissioning funding plan must also be submitted when a combination of isotopes is involved if R divided by 10^5 is greater than 1 (unity rule), where R is defined here as the sum of the ratios of the quantity of each isotope to the applicable value in Appendix 4-F of 180 NAC 4. 2. Holder of, or applicant for, any specific license authorizing the possession and use of sealed sources or plated foils of half-life greater than 120 days and in quantities exceeding 10^{12} times the applicable quantities set forth in 180 NAC 4, Appendix 4-F (or when a combination of isotopes is involved if R, as defined in 180 NAC 3-018.01, item 1, divided by 10^{12} is greater than 1), must submit a decommissioning funding plan as described in 180 NAC 3-018.05. The decommissioning funding plan must be submitted to the Department by (two years from effective date of these regulations). 3-018.02 Each applicant for a specific license authorizing possession and use of byproduct material of half-life greater than 120 days and in quantities specified in 180 NAC 3-018.04 must either: 1. Submit a decommissioning funding plan

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				paragraph (e) of this section or a certification of financial assurance for decommissioning in an amount at least equal to $1,125,000 in accordance with the criteria set forth in this section. If the licensee submits the certification of financial assurance rather than a decommissioning funding plan, the licensee shall include a decommissioning funding plan in any application for license renewal. * * * * * (5) Waste collectors and waste processors, as defined in 10 CFR part 20, Appendix G, must provide financial assurance in an amount based on a decommissioning funding plan as described in paragraph (e) of this section. The decommissioning funding plan must include the cost of disposal of the maximum amount (curies) of radioactive material permitted by license, and the cost of disposal of the maximum quantity, by volume, of radioactive material which could be present at the licensee's facility at any time, in addition to the cost to remediate the licensee's site to meet the license termination criteria of 10 CFR part 20. The decommissioning funding plan must be submitted by December 2, 2005. (d) Table of required amounts of financial assurance for decommissioning by quantity of material. Licensees required to submit the $1,125,000 amount must do so by December 2, 2004. Licensees required to submit the $113,000 or $225,000 amount must do so by June 2, 2005. Licensees having possession limits exceeding the upper bounds of this table must base financial assurance on a decommissioning funding plan. Greater than 10^4 but less than or equal to 10^5 times the applicable quantities of appendix B to part 30 in unsealed form. (For a combination of isotopes, if R, as defined inSec. 30.35(a)(1), divided by 10^4 is greater than 1 but R divided by 10^5 is less than or equal to1).....$1,125,000 Greater than 10^3 but less than or equal to 10^4 times the applicable quantities of appendix B to part 30 in unsealed form. (For a combination	3-018.04 (NRC) NO	as described in 180 NAC 3-018.05 or Submit a certification that financial assurance for decommissioning has been provided in the amount prescribed by 180 NAC 3-018.04 using one of the methods described in 180 NAC 3-018.06. For an applicant, this certification may state that the appropriate assurance will be obtained after the application has been approved and the license issued but prior to the receipt of radioactive material. If the applicant defers execution of the financial instrument until after the license has been issued, a signed original of the financial instrument obtained to satisfy 180 NAC 3-018.06 must be submitted to the Department before receipt of radioactive material. If the applicant does not defer execution of the financial instrument, the applicant must submit to the Department as part of the certification, a signed original of the financial instrument obtained to satisfy the requirements of 180 NAC 3-018.06. 3-018.04Table of required amounts of financial assurance for decommissioning by quantity of material. Licensees required to submit the $1,125,000 amount must do so by (one year from effective date of these regulations). Licensees required to submit the $113,000 or $225,000 amount must do so by (one and a half years from effective date of these regulations). Licensees having possession limits exceeding the upper bound of this table must base financial assurance on a decommission funding plan. Greater than 10^4 but less than or equal to 10^5 times the applicable quantities of 180 NAC 4, Appendix 4-F in unsealed form. (For a combination of isotopes, if R, as defined in 180 NAC 3-018.01, item 1divided by 10^4 is greater than 1 but R divided by 10^5 is less than or equal to 1.) $1,125, Greater than 10^3 but less than or equal to 10^4 times the applicable quantities of 180 NAC 4, Appendix 4-F in unsealed form. (For a combination of isotopes, if R, as defined in 180 NAC 3-018.01,item 1, divided by 10^3 is greater than 1 but R divided by 10^4 is less than or equal to 1.)	

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				of isotopes, if R, as defined in Sec. 30.35(a)(1), divided by 10^3 is greater than 1 but R divided by 10^4 is less than or equal to 1).....$225,000 Greater than 10^{10} but less than or equal to 10^{12} times the applicable quantities of appendix B to part 30 in sealed sources or plated foils. (For a combination of isotopes, if R, as defined in Sec. 30.35(a)(1), divided by 10^{10} is greater than, 1, but R divided by 10^{12} is less than or equal to 1).....$113,000 (e) Each decommissioning funding plan must contain a cost estimate for decommissioning and a description of the method of assuring funds for decommissioning from paragraph (f) of this section, including means for adjusting cost estimates and associated funding levels periodically over the life of the facility. Cost estimates must be adjusted at intervals not to exceed 3 years. The decommissioning funding plan must also contain a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning and a signed original of the financial instrument obtained to satisfy the requirements of paragraph (f) of this section. *****	3-018.05 (NRC) NO	Greater than 10^{10} but less than or equal to 10^{12} times the applicable quantities of 180 NAC 4, Appendix 4-F in sealed sources or plated foils. (For a combination of isotopes, if R, as defined in180 NAC 3-018.01, item 1 divided by 10^{10} is greater than 1, but R divided by 10^{12} is less than or equal to 1) 3-018.07 Each person licensed under 180 NAC 3, 5, 7, 12, 14 and 19 must keep records of information important to the decommissioning of the facility in an identified location until the site is released for unrestricted use. Before licensed activities are transferred or assigned in accordance with 180 NAC 3-017.02, licensees must transfer all records described in 180 NAC 3-018.07 to the new licensee. In this case, the new licensee will be responsible for maintaining these records until the license is terminated. If records important to the decommissioning of a facility are kept for other purposes, reference to these records and their locations may be used. Information the Department considers important to decommissioning consists of: 1. Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations. 2. As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used	

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						and/or stored and of locations of possible inaccessible contamination such as buried pipes which may be subject to contamination. If required drawings are referenced, each relevant document need not be indexed individually. If drawings are not available, the licensee must substitute appropriate records of available information concerning these areas and locations. 3. Except for areas containing only sealed sources (provided the sources have not leaked or no contamination remains after any leak) or byproduct materials having only half-lives of less than 65 days, a list contained in a single document and updated every 2 years, of the following: a. All areas designated and formerly designated as restricted areas as defined under 180 NAC 1-002 ; b. All areas outside of restricted areas that require documentation under 180 NAC 3-018.07, item 1.; c. All areas outside of restricted areas where current and previous wastes have been buried as documented under 180 NAC 4-054; and All areas outside of restricted areas which contain material such that, if the license expired, the licensee would be required to either decontaminate the area to unrestricted release levels or apply for approval for disposal under 180 NAC 4-040. 4. Records of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and records of the funding method used for assuring funds if either a funding plan or certification is used.

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40.36	Financial assurance and recordkeeping for decommissioning		D--paragraphs (c) and (e). H&S--paragraphs (a), (b), (d), and (f).	**In Sec. 40.36, paragraphs (b)(2), (c)(2), and (d) are revised to read as follows:** * * * * * (b) * * * (2) Submit a certification that financial assurance for decommissioning has been provided in the amount of $225,000 by June 2, 2005 using one of the methods described in paragraph (e) of this section. For an applicant, this certification may state that the appropriate assurance will be obtained after the application has been approved and the license issued but before the receipt of licensed material. If the applicant defers execution of the financial instrument until after the license has been issued, a signed original of the financial instrument obtained to satisfy the requirements of paragraph (e) of this section must be submitted to NRC prior to receipt of licensed material. If the applicant does not defer execution of the financial instrument, the applicant shall submit to NRC, as part of the certification, a signed original of the financial instrument obtained to satisfy the requirements of paragraph (e) of this section. (c) * * * (2) Each holder of a specific license issued before July 27, 1990, and of a type described in paragraph (a) of this section shall submit a decommissioning funding plan as described in paragraph (d) of this section or a certification of financial assurance for decommissioning in an amount at least equal to $1,125,000 in accordance with the criteria set forth in this section. If the licensee submits the certification of financial assurance rather than a decommissioning funding plan, the licensee shall include a decommissioning funding plan in any application for license renewal. Licensees required to submit the $1,125,000 amount must do so by December 2, 2004. * * * * * (d) Each decommissioning funding plan must contain a cost estimate for decommissioning and a description of the method of assuring funds for decommissioning from paragraph (e) of this section, including means for adjusting	NA	

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				cost estimates and associated funding levels periodically over the life of the facility. Cost estimates must be adjusted at intervals not to exceed 3 years. The decommissioning funding plan must also contain a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning and a signed original of the financial instrument obtained to satisfy the requirements of paragraph (e) of this section. * * * * *		
70.25	Financial assurance and recordkeeping for decommissioning		D--paragraphs (c), (e), and (f) NRC--paragraph (a) H&S--paragraphs (b), (d), and (g).	In Sec. 70.25, paragraphs (c)(2), (d), and (e) are revised to read as follows: * * * * * (c) * * * (2) Each holder of a specific license issued before July 27, 1990, and of a type described in paragraph (a) of this section shall submit a decommissioning funding plan as described in paragraph (e) of this section or a certification of financial assurance for decommissioning in an amount at least equal to $1,125,000 in accordance with the criteria set forth in this section. If the licensee submits the certification of financial assurance rather than a decommissioning funding plan, the licensee shall include a decommissioning funding plan in any application for license renewal. * * * * * (d) Table of required amounts of financial assurance for decommissioning by quantity of material. Licensees required to submit the $1,125,000 amount must do so by December 2, 2004. Licensees required to submit the $225,000 amount must do so by June 2, 2005. Licensees having possession limits exceeding the upper bounds of this table must base financial assurance on a decommissioning funding plan. Greater than 10^4 but less than or equal to 10^5 times the applicable quantities of appendix B to part 30. (For a combination of isotopes, if R, as defined in Sec. 70.25(a), divided by 10^4 is greater than 1 but R divided by 10^5 is less than	NA	

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				or equal to 1.).....$1,125,000 Greater than 10^3 but less than or equal to 10^4 times the applicable quantities of appendix B to part 30. (For a combination of isotopes, if R, as defined in Sec. 70.25(a), divided by 10^3 is greater than 1 but R divided by 10^4 is less than or equal to 1.)..... $225,000 (e) Each decommissioning funding plan must contain a cost estimate for decommissioning and a description of the method of assuring funds for decommissioning from paragraph (f) of this section, including means for adjusting cost estimates and associated funding levels periodically over the life of the facility. Cost estimates must be adjusted at intervals not to exceed 3 years. The decommissioning funding plan must also contain a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning and a signed original of the financial instrument obtained to satisfy the requirements of paragraph (f) of this section. * * * * *		

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Revision of the Skin Dose Limit, 10 CFR Part 20 (67 FR 16298) Effective: June4 , 2002 Implementation Date: April 5, 2005 RATS ID: 2002-1						
20.1003	Definitions		A	The definition of shallow-dose equivalent (Hs) is revised to read as follows: Shallow-dose equivalent (Hs), which applies to the external exposure of the skin of the whole body or the skin of an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm2).	180 NAC 4-002 (NRC_ NO	Shallow-dose equivalent (Hs) which applies to the external exposure of the skin of the whole body or the skin of an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm^2)
20.1201(a)(2), (a)(2)(ii) and (c)	Occupational Dose Limits for Adults		A	The introductory text of paragraph (a)(2), and paragraphs (a)(2)(ii) and (c), are revised to read as follows: (2) The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities, which are: (ii) A shallow-dose equivalent of 50 rem (0.5 Sv) to the skin of the whole body or to the skin of any extremity. (c) The assigned deep-dose equivalent must be for the part of the body receiving the highest exposure. The assigned shallow-dose equivalent must be the dose averaged over the contiguous 10 square centimeters of skin receiving the highest exposure. The deep-dose equivalent, lens-dose equivalent, and shallow-dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable.	180 NAC 4-005.01, item 2 (NRC) NO 4-005.03 (NRC) NO	2. The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities, which are: b. A shallow dose equivalent of 0.5 Sv (50 rem) to the skin of the whole body or to the skin of any extremity. 4-005.03The assigned deep dose equivalent must be for the part of the body receiving the highest exposure. 1. The assigned shallow-dose equivalent must be the dose averaged over the contiguous ten square centimeters of skin receiving the highest exposure. The deep-dose equivalent, lens-dose equivalent, and the shallow-dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable.
Medical Use of Byproduct Material, 10 CFR 20, 32, and 35 (67 FR 20249) Effective: April 24, 2002 Implementation Date: April 24, 2005						

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Part 35 was completely revised and due to the extensive changes, each section will not be listed separately in the chronology. The States should adopt the new Part 35 in accordance with the compatibility chart published in the Federal Register with the final rule. **FOR DETAILS SEE I:\REGS\RATS\NRC-CHRONOLOGY_PART35_20002-2.DOC**

5/9/02

COMPATIBILITY DESIGNATIONS FOR FINAL 10 CFR PART 35 - MEDICAL USE OF BYPRODUCT MATERIAL, PART 20 & PART 32

§20.1002	**Scope**		**D**	**Does not meet any of the criteria of Category A, B, C, or H&S.**	**4-001.03**	**4-001.03**
§20.1003	**Definitions**					
	Occupational dose		A		1-002 (NRC) NO	1-002 Occupational dose means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to sources of radiation from licensed/registered or unlicensed/unregistered sources of radiation, whether in the possession of the licensee, registrant, or other person. Occupational dose does not include doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-037, from voluntary participation in medical research programs, or as a member of the public.
	Public dose		A		1-002 (NRC) NO	1-002 Public dose means the dose received by a member of the public from exposure to sources of radiation released by a licensee or registrant, or to any other source of radiation under the control of a licensee or registrant. Public dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-037, or from voluntary participation in medical research programs,
					4-013.01	4-013.01 Each licensee or registrant must conduct

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§20.1301 (a) and (c)	Dose limits for individual members of the public		A		(NRC) NO	operations so that: 1. The total effective dose equivalent to individual members of the public from the licensed or registered operation does not exceed 1 mSv (0.1 rem) in a year, exclusive of the dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-037, from voluntary participation in medical research programs, and from the licensee's or registrant's disposal of radioactive material into sanitary sewerage in accordance with 180 NAC 4-041, and 4-013.03 Notwithstanding 180 NAC 4-013.01, item 1 a licensee may permit visitors to an individual who cannot be released, under 180 NAC 7-037, to receive a radiation dose greater than 1 mSv (0.1 rem) if: 1. The radiation dose received does not exceed 5 mSv (0.5 rem); and 2. The authorized user, as defined in 180 NAC 7, has determined before the visit that it is appropriate.
§32.72 (b)(1) and (b)(2)(ii)	Manufacture, preparation, or transfer for commercial distribution of radioactive drugs containing byproduct material for medical use under Part 35		B		3-014.10, item 2a, NO item 2.b.(2) NO	3-014.10, item 2a. a. May prepare radioactive drugs for medical use, as defined in 180 NAC 7-002, provided that the radioactive drug is prepared by either an authorized nuclear pharmacist, as specified in 180 NAC 3-014.10, item 1.b. and d, or an individual under the supervision of an authorized nuclear pharmacist as specified in 180 NAC 7-018. 3-014.10, item 2b(2) (2) This individual meets the requirements specified in 180 NAC 7-024.02 and 7-027 and the licensee has received an approved license amendment identifying this individual as an authorized nuclear pharmacist, or
§32.74 (a) and (a)(3)	Manufacture and distribution of sources or devices containing		B		3-014.12 (NRC) NO	3-014.12. Manufacture and Distribution of Sources or Devices Containing Radioactive Material for Medical Use. An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed

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	byproduct material for medical use				3-014.12 .item 3 (NRC)	pursuant to 180 NAC 7 for use as a calibration or reference source or for the uses listed in 180 NAC 7-055, 7-065 and 7-067 will be approved if: 3-014.012, item 3. The label affixed to the source or device, or to the permanent storage container for the source or device, contains information on the radionuclide, quantity, and date of assay, and a statement that the Department has approved distribution of the (name of the source or device) to persons licensed to use radioactive material identified in 180 NAC 7-032, 7-055, 7-065 and 7-067 as appropriate, and to persons who hold an equivalent license issued by the U.S. Nuclear Regulatory Commission or an Agreement State.
§35.1	Purpose and scope		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-001	7-001
§35.2	Definitions					
	Address of use		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Agreement State		[B]	This definition also appears in 10 CFR §150.3(b). For purposes of compatibility, the language of the Part 150 definition should be used and it is assigned to Compatibility Category B.	1-002 (NRCX NO)	1-002 Agreement State means any State with which the U.S. Nuclear Regulatory Commission or the U.S. Atomic Energy Commission has entered into an effective agreement under subsection 274b. of the Atomic Energy Act of 1954, as amended (73 Stat. 689).
	Area of use		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	*Authorized medical physicist		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the	7-002 (SSR) NO	7-002 Authorized medical physicist means an individual who: 2. Meets the requirements in 180 NAC 7-023.01 and 7-027; or 3. Is identified as an authorized medical physicist on a specific license or equivalent permit issued by the Department, Nuclear Regulatory Commission or Agreement State; or 4. Is identified as an authorized medical physicist on a permit issued by an Department,

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				medical use of byproduct material are consistent between NRC and Agreement States.		Nuclear Regulatory Commission or Agreement State specific medical use license of broad scope that is authorized to permit the use of radioactive material.
	* Authorized nuclear pharmacist		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-002 (SSR) NO	7-002 Authorized nuclear pharmacist means a pharmacist who: 1. Meets the requirements of 180 NAC 7-024.01 and 7-027; or 2. Is identified as an authorized nuclear pharmacist on a specific license or equivalent permit that authorizes medical use, the practice of nuclear pharmacy, commercial nuclear pharmacy or the manufacture and distribution of radiopharmaceuticals issued by the Department, Nuclear Regulatory Commission or Agreement State; or 3. Is identified as an authorized nuclear pharmacist on a permit issued by the Department, Nuclear Regulatory Commission or Agreement State specific medical use license of broad scope that is authorized to permit the use of radioactive material.
	* Authorized user		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-002 NO except (Did not include Podiatrist and dentist. But will add)**	7-002 Authorized user means a physician who: 1. Meets the requirements in 180 NAC 7-027 and 7-043.01, 7-047.01, 7-052.01, 7-053.01, 7-054.01, 7-063.01, 7-066.01 or 7-084.01; or 2. Is identified as an authorized user on a specific license or equivalent permit issued by the Department, Nuclear Regulatory Commission or Agreement State; or 3. Is identified as an authorized user on a permit issued by an Department, Nuclear Regulatory Commission or Agreement State specific license of broad scope that is authorized to permit the medical use of radioactive material
	Brachytherapy		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Brachytherapy source		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Client's			Does not meet any of the criteria of Category A, B,	7-002	7-002

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	address		D	C, or H&S.		
	Dedicated check source		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Dentist		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	High dose-rate remote afterloader		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Low dose-rate remote afterloader		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Management		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Manual Brachythera py		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Medical event		D	Does not meet any of the criteria of Category A, B, C, or H&S since the term was not defined in this section, but is defined in 35.3045(a).	7-002	7-002
	Medical institution		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	* Medical use		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(e), this definition was identified as a Category C. The essential objectives of this definition should be adopted because the lack of it could potentially impair effective communication. The essential objective of this definition is to establish a common understanding regarding the application of radioactive materials and the radiation therefrom to humans as directed by an authorized user.	7-002 (SSR) NO	7-002 Medical use means the intentional internal or external administration of radioactive material, or the radiation from radioactive material to patients or human research subjects under the supervision of an authorized user

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	Medium dose-rate remote afterloader		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Mobile medical service		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Output		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Patient intervention		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Pharmacist		D	Does not meet any of the criteria of Category A, B, C, or H&S.	1-002	7-002
	Physician		D	Does not meet any of the criteria of Category A, B, C, or H&S.	1-002	7-002
	Podiatrist		D	Does not meet any of the criteria of Category A, B, C, or H&S.	1-002	7-002
	Preceptor		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	
	* Prescribed dosage		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraphs (2)(c) and (2)(e), this definition was identified as a Category C. The essential objectives of this definition should be adopted because the lack of it could potentially preclude an effective review or evaluation by the Commission and Agreement State programs for agreement materials with respect to protection of public health and safety and impair effective communication. The essential objective of this definition is to establish a common understanding regarding the correct quantity of	7-002 (CFR) NO	7-002 <u>Prescribed dosage</u> means the specified activity or range of activity of radioactive drug as documented: 1. In a written directive as specified in 180 NAC 7-019; or 2. In accordance with the directions of the authorized user for procedures performed per 180 NAC 7=041, 7-044 and 7-048.

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				radiopharmaceutical activity prescribed by the authorized user for administration to a patient.		
	* Prescribed dose		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraphs (2)(c) and (2)(e), this definition was identified as a Category C. The essential objective of this definition should be adopted because the lack of it could potentially preclude an effective review or evaluation by the Commission and Agreement State programs for agreement materials with respect to protection of public health and safety and impair effective communication. The essential objective of this definition is to establish a common understanding regarding the correct quantity of radiopharmaceutical activity prescribed by the authorized user for administration to a patient.	7-002 (CFR) NO	7-002 Prescribed dose means: 1. For gamma stereotactic radiosurgery, the total dose as documented in the written directive; 2. For teletherapy, the total dose and dose per fraction as documented in the written directive; 3 .For manual brachytherapy, either the total source strength and exposure time or the total dose as documented in the written directive; or 4. For remote brachytherapy afterloaders, the total dose and dose per fraction as documented in the written directive
	Pulsed dose-rate remote afterloader		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	* Radiation safety officer		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-002 (CFR) NO	7-002 Radiation Safety Officer (RSO) means an individual who: 4. Meets the requirements in 180 NAC 7-022.01 and 7-026; 5. Is identified as a Radiation Safety Officer on a Nuclear Regulatory Commission or Agreement State license or other equivalent permit or license recognized by the Department for similar types and uses of radioactive material.
	Sealed source		[B]	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (B), paragraph (2)(c), this definition was identified as a Category B because it is a definition of a product that licensees routinely transport in multiple jurisdictions. This definition *also appears in 10 CFR §30.4. For purposes of* compatibility, the language of the Part 30 definition should be used and it is assigned to Compatibility Category B.	1-002 NO	1-002 Sealed source means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material .

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	Sealed source and device registry		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Stereotactic radiosurgery		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Structured educational program		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Teletherapy		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Temporary jobsite		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Therapeutic dosage		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Therapeutic dose		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	* Treatment site		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraphs (2)(c) and (2)(e), this definition was identified as a Category C. The essential objective of this definition should be adopted because the lack of it could potentially preclude an effective review or evaluation by the Commission and Agreement State programs for agreement materials with respect to protection of public health and safety and impair effective communication. The essential objective of this definition is to establish a common understanding of the correct anatomical description of the area intended to receive a radiation dose.	7-002 (CFR) NO	7-002 Treatment site means the anatomical description of the tissue intended to receive a radiation dose, as described in a written directive.
	Type of use		D	Does not meet any of the criteria of Category A, B,	7-002	7-002

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				C, or H&S.		
	Unit dosage		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-002	7-002
	Written directive		D	Does not meet any of the criteria of Category A, B, C, or H&S since the term was not defined in this section, but is defined in 35.40.	7-002	7-002
§35.5	Maintenance of records		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-003	7-002
§35.6	Provisions for the protection of human research subjects		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (1), this requirement was designated a Category C. The lack of this requirement could create a gap whereby the Federal Policy for the Protection of Human Subjects would not be applied. The essential objective of this requirement is to assure the consistent application of the Federal Policy.	7-004 NO	7-004 PROVISIONS FOR RESEARCH INVOLVING HUMAN SUBJECTS: A licensee may conduct research involving human subjects using radioactive material provided: 7-004.01 That the research is conducted, funded, supported, or regulated by a Federal agency which has implemented the Federal Policy for the Protection of Human Subjects. Otherwise, a licensee may apply for and receive approval of a specific amendment to its Department license before conducting such research. Both types of licensees must, at a minimum, obtain prior informed consent from the human subjects and obtain prior review and approval of the research activities by an "Institutional Review Board" in accordance with the meaning of these terms as defined and described in the Federal Policy for the Protection of Human Subjects; 7-004.02 The research involving human subjects authorized in 180 NAC 7-004.01 maybe conducted using radioactive material authorized for medical use in the license; and 7-004.03 Nothing in 180 NAC 7-004 relieves the licensee from complying with the requirements in 180 NAC 7.
§35.7	FDA, other Federal, and State		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-005	7-005

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	requirements					
§35.8	Information collection requirements : OMB Approval		D	Does not meet any of the criteria of Category A, B, C, or H&S.	NA	
§35.10	Implementation		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-006	7-006
§35.11	License required		[C]	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(f), this requirement was designated a Category C because Agreement States should adopt the Part 30 provision as a minimum requirement for their licensees. The general requirement for activities to be licensed appears in 10 CFR § 30.3 which has been designated compatibility category C. If an Agreement State has adopted 10 CFR § 30.3, it is not necessary to adopt this section since the requirements are covered in Part 30.3 and this section would be a duplication of those provisions.	7-007 (NRC) NO	7-007 7-007 LICENSE REQUIRED 7-007.01 A person may only manufacture, produce, prepare, acquire, receive, possess, use, or transfer radioactive material for medical use in accordance with a specific license issued by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State, or as allowed by 180 NAC 7-007.02 or 7-007.03. 7-007.02 An individual may receive, possess, use or transfer radioactive material in accordance with 180 NAC 7 under the supervision of an authorized user as provided in 180 NAC 7-018, unless prohibited by license condition. 7-007.03 An individual may prepare unsealed radioactive material for medical use in accordance with the regulations in 180 NAC 7 under the supervision of an authorized nuclear pharmacist or authorized user as provided in 180 NAC 7-018, unless prohibited by license condition.
§35.12	Application for license, amendment, or renewal		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-008	7-008
§35.13	License amendments		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-010	7-010
§35.14	Notifications		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-011	
					7-012	

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§35.15	Exemptions regarding Type A specific licenses of broad scope		D	Does not meet any of the criteria of Category A, B, C, or H&S.		
§35.18	License issuance		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-013	7-013
§35.19	Specific exemptions		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-014	7-014
§35.24	Authority and responsibilities for the radiation protection program		D - paragraphs (a)(1), (a)(2), (a)(3), (c), (d), (e), (g) and (h) H&S- paragraph (b) and (f)	Paragraphs (a)(1), (a)(2), (a)(3), (d) and (g), do not meet any of the criteria of Category A, B, C, or H&S. In addition, paragraph (a)(2) was not required because the definitions and training of authorized users, authorized nuclear pharmacists, radiation safety officers and authorized medical physicists are required as a matter of compatibility and would prevent an unqualified individual from working in these positions. Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (E), paragraphs (b) and (f) were designated Category H&S because they assist in establishing a minimum level of safety for the medical use of agreement materials since they deal with the implementation of the radiation protection program. The essential objective of paragraph (b) is to assure that the RSO agrees to implement the radiation safety program. The essential objective of paragraph (f) is to require that management provides the RSO with sufficient authority, time and resources to identify radiation problems, initiate corrective actions, stop unsafe operations and verify the implementation of corrective actions. The H&S two or fewer failure test scenario: If unapproved changes are made to the radiation safety program, or if unsafe operations are not stopped, the public and workers could receive radiation exposures in excess of the radiation protection limits in Parts 20 & 35 and a medical	7-015.04 (NRC) NO 7-015.04 (NRC) NO	7-015.04 7-015.04 A licensee's management must appoint a Radiation Safety Officer, who agrees, in writing, to be responsible for implementing the radiation protection program. The licensee, through the Radiation Safety Officer, must ensure that radiation safety activities are being performed in accordance with licensee-approved procedures and regulatory requirements. 7-015.08 Licensees that are authorized for one or more different types of use under 180 NAC 7-048, 7-055, 7-067 and 7-085, or one or more types of units under 180 NAC 7-067, will establish a Radiation Safety Committee to oversee all uses of radioactive material permitted by the license. The Committee must include an authorized user of 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, and may include other members the licensee deems appropriate.

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				event may occur.		
§35.26	Radiation protection program changes		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-016	7-016
§35.27	Supervision		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S because it assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a worker overexposure and medical event. The essential objectives of this requirement are to assure the instruction of the supervised individuals in radiation safety procedures and policies, and for the supervised individuals to request clarification from authorized users as needed. The H&S two or fewer failure test scenario: If a licensee fails to instruct supervised individuals in radiation safety procedures, regulations and license conditions and radioactive material is mishandled, the public and workers could receive radiation exposures in excess of limits and a medical event could occur.	7-018 (SSR) NO	7-018.01 A licensee permitting the receipt, possession, use, or transfer of radioactive material by an individual under the supervision of an authorized user as allowed by 180 NAC 7-007.02, must: 1. In addition to the requirements of 180 NAC 10-003, instruct the supervised individual in the licensee's written radiation protection procedures, written directive procedures, regulations of 180 NAC 7, and the license conditions with respect to the use of radioactive material; and 2. Require the supervised individual to follow the instructions of the supervising authorized user for medical uses of radioactive material, written radiation protection procedures, written directive procedures, regulations of 180 NAC 7, and license conditions with respect to the medical use of radioactive material. 3. Require that only those individuals specifically trained, and designated by the authorized user, be permitted to administer radionuclides or radiation to patients or human research subjects. 4. Require the authorized user to audit the performance of each supervised individual initially and at least annually. The audit must include verification that the supervised individual is meeting the requirements of 180 NAC 7-018.01, item 2 and physical observation of the individual performing the duties the authorized user has delegated to them. 7-18.02 A licensee permitting the preparation of radioactive material for medical use by an individual under the supervision of an authorized nuclear pharmacist or physician who is an authorized user, as allowed by 180 NAC 7-007.03, must: 1. Train and instruct the supervised individual in the preparation of radioactive material for medical use, as appropriate to that individual's involvement with

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						radioactive material; and 2. Require the supervised individual to follow the instructions of the supervising authorized user or authorized nuclear pharmacist regarding the preparation of radioactive material for medical use, the written radiation protection procedures, the regulations of 180 NAC 7, and license conditions. 7-018.03 Unless physical presence as described in other sections of 180 NAC 7 is required, a licensee who permits supervised activities under 180 NAC 7-018.01 and 7-018.02 must require an authorized user to be immediately available (by telephone within ten minutes) to communicate with the supervised individual, and 7-018.04 A licensee that permits supervised activities under 180 NAC 7-018.01 and 7-018.02 is responsible for the acts and omissions of the supervised individual.
§35.40	Written directives		H&S, (a) and (b) except paragraphs (c) an (d) are D	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S because it assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that correct information on the prescribed dose is communicated to the licensee's staff. The H&S two or fewer failure test scenario: If a licensee does not use written directives for therapeutic medical use and a misinterpretation of the authorized users' orders occurs, a medical event could occur.	7-019 (SSR) NO	7-019 7-019.01 A written directive must be dated and signed by an authorized user prior to administration of I-131 sodium iodide greater than 1.11 Megabecquerels (MBq) (30 microcuries (μCi)), any therapeutic dosage of unsealed radioactive material or any therapeutic dose of radiation from radioactive material. 1. If, because of the emergent nature of the patient's condition, a delay in order to provide a written directive would jeopardize the patient's health, an oral directive is acceptable, provided that the information contained in the oral directive is documented as soon as possible in writing in the patient's record and a written directive is prepared within 48 hours of the oral directive. 7-019.02 The written directive must contain the patient or human research subject's name and the following information: For any administration of dosage of radioactive drug containing radioactive material, the radioactive drug containing radioactive material, dosage, and the route of administration; For gamma stereotactic radiosurgery, the total dose, treatment site, and number of target coordinate settings per treatment for each anatomically distinct treatment site;

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						For teletherapy, the total dose, dose per fraction, number of fractions, and treatment site; For high dose-rate remote afterloading brachytherapy: the radionuclide, treatment site, dose per fraction, number of fractions, and total dose; or For all other brachytherapy, including low, medium, and pulsed dose rate remote afterloaders: a. Prior to implantation: treatment site, the radionuclide, and dose; and b. After implantation but prior to completion of the procedure: *the radioisotope, treatment site,* number of sources, and total source strength and exposure time (or the total dose).
§35.41	Procedures for administrations requiring a written directive		H&S, except paragraphs (b) and (c) are D	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S because it assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure patient identification and dose verification prior to administration to human beings. *The H&S two or fewer failure test scenario: If a* licensee does not verify patient identity, radioactive material or radiation could be administered to the wrong person, and an exposure in excess of limits could occur. In addition, If the prescribed dose is not verified before administration, the prescribed dose could be exceeded and a medical event could occur.	7-020 (SSR) NO	7-020 7-020.01 For any administration requiring a written directive, the licensee will develop, implement, and maintain written procedures to provide high confidence that: 1. The patient's or human research subject's identity is verified before each administration; and 2. Each administration is in accordance with the written directive. 7-020.02 The procedures required by 180 NAC 7-020.01 must, at a minimum, address the following items that are applicable to the licensee's use of radioactive material: 1. Verifying the identity of the patient or human research subject: 2. Verifying that the specific details of the administration is in accordance with the treatment plan, if applicable, and the written directive. 3. Checking both manual and computer-generated dose calculations; and Verifying that any computer-generated dose calculations are correctly transferred into the consoles of therapeutic medical units authorized by 180 NAC 7-067
§35.49	Suppliers for sealed sources or devices for medical use		[C]	This section is a bracketed Category C, because it is already required by 10 CFR § 30.32 (g) and § 32.74. Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(f), 10 CFR § 30.32 (g) was designated a Category C. This section requires that licensees, authorized to possess and use sealed sources or	7-021 (SSR)_ NO	7-021 7-021.01 Sealed sources or devices initially manufactured, labeled, packaged, and distributed in accordance with a license issued pursuant to 180 NAC 3 or the equivalent regulations of the U.S. Nuclear Regulatory Commission, or another Agreement State; 7-021.02 Teletherapy sources manufactured and distributed in accordance with a license issued

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				devices for medical use, obtain these products from a licensed vendor. In addition, 10 CFR § 32.74, "Manufacture and distribution of sources or devices containing byproduct material for medical use," is designated a Category B. This designation was based upon Handbook 5.9 Part II, "Categorization Criteria," Section (B), paragraph (b), requirements for approval of products that are distributed nationwide. If an Agreement State has adopted 10 CFR § 30.32 (g) and 10 CFR § 32.74, it is not necessary to adopt this section since the requirements are covered by these provisions.		pursuant to 180 NAC 3, or the equivalent regulations of the U.S. Nuclear Regulatory Commission or another Agreement State.
§35.50	Training for Radiation Safety Officer		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-022 (NRC) NO	7-022 TRAINING FOR RADIATION SAFETY OFFICER Except as provided in 180 NAC 7-026, the licensee must require an individual fulfilling the responsibilities of the Radiation Safety Officer as provided in 180 NAC 7-015 to be: 7-022.01 An individual who is certified by a specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission and who meets the requirements in 180 NAC 7-022.04 and 7-022.05. (The names of board certifications which have been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State will be posted on the NRC's web page.) 1. To have its certification process recognized, a specialty board will require all candidates for certification to: d. Hold a bachelor's or graduate degree from an accredited college or university in physical science or engineering or biological science with a minimum of 20 college credits in physical science; e. Have five or more years of professional experience in health physics (graduate training may be substituted for no more than two years of the required experience) including at least three years in applied health physics; and f. Pass an examination administered by diplomats of the specialty board, which evaluates knowledge and competence in radiation physics and instrumentation, radiation protection, mathematics pertaining to the use and measurement of radioactivity, radiation biology, and radiation dosimetry; or 2. Require all candidates for certification to:

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						c. Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; d. Have two years of full-time practical training and/or supervised experience in medical physics: (3) Under the supervision of a medical physicist who is certified in medical physicist by a specialty board recognized by an agreement state of the U.S. Nuclear Regulatory Commission. (4) In clinical nuclear medicine facilities providing diagnostic and/or therapeutic services under the direction of physicians who meet the requirements or for authorized users in 180 NAC 7-047 or 7-052; and e. Pass an examination, administered by diplomats of the specialty board, that assesses knowledge and competence in clinical diagnostic radiological or nuclear medicine physics and in radiation safety; or 7-022.02 An individual who: 1. Has completed a structured educational program consisting of both: a. 200 hours of classroom and laboratory training in the following areas: (1) Radiation physics and instrumentation; (2) Radiation protection; (3) Mathematics pertaining to the use and measurement of radioactivity; (4) Radiation biology; and (5) Radiation dosimetry; and b. One year of full-time radiation safety experience under the supervision of the individual identified as the Radiation Safety Officer on a U.S. Nuclear Regulatory Commission or Agreement State license or permit issued by the a U.S. Nuclear Regulatory Commission master material licensee that authorizes similar type(s) of use(s) of radioactive material involving the following: (1) Shipping, receiving, and performing related radiation surveys; (2) Using and performing checks for proper operation of dose calibrators, survey meters, and instruments used to measure radionuclides; (3) Securing and controlling radioactive material; (4) Using administrative controls to avoid mistakes in the administration of radioactive material;

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						(5) Using procedures to prevent or minimize radioactive contamination and using proper decontamination procedures; (6) Using emergency procedures to control radioactive material; and (8) Disposing of radioactive material; and 2. Meets the requirements in 180 NAC 7-022.04 and 7-022.05; or 7-022.03 7-022.03 The individual who is a: 3. Medical physicist who has been certified by a specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State in 180 NAC 7-023.01 and has experience in radiation safety for similar types of use of radioactive material for which the licensee is seeking the approval of the individual as Radiation Safety Officer and who meets the requirement in 180 NAC 7-022.04 and 7-022.05; or 4. Is an authorized user, authorized medical physicist, or authorized nuclear pharmacist identified on the licensee's license and has experience with the radiation safety aspects of similar types of use of radioactive material for which the individual has Radiation Safety Officer responsibilities and who meets the requirements in 180 NAC 7-022.04 and 7-022.05. 7-022.04 An individual who has obtained written attestation, signed by a preceptor Radiation Safety Officer, that the individual has satisfactorily completed the requirements in 180 NAC 7-022.05 and in 180 NAC 7-022.01, item 1.a. and b. or 180 NAC 7-022.01, item 2.a. and b, or 180 NAC 7-022.02 item 1 or 180 NAC 7-022.03 and has achieved a level of radiation safety knowledge sufficient to function independently as a Radiation Safety Officer for a medical use licensee. 7-022.05 An individual who has training in the radiation safety, regulatory issues and emergency procedures for the types of use for which a licensee seeks approval. This training requirement may be satisfied by completing training that is supervised by a radiation safety officer, authorized medical physicist, authorized nuclear pharmacist, or authorized user as appropriate, who is authorized for the type(s) of use for which the licensee is seeking approval.
					7-023	7-023 TRAINING FOR AN AUTHORIZED MEDICAL

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§35.51	Training for an authorized medical physicist		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	(NRC) NO	PHYSICIST The licensee must require the authorized medical physicist to be: 7-023.01 An individual who is certified by a specialty board whose certification process has been recognized by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State and who meets the requirements of 180 NAC 7-023.03 and 7-023.04. (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 3. Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; 4. Have two years of full-time practical training and/or supervision experience in medical physics: a. Under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission, or b. In a clinical radiation facilities providing high energy, external beam therapy (photons and electrons with energies greater than or equal to one million electron volts) and brachytherapy services under the direction of physicians who meet the requirements for authorized users in 180 NAC 7-063 or 7-084; and 3. Pass an examination, administered by diplomats of the specialty board, which assesses knowledge and competence in clinical radiation therapy, radiation safety, calibration, quality assurance, and treatment planning for external beam therapy, brachytherapy, and stereotactic radiosurgery; or 7-023.02 An individual who: 1. Holds a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; and has completed one year of full-time training in medical physics and an additional year of full-time work experience under the supervision of an individual who meets the requirements for an authorized medical physicist for the types(s) of use for which the individual is seeking

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						authorization. This training and work experience must be conducted in clinical radiation facilities that provide high energy, external beam therapy (photons and electrons with energies greater than or equal to one million electron volts) and brachytherapy services and must include: a. Performing sealed source leak tests and inventories; b. Performing decay corrections; c. Performing full calibration and periodic spot checks of external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable; and f. Conducting radiation surveys around external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable, and 2. Meets the requirements of 180 NAC 7-023.03. and 7-023.04. 7-023.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-023.04 and 180 NAC 7-023.01, item 1 and 2, or 180 NAC 7-023.02, item 1 and 180 NAC 7-023.04, and has achieved a level of competency sufficient to function independently as an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. The written attestation must be signed by a preceptor authorized medical physicist who meets the requirements in 180 NAC 7-023, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements for an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. 7-023.04 Has training for the type(s) of use for which authorization is sought that includes hands-on device operation, safety procedures, clinical use, and the operation of a treatment planning system. This training requirement may be satisfied by satisfactorily completing either a training program provided by the vendor or by training supervised by an authorized medical physicist authorized for the type(s) of use for which the individual is seeking authorization.
					7-024	7-024 TRAINING FOR AN AUTHORIZED NUCLEAR

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
§35.55	Training for an authorized nuclear pharmacist		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	(NRC) NO	PHARMACIST The licensee will require the authorized nuclear pharmacist to be a pharmacist who: 7-024.01 Is certified by a specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission who meets the requirements of 180 NAC 7-024.03. (The names of the board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) will be posted on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 1. Have graduated from a pharmacy program accredited by the American Council on Pharmaceutical Education (ACPE) or have passed the Foreign Pharmacy Graduate Examination Committee (FPGEC) examination; 2. Hold a current, active license to practice pharmacy; 3. Provide evidence of having acquired at least 4,000 hours of training/experience in nuclear pharmacy practice. Academic training may be substituted for no more than 2,000 hours of the required training and experience; 4. Pass an examination in nuclear pharmacy administered by diplomats of the specialty board, which assesses knowledge and competency in procurement, compounding, quality assurance, dispensing, distribution, health and safety, radiation safety, provision of information and consultation, monitoring patient outcomes, research and development; or 7-024.02 Completed all of the following requirements: 1. 700 hours in a structured educational program consisting of both: a. 200 hours of classroom and laboratory training in the following areas: (1) Radiation physics and instrumentation; (2) Radiation protection; (3) Mathematics pertaining to the use and measurement of radioactivity; (4) Chemistry of radioactive material for medical use; and (5) Radiation biology; and

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						b. Supervised practical experience in nuclear pharmacy involving: (1) Shipping, receiving, and performing related radiation surveys; (2) Using and performing checks for proper operation of instruments used to determine the activity of dosages, survey meters, and, if appropriate, instruments used to measure alpha- or beta-emitting radionuclides; (3) Calculating, assaying, and safely preparing dosages for patients or human research subjects; (4) Using administrative controls to avoid medical events in the administration of radioactive material; and (5) Using procedures to prevent or minimize radioactive contamination and using proper decontamination procedures; and 2. Meets the requirement of 180 NAC 7-024.03. 7-024.03 Has obtained written attestation, signed by a preceptor authorized nuclear pharmacist, that the individual has satisfactorily completed the requirements of 180 NAC 7-024.01, item 1, 2, and 3 or 7-024.02 and has achieved a level of competency sufficient to function independently as an authorized nuclear pharmacist.
§35.57	Training for experienced Radiation Safety Officer, teletherapy or medical physicist, authorized user, and nuclear pharmacist		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-026(NRC) NO except no dentist or podiatrists but will add)	7-026 PROVISIONS FOR EXPERIENCED RADIATION SAFETY OFFICER, TELETHERAPY OR MEDICAL PHYSICIST, AUTHORIZED MEDICAL PHYSICIST, AUTHORIZED USER, NUCLEAR PHARMACIST AND AUTHORIZED NUCLEAR PHARMACIST 7-026.01 An individual identified as a Radiation Safety Officer, a teletherapy or medical physicist, or a nuclear pharmacist on a U.S. Nuclear Regulatory Commission, an Agreement State license or on a permit issued by a U.S. Nuclear Regulatory Commission or Agreement State broad scope licensee or master material license permit or by a master material permittee of broad scope that authorizes medical use or practice of nuclear pharmacy, before the effective date of these regulations need not comply with the training requirements of 180 NAC 7-022 through 7-024. 7-026.02 Physicians identified as authorized users for the medical, use of radioactive material on a license

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						issued by the U.S. Nuclear Regulatory Commission or Agreement State, a permit issued by a U.S. Nuclear Regulatory Commission master material licensee, a permit issued by a U.S. Nuclear Regulatory Commission or Agreement State broad scope licensee, or on a permit issued by a U.S. Nuclear Regulatory Commission master material license broad scope permittee before the effective date of these regulations who perform only those medical uses for which they were authorized on that date need not comply with the training requirements 180 NAC 7-041 through 7-084 .
§35.59	Recentness of training		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-027 (NRS) NO	7-027 RECENTNESS OF TRAINING The training and experience specified in 180 NAC 7 must have been obtained within seven years preceding the date of license application or the individual must have had related continuing education and experience since the required training and experience was completed.
§35.60	Possession, use, and calibration of instruments to measure the activity of unsealed byproduct material		H&S, except paragraph (c) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure the measurement of the dosage with proper instrumentation prior to administration. The H&S two or fewer failure test scenario: If a licensee does not properly measure the dosage with the appropriate instrumentation, the administered dose could differ from the prescribed dose and a medical event could occur.	7-029 (NRC) NO	7-029 POSSESSION, USE, AND CALIBRATION OF INSTRUMENTS USED TO MEASURE THE ACTIVITY OF UNSEALED RADIOACTIVE MATERIAL 7-029.01 For direct measurements performed in accordance with 180 NAC 7-031, a licensee must possess and use instrumentation to measure the activity of unsealed radioactive material prior to administration to each patient or human research subject. 7-029.02 A licensee must test the instrumentation required in 180 NAC 7-029.01 in accordance with nationally recognized standards or the manufacturer's instructions. 7-029.03 The tests required in 180 NAC 7-029.02 must at minimum include tests for constancy, linearity, accuracy and geometry dependence, as appropriate to demonstrate proper operation of the instrument. 7-029.04 A licensee will must a record of each instrument test required by 180 NAC 7-029 in

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						accordance with 180 NAC 7-091.
§35.61	Calibration of survey instruments		H&S, except paragraphs (a)(3) & (c) are D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials. Without properly calibrated survey instruments over exposures could occur and is needed to demonstrate compliance with Part 20 requirements. The essential objective of this requirement is to assure the possession of calibrated survey instruments. The H&S two or fewer failure test scenario: If a licensee does not calibrate or check survey instruments as required by this rule, and a contamination event occurs, radiation levels in excess of Part 20 limits could occur.	7-030 (NRC & SSR) NO	7-030 CALIBRATION OF SURVEY INSTRUMENTS 7-030.01 A licensee must ensure that the survey instruments used to show compliance with 180 NAC 7 and 180 NAC 4 have been calibrated before first use, annually and following any repair that affects the calibration. 7-030.02 To satisfy the requirements of 180 NAC 7-030.01, the licensee must: 1. Calibrate all required scale readings up to 10 mSv (1000 mrem) per hour with a radiation source; 2. Have each radiation survey instrument calibrated: a. At energies appropriate for use and at annual intervals or after servicing instrument except for battery changes; b. For linear scale instruments at two points located approximately one-third and two-thirds of full-scale on each scale; for logarithmic scale instruments, at mid-range and each decade, and at two points of at least one decade; and for digital instruments, at three points between 0.02 and 10 mSv (2 and 1,000 mrem) per hour; and c. For dose rate instruments, so that an accuracy within plus or minus 20% of the true radiation dose rate can be demonstrated at each point checked. 3. Conspicuously note on the instrument the date of calibration. 7-030.03 The licensee may not use survey instruments if the difference between the indicated exposure rate and the calculated exposure rate is more than 20%. 7-030.04 A licensee must check each survey instrument for consistent response with a dedicated check source before each use. The licensee is not required to keep records of these checks. 7-030.05 A licensee must maintain a record of each survey instrument calibration in accordance with 180 NAC 7-092.
§35.63	Determination of dosages of unsealed byproduct		H&S, except paragr	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S because it assists in establishing a minimum level of safety for the medical use of	7-031 (NRC & SSR) NO	7-031 DETERMINATION OF DOSAGES OF RADIOACTIVE MATERIAL FOR MEDICAL USE 7-031.01 A licensee must determine and record the activity of each dosage prior to medical use.

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	material for medical use		aph (e) is D.	agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure proper determination of prescribed dosages by proper measurement and/or calculation prior to human use. The H&S two or fewer failure test scenario: If a licensee does not measure a dosage, and a preparation error occurs, a medical event could occur.		7-031.02 For unit dosages not requiring a written directive, this determination must be made by either direct measurement of radioactivity or by a decay calculation, based on the measurements made by a manufacturer or preparer licensed pursuant to 180 NAC 3 or equivalent provision of the U.S. Nuclear Regulatory Commission or Agreement State. 7-031.03 For unit dosages requiring a written directive this determination must be made by direct measurement of radioactivity in accordance with 180 NAC 7-029. 7-031.04 For other than unit dosages not requiring a written directive, this determination must be made by direct measurement of radioactivity or by a combination of measurements of radioactivity and mathematical calculations or combination of volumetric measurements and mathematical calculations, based on the measurement made by a manufacturer or preparer licensed pursuant to 180 NAC 3 or equivalent provision of the U.S. Nuclear Regulatory Commission or Agreement State. 7-031.05 For other than unit dosages requiring a written directive this must be made by direct measurement of radioactivity in accordance with 180 NAC 7-029. 7-031.06 A licensee may not use a dosage if the dosage differs from the prescribed dosage by more than 20%. 7-031.07 A licensee must retain a record of the dosage determination required by 180 NAC 7 in accordance with 180 NAC 7-093.
§35.65	Authorization for calibration, transmission and reference sources		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-032	7-032
§35.67	Requirements for possession of sealed sources and		H&S, except paragraphs	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing	7-033 (NRC) NO	7-033 REQUIREMENTS FOR POSSESSION OF SEALED SOURCES AND BRACHYTHERAPY SOURCES 7-033.01 A licensee in possession of any sealed source or brachytherapy source must follow the radiation safety and handling instructions supplied by

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	brachytherapy sources		(d) & (f) are D.	the likelihood of a medical event and worker overexposure. The essential objective of this requirement is to assure the safe handling, periodic leak testing, and inventory of sealed sources. The H&S two or fewer failure test scenario: if the licensee does not follow the manufacturers' instructions, including testing for leakage, and a source is damaged or misplaced, public and worker exposures in excess of limits and a medical event could occur.		the manufacturer, or equivalent instructions approved by the Department. 7-033.02 A licensee in possession of a sealed source must: 1. Test the source for leakage in accordance with 180 NAC 1-011; and. 2. Test the source for leakage at intervals not to exceed six months or at intervals approved by the Department, another Agreement State, or the U.S. Nuclear Regulatory Commission in the Sealed Source and Device Registry. 7-033.03 If the leak test reveals the presence of 185 Bq (0.005 μCi) or more of removable contamination, the licensee must: 1. Immediately withdraw the sealed source from use and store, dispose, or cause it to be repaired in accordance with the requirements of 180 NAC 1-011.06 and 180 NAC 4; and 2. File a report within five days of the leak test in accordance with 180 NAC 7-118. 7-033.04 A licensee in possession of a sealed source or brachytherapy source, except for gamma stereotatic radiosurgery sources, must conduct a semi-annual physical inventory of all such sources. The licensee must retain each inventory record in accordance with 180 NAC 7-094
§35.69	Labeling of vials and syringes		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event and worker overexposure. The essential objective of this requirement is to make sure that licensees develop, implement and maintain written procedures for labeling syringes, syringe shields, and vial shields that contain radiopharmaceuticals. The H&S two or fewer failure test scenario: If the syringe, syringe shield, or vial shield is not labeled, then the wrong radiopharmaceutical could be administered, and a medical event could occur. If syringe and vial shields are not used, then a worker could be overexposed.	7-034 * 7-035 (NRC & SSR) NO	7-034 LABELS: Each syringe and vial that contains a radioactive drug must be labeled to identify the radioactive drug. 7-035 VIAL SHIELDS AND SYRINGE SHIELD 7-035.01 A licensee must require each individual preparing or handling a vial that contains a radioactive drug to keep the vial in a vial radiation shield. 7-035.02 A licensee must keep syringes that contain radioactive material to be administered in a radiation shield. 7-035.03 A licensee must require each individual who prepares or administers radioactive drugs to use a syringe radiation shield unless the use of the shield is contraindicated for that patient or human research subject.

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§35.70	Surveys of ambient radiation exposure rate		H&S, except paragraphs (b) and (c) are D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this requirement was designated a H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event and worker overexposure. The essential objective of this requirement is to assure that daily radiation surveys are performed in areas where therapeutic radiopharmaceuticals are used. The H&S two or fewer failure test scenario: If a licensee does not conduct surveys for ambient radiation exposure rates, and an unplanned release of radioactive material occurs, contamination could go undetected and cause public and worker exposure in excess of the radiation protection limits in Part 20.	7-036 (NRC) NO	7-036.01 Except as provided in 180 NAC 7-036.02 a licensee must survey with a radiation detection survey instrument at the end of each day of use all areas where radioactive drugs containing radioactive material requiring a written directive were prepared for use or administered.
§35.75	Release of individuals containing unsealed byproduct material or implants containing byproduct material		C, except paragraphs (c) and (d) are D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraphs (2)(a) and (f), this requirement was designated a Category C. This provision assists in establishing a minimum level of safety for the medical use of agreement materials on a nationwide basis by reducing the likelihood of public overexposures in multiple jurisdictions. The essential objective of this requirement is to assure that 0.5 rem TEDE is not exceeded by any individual, and that instructions are provided so that a breast-feeding infant/child does not receive an exposure exceeding 0.1 rem TEDE.	7-037 (NRC) NO	7-037.01 A licensee may authorize the release from its control of any individual who has been administered radioactive drugs or implants containing radioactive material if the total effective dose equivalent to any other individual from exposure to the released individual is not likely to exceed 5 mSv (0.5 rem).[4] 7-037.02 For patients administered radioactive material for which a written directive is required, a licensee must provide the released individual, or individual's parent or guardian with oral and written instructions on actions recommended to maintain doses to other individuals as low as is reasonably achievable if the total effective dose equivalent to any other individual is likely to exceed 1 mSv (0.1 rem). If the dose to a breast-feeding infant or child could exceed 1 mSv (0.1 rem) assuming there were no interruption of breast-feeding, the instructions must also include: 1. Guidance on the interruption or discontinuation of breast-feeding and

[4]U.S. Nuclear Regulatory Commission's - Regulatory Guide 7.1, "Release of Patients Administered Radioactive Materials," describes methods for calculating doses to other individuals and contains tables of activities not likely to cause doses exceeding 5 mSv (0.5 rem).

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						2. Information on the potential consequences, if any, of failure to follow the guidance.
§35.80	Provision of mobile medical service		H&S (a)(2), (a)(3) & (b) for those States which author ize this activit y D for other States	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraph (a) was designated a H&S those Agreement States which authorize this service. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a public exposure. The essential objective of this requirement is to make sure that instruments are possessed, used, calibrated and checked as described in §35.60 and §35.61, that properly operating survey instruments are used and that radiation surveys are performed in areas where therapeutic radiopharmaceuticals are used. The H&S two or fewer failure test scenario: Paragraphs (a)(2) and (a)(3) require that the requirements in §35.60 and §35.61 be applied to mobile services and that survey instruments are operating properly. If a mobile service licensee does not measure dosages with a proper operating instrumentation, then the prescribed dose could be exceeded, causing a medical event and the radiation protection limits in Part 20 for workers and the public could be exceeded. Paragraph (a)(4) requires that the mobile service survey all areas of use to assure compliance with Part 20 before leaving the client's address of use. If an exit survey is not conducted and byproduct material is left at the client's address of use, radiation protection limits in Part 20 for workers and the public could be exceeded.	7-038 (NRC & SSR) NO	7-038 MOBILE MEDICINE SERVICE TECHNICAL REQUIREMENTS: A licensee providing mobile nuclear medicine service must: 7-038.01 Transport to each address of use only syringes or vials containing prepared drugs or radioactive materials that are intended for reconstitution of radioactive drug kits; 7-038.02 Bring into each location of use all radioactive material to be used and, before leaving, remove all unused radioactive material and associated radioactive waste; 7-038.03 Secure or keep under constant surveillance and immediate control all radioactive material when in transit or at an address of use; 7-038.04 Check instruments used to measure the activity of unsealed radioactive material for proper function before medical use at each address of use or on each day of use, whichever is more frequent. At a minimum, the check for proper function must include a constancy check; 7-038.05 Check survey instruments for consistent response with a dedicated check source before use at each client's address; 7-038.06 Prior to leaving a client's address of use, perform area surveys and survey for removable contamination in all areas of use, to ensure compliance with the requirements in 180 NAC 4. 7-038.07 Use radioactive gases only in areas of use and under conditions which have been evaluated and approved by the Department for compliance with airborne release standards; and, 7-038.08 Retain a record of each survey required by 180 NAC 7-038.05 in accordance with 180 NAC 7-097.
§35.92	Decay-in-storage		H&S - for those States which author ize this	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) and (b) are designated as H&S for those Agreement States which authorize this activity. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a public overexposure. The essential objective of this requirement is to allow	7-040	Draft 2006

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			activity, except paragraph (b) is D. D - for other States	decay in storage for byproduct materials with less than 120 day half-life and to assure that surveys will be performed on the material before disposal. The H&S two or fewer failure test scenario: If byproduct material is allowed to decay-in-storage and is improperly surveyed, it may be disposed of as normal trash. Byproduct material could then be released into the public domain and overexpose workers and members of the public.		
§35.100	Use of unsealed byproduct material for uptake, dilution, and excretion studies for which a written directive is not required		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this provision was designated a H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that radiopharmaceuticals are obtained from a licensed vendor or authorized preparer. The H&S two or fewer failure test scenario: If a licensee does not obtain radiopharmaceuticals from a licensed manufacturer or authorized preparer, a preparation error could occur, and a medical event could occur.	7-041 (NRC) NO	7-040 DECAY-IN-STORAGE: See 180 NAC 4-039.03 for decay-in-storage requirements. 4-039.03 A licensee may hold radioactive material with a physical half-life of less than 120 days for decay-in-storage before disposal without regard to its radioactivity if the licensee: 1. Holds radioactive material for decay a minimum of ten half-lives; 2. Monitors radioactive material at the container surface before disposal and determines that its radioactivity cannot be distinguished from the background radiation level with an appropriate radiation detection survey instrument set on its most sensitive scale and with no interposed shielding; 3. Removes or obliterates all radiation labels; except for materials that will be handled as biomedical waste after released; and 4. Separates and monitors each generator column individually with all radiation shielding removed to ensure that its contents have decayed to background radiation level before disposal.
§35.190	Training for uptake, dilution and excretion studies		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent	7-043 (NRC) NO	7-043 TRAINING FOR UPTAKE, DILUTION, AND EXCRETION STUDIES: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of unsealed radioactive material for the uses authorized in 180 NAC 7-041 to be a physician who: 7-043.01 Is certified by a medical specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State and who meets the requirements in 180 NAC 7-043.04. (The names of board certifications which have been recognized by the U.S. Nuclear Regulatory Commission or an Agreement

				between NRC and Agreement States.		State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 3. Complete 60 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies that includes the topics listed in 180 NAC 7-043.03, item 1.and 2 and 7-043.04; and 4. Pass an examination, administered by diplomats of the specialty board, that assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or 7-043.02 Is an authorized user under 180 NAC 7-047 or 7-051 or equivalent U.S. Nuclear Regulatory or Agreement State requirements; or 7-043.03 Has completed 60 hours of training and experience, including a minimum of eight hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies. The training and experience must include: 1. Classroom and laboratory training in the following areas: a. Radiation physics and instrumentation; b. Radiation protection; c. Mathematics pertaining to the use and measurement of radioactivity; d. Chemistry of byproduct material for medical use; and e. Radiation biology; and 2. Work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-043, 7-047 or 7-051 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, involving: a. Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys; b. Performing quality control procedures on instruments used to determine the activity of dosages

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						and performing checks for proper operation of survey meters c. Calculating, measuring, and safely preparing patient or human research subject dosages; d. Using administrative controls to prevent a medical event involving the use of unsealed radioactive material; e. Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and f. Administering dosages of radioactive drugs to patients or human research subjects; and 3. Meet the requirements of 180 NAC 7-043.04. 7-043.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-043, 7-047, or 7-051, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirement in 180 NAC 7-043.01, item 1 or 7-043.03, item 1 and 2 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized in 180 NAC 7-041.
§35.200	Use of unsealed byproduct material for imaging and localization studies for which a written directive is not required		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, this section was designated a H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that radiopharmaceuticals are obtained from a licensed vendor or authorized preparer. The H&S two or fewer failure test scenario: If a licensee does not obtain radiopharmaceuticals from a licensed manufacturer or authorized preparer, and a preparation error occurs, a patient could receive a radiation exposure and a medical event could occur.	7-044 (NRC) NO	7-044 USE OF UNSEALED RADIOACTIVE MATERIAL FOR IMAGING AND LOCALIZATION STUDIES FOR WHICH A WRITTEN DIRECTIVE IS NOT REQUIRED: A licensee may use, for imaging and localization studies, any radioactive material prepared for medical use, in quantities that do not require a written directive as described in 180 NAC 7-019 that is: 7-044.01 Obtained from a manufacturer or preparer licensed pursuant to 180 NAC 3-014.10 or equivalent U.S. Nuclear Regulatory Commission or Agreement State ; or 7-044.02 Prepared by: 1. An authorized nuclear pharmacist; 2. A physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7), or 3. An individual under the supervision, as specified in 180 NAC 7-018; of, the authorized nuclear pharmacist in paragraph 180 NAC 7-044.02, item 1 or the physician who is an authorized user in

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						paragraph 180 NAC 7-044.02, item 2; 7-044.03 Obtained from and prepared by an U.S. Nuclear Regulatory Commission or Agreement State licensee for use in research in a(1) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys; (2) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters; (3) Calculating, measuring, and safely preparing patient or human research subject dosages; (4) Using administrative controls to prevent a misadministration involving the use of unsealed radioactive material; (5) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; (6) Administering dosages of radioactive drugs to patients or human research subjects; and (7) Eluting generator systems appropriate for preparation of radioactive drugs for imaging and localization studies, measuring and testing the eluate for radionuclide purity, and processing the eluate with reagent kits to prepare labeled radioactive drugs; and ccordance with a Radioactive Drug Research Committee-approved protocol or an Investigational New Drug (IND) protocol accepted by FDA; or 7-044.04 Prepared by the licensee for use in research in accordance with a Radioactive Drug Research Committee-approved application or an Investigational New Drug (IND) protocol accepted by FDA.
§35.204	Permissible molybdenum-99 concentration		H&S, except paragraph (c) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) and (b) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that 5.55kBq is not exceeded. The H&S two or fewer failure test scenario: If a licensee does not perform a Mo-99 measurement and the 5.55kBq limit is exceeded, and this	7-045 (SSR) NO	7-045 RADIONUCLIDE CONTAMINANTS 7-045.01 A licensee must not administer to humans a radioactive drug containing: 1. More than 0.15 kBq of molybdenum-99 per MBq of technetium-99m (0.15 µCi of molybdenum-99 per mCi of technetium-99m). 2. More than 0.02 kBq of strontium-82 per MBq of rubidium-82 chloride injection (0.02 µCi of strontium-82 per mCi of rubidium-82 chloride injection). 3. More than 0.02 kBq of strontium-85 per MBq of rubidium-82 chloride injection (0.02 µCi of

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				contaminant is administered, a medical event could occur.		strontium-85 per mCi of rubidium-82 chloride injection). 7-045.02 To demonstrate compliance with 180 NAC 7-045, the licensee preparing radioactive drugs from radionuclide generators must: 1. Measure the concentration of radionuclide contaminant in the first eluate after receipt of a molybdenum-99/technetium-99m generator; 2. Measure the concentration of radionuclide contaminant in each eluate or extract, as appropriate for other generator systems. 7-045.03 A licensee who must measure radionuclide concentration must retain a record of each measurement in accordance with 180 NAC 7-099. 7-045.04 A licensee must report immediately to the Department each occurrence of molybdenum-99 concentration exceeding the limits specified in 180 NAC 7-045.01.
§35.290	Training for imaging and localization studies		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-047 (NRC) NO	7-047 TRAINING FOR IMAGING AND LOCALIZATION STUDIES: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of unsealed radioactive material for the uses authorized in 180 NAC 7-044 to be a physician who: 7-047.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) and who meets to requirement in 180 NAC 7-047.04. (The names of board certification which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 4. Complete 700 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for imaging and localization studies that includes the topics listed in 180 NAC 7-047.03; and 5. Pass an examination, administered by diplomats of the specialty board, which assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or 7-047.02 Is an authorized user in 180 NAC 7-051

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						and meets the requirements in 180 NAC 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements; or 7-047.03 The physician: 1. Completed 700 hours of training and experience, including a minimum of 80 hours of classroom and laboratory training in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for imaging and localization studies. The training and experience must include at a minimum: a. Classroom and laboratory training in the following areas: (1) Radiation physics and instrumentation; (2) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters; (3) Mathematics pertaining to the use and measurement of radioactivity; (4) Chemistry of radioactive material for medical use; (5) Radiation biology; and b. Work experience, under the supervision of an authorized user, who meets the requirements in 180 NAC 7-047 or 7-47.03, item 1.b.(7) and 180 NAC 7-051 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, involving; 2. Meets the requirement of 180 NAC 7-047.04. 7-047.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-047.01, item 1 or 180 NAC 7-047.03, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-041 and 7-044 .
§35.300	Use of unsealed		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraph (a) was designated	7-048 (NRC) NO	7-048 USE OF UNSEALED RADIOACTIVE MATERIAL FOR WHICH A WRITTEN DIRECTIVE IS REQUIRED: A licensee may use any unsealed

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	byproduct material for which a written directive is required			a H&S for those Agreement States which authorize this activity. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that radiopharmaceuticals are obtained from a licensed vendor or authorized preparer. The H&S two or fewer failure test scenario: If a licensee does not obtain radiopharmaceuticals from a licensed manufacturer or authorized preparer, a preparation error or medical event could occur.		radioactive material for diagnostic or therapeutic medical use for which a written directive is required that has been: 7-048.01 Obtained from a manufacturer or preparer licensed in 180 NAC 3; or 7-048.02 Prepared by an authorized nuclear pharmacist, a physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047 or 7-051, or an individual under the supervision of either as specified in 180 NAC 7-018; or 7-048.03 Obtained from and prepared by the Department, U.S. Nuclear Regulatory Commission or Agreement State licensee in accordance with a Radioactive Drug Research Committee's approval protocol or an Investigational New Drug (IND) protocol accepted by FDA for use in research; or 7-048.04 Prepared by the licensee for use in research in accordance with an approved application or an Investigational New Drug (IND) protocol accepted by FDA for use in research.
§35.310	Safety instruction		H&S, except paragraph (b) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraph (a) was designated a H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of exposure to members of the public. The essential objective of this requirement is to assure that personnel caring for patients receive initial and annual radiation safety instruction. The H&S two or fewer failure test scenario: If the personnel caring for patients are not properly instructed, then personnel could be overexposed and persons visiting the patient could be overexposed. In addition, contaminated material could be released into the public domain, and a public overexposure could occur.	7-049 .01 (SSR)) NO	7-049 SAFETY INSTRUCTION AND SAFETY PRECAUTIONS 7-049.01 In addition to the requirements of 180 NAC 10-003, 1. A licensee must provide radiation safety instruction to all personnel caring for patients or human research subjects that have received therapy with radioactive drug, and cannot be released in accordance with 180 NAC 7-037. The training must be provided initially and at least annually. The instruction must be appropriate to the personnel's assigned duties and include the following: a. Patient or human research subject control; b. Visitor control to include the following: (1) Routine visitation to hospitalized individuals in accordance with 180 NAC 4-013.01, item 1; and (2) Visitation authorized in accordance with 180 NAC 4-013.03. c, Contamination control; d. Waste control; and e. Notification of the Radiation Safety Officer or his/her designee and the authorized user if the patient or the human research subject has a medical emergency or dies. 2. A licensee must retain a record of individuals

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						receiving instruction required by 180 NAC 7-101.
§35.315	Safety precautions		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraph (a) was designated a H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of worker and public exposure. The essential objective of this requirement is to limit unnecessary patient contact with members of the public, and to assure that proper notifications are made if the patient dies. The H&S two or fewer failure test scenario: If the safety precautions are not taken, then hospital personnel could be overexposed and persons visiting the patient could be overexposed. Contaminated material could also be released into the public domain, and public overexposures could occur. In addition, if the proper persons are not notified if a patient dies or, if a medical emergency occurs, other personnel could be overexposed.	7-049.02 (SSR) NO	7-049.02 Safety Precautions 1. For each patient or human research subject receiving radiopharmaceutical therapy and hospitalized for compliance with 180 NAC 7-037, a licensee must: a. Quarter the patient or the human research subject either in: (1) A private room with a private sanitary facility; or (2) A room, with a private sanitary facility, with another individual who also has received similar radiopharmaceutical therapy and who also cannot be released under 180 NAC 7-037; b. Visibly post the patient's or the human research subject's door with a "Caution: Radioactive Materials" sign and note on the door or in the patient's or human research subject's chart where and how long visitors may stay in the patient's or human research subject's room; and c. Either: (1) Monitor material and items removed from the patient's or the human research subject's room to determine that their radioactivity cannot be distinguished from the natural background radiation level with a radiation detection survey instrument set on its most sensitive scale and with no interposed shielding; or (2) Handle such material and items as radioactive waste. 2. The Radiation Safety Officer, or his/her designee, and the authorized user must be notified immediately if the hospitalization patient dies or has a medical emergency. The licensee must also notify the Department in accordance with 180 NAC 7-119 if it is possible that any individual could receive exposures in excess of 180 NAC 4-013 as a result of the deceased's body. 3. Measure the thyroid burden of each individual who helped prepare or administer a liquid dosage of iodine-131 or in all cases where the patient's vomits or the capsule is compromised. The measurement must be done within three days after administering

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						the dosage, and retain for the period required by 180 NAC 4-051.01 a record of each thyroid burden measurement, date of measurement, the name of the individual whose thyroid burden was measured, and the initials of the individual who made the measurements.
§35.390	Training for use of unsealed byproduct material for which a written directive is required		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-052 (NRC) NO	7-051 TRAINING FOR USE OF UNSEALED RADIOACTIVE MATERIAL Except as provided in 180 NAC 7-026, the licensee must require an authorized user of unsealed radioactive material for the uses authorized under 180 NAC 7-048 to be a physician who: 7-051.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) who meets the requirements in 180 NAC 7-051.02, item 1.b.(6) and 7-051.03. (Specialty Boards whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) To be recognized, a specialty board must require all candidates for certification to: 2. Successfully complete a minimum of three years of residency training in a radiation therapy or nuclear medicine training program or a program in a related medical specialty. These residency training programs must include 700 hours of training and experience as described in 180 NAC 7-051.02, item 1.a. through 7-051.02, item 1.b.(5). Eligible training programs must be approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and 3. Pass an examination, administered by diplomats of the specialty board, which tests knowledge and competence in radiation safety, radionuclide handling, quality assurance, and clinical use of unsealed radioactive material for which a written directive is required; or 7-051.02 The physician: 1. Has completed 700 hours of training and experience, including a minimum of 200 hours of classroom and laboratory training, in basic

radionuclide handling techniques applicable to the medical use of unsealed radioactive material requiring a written directive. The training and experience must include:

a. Classroom and laboratory training in the following areas:

(1) Radiation physics and instrumentation;

(2) Radiation protection;

(3) Mathematics pertaining to the use and measurement of radioactivity;

(4) Chemistry of radioactive material for medical use; and

(5) Radiation biology; and

b. Work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory or Agreement State requirements. A supervising authorized user, who meets the requirements in 180 NAC 7-051.02, must also have experience in administering dosages in the same dosage category or categories (that is , 180 NAC 7-051.02, item 1., b.(6)) as the individual requesting authorized user status. The work experience must involve:

(1) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

(2) Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters;

(3) Calculating, measuring, and safely preparing patient or human research subject dosages;

(4) Using administrative controls to prevent a misadministration involving the use of unsealed radioactive material;

(5) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures;

(6) Administering dosages of radioactive drugs to patients or human research subjects involving a minimum of three cases in each of the following categories for which the individual is requesting authorized user status:

Oral administration of less than or equal to 1.22 GBq (33 mCi) of sodium iodide I-131, for which a written directive is required;

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						Oral administration of greater than 1.22 GBq (33 mCi) of sodium iodide I-131[5]; Parenteral administration of any beta emitter or a photon-emitting radionuclide with a photon energy less than 150 keV, for which a written directive is required; and/or Parenteral administration of any betha emitter, or a photon-emitting radionuclide with a photon energy less than 150 kev, for which a written directive is required; and/or 2. Meets the requirements of 180 NAC 7-051.03. 7-051.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-051.01, item 1 and 7-051.02, item 1.b.(6) or 7-051.02, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. The preceptor authorized user, who meets the requirement in 180 NAC 7-051.02 must have experience in administering dosages in the same dosage category or categories (that is, 180 NAC 7-051.02, item 1.b.(6)) as the individual requesting authorized user status.
§35.392	Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities less than or equal to 1.22 Gigabecquerels (33		B	o be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-053 (NRC) NO	7-052 TRAINING FOR THE ORAL ADMINISTRATION OF SODIUM IODIDE I-131 IN QUANTITIES LESS THAN OR EQUAL TO 1.22 GIGABECQUERELS (33 MILLICURIES) FOR WHICH A WRITTEN DIRECTIVE IS REQUIRED: Except as provided in 180 NAC 7-026, the licensee must require an authorized user for the oral administration of sodium iodide I-131 in quantities less than or equal to 1.22 GBq (33 mCi), for which a directive is required, to be a physician who: 7-052.01 Is certified by a medical specialty board whose certification process includes all of the requirements in 180 NAC 7-052.03, item 1. and 2.

[5]Experience with at least 3 cases in 180 NAC 7-051.02, item 1.b. (6) (b) also satisfies the requirement in 180 NAC 7-051.02, item 1.b.(6)(a).

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	millicuries)					and whose certification has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission who meets the requirements of 180 NAC 7-052.04. (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) or 7-052.02 Is an authorized user under 180 NAC 7-051.01, 7-051.02 for uses listed in 180 NAC 7-051.02, item 1.b.(6)(a) or (b), 180 NAC 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements; or 7-052.03 The physician: 1. Has successfully completed 80 hours of classroom and laboratory training, applicable to the medical use of sodium iodide I-131 for procedures requiring a written directive. The training must include: a. Radiation physics and instrumentation; b. Radiation protection; c. Mathematics pertaining to the use and measurement of radioactivity; d. Chemistry of radioactive material for medical use; and e. Radiation biology; and 2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051.01, 7-051.02, 7-052, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A supervising authorized user who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(a) or (b). The work experience must involve: a. Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys; b. Performing quality control procedures on instruments used to determine the activity of dosages and performing check for proper operation of survey meters; c. Calculating, measuring, and safely preparing patient or human research subject dosages; d. Using administrative controls to prevent a misadministration involving the use of radioactive

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						material; e. Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and f. Administering dosages to patients or human research subjects, that includes at least three cases involving the oral administration of less than or equal to 1.22 GBq (33 mCi) of sodium iodide I-131; and 3. Meets the requirements of 180 NAC 7-052.04. 7-052.04 Has obtained written attestation that the individual has satisfactorily completed the requirements in180 NAC 7-052.03, item 1. and 2. and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, 7-052, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A preceptor authorized user, who meets the requirement in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(a) or (b).
§35.394	Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities greater than 1.22 Gigabecquerels (33 millicuries)		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-054 (NRC except 7-051.01 item 1 (three years of residency & will need to change)) NO	7-054 TRAINING FOR THE PARENTERAL ADMINISTRATION OF UNSEALED RADIOACTIVE MATERIAL REQUIRING A WRITTEN DIRECTIVE Except as provided in 180 NAC 7-026, the licensee must require an authorized user for the parenteral administration requiring a written directive, to be a physician who: 7-054.01 Is an authorized user under 180 NAC 7-051 for uses listed in 7-051.02, item 1.b. (6)(c) or (d),or equivalent Agreement State requirements; or 7-054.02 Is an authorized user under 180 NAC 7-063 or 7-084, or equivalent Agreement State requirements and who meets the requirements in 180 NAC 7-054.04; or 7-054.03 Is certified by a medical specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State under 180 NAC 7-063 or 7-084; and who meets the requirements in 180 NAC 7-054.04. 7-054.04 The physician:

1. Has successfully completed 80 hours of classroom and laboratory training, applicable to parenteral administrations, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training must include:
(1) Radiation physics and instrumentation;
(2) Radiation protection;
(3) Mathematics pertaining to the use and measurement of radioactivity;
(4) Chemistry of radioactive material for medical use; and
(1) Radiation biology; and

2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051 or 7-054, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, in the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements in 180 NAC 7-051, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d). The work experience must involve:
a. Ordering, receiving, and unpacking radioactive materials safely, and performing the related radiation surveys;
b. Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters;
c. Calculating, measuring, and safely preparing patient or human research subject dosages;
d. Using administrative controls to prevent a medical event involving the use of unsealed radioactive material;
e Using procedures to contain spilled radioactive material safely, and using proper decontamination procedures; and
f. Administering dosages to patients or human research subjects, that include at least three cases involving the parenteral administration, for which a

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						written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV and/or at least three cases involving the parenteral administration of any other radionuclide, for which a written directive is required; and 3. Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-054.02 or 7-054.03, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed radioactive material requiring a written directive. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or 7-054, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in 180 NAC 7-051, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d).
§35.400	Use of sealed sources for manual brachytherapy		[C]	This section is a bracketed Category C, because it is already required by 10 CFR § 30.32 (g) and § 32.74. Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(f), 10 CFR § 30.32 (g) was designated a Category C. This section requires the use of sealed sources in the SS&D Registry by all specific licensees. In addition, 10 CFR § 32.74, "Manufacture and distribution of sources or devices containing byproduct material for medical use," is designated a Category B. This designation was based upon Handbook 5.9 Part II, "Categorization Criteria," Section (B), paragraph (b), requirements for approval of products that are distributed nationwide. If an Agreement State has adopted 10 CFR § 30.32 (g) and 10 CFR § 32.74, it is not necessary to adopt this section since the requirements are covered by these provisions.	7-055 (SSR) NO	7-055 USE OF SOURCES FOR MANUAL BRACHYTHERAPY: A licensee must use only brachytherapy sources for therapeutic medical uses: 7-055.01 As approved in the Sealed Source and Device Registry; or 7-055.02 For research in accordance with an active Investigational Device Exemption (IDE) application that has been accepted by the FDA, provided the requirements of 180 NAC 7-021.01 are met.
§35.404	Surveys after source implant and		H&S, except paragr	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) and (b) were designated H&S. These provisions assist in establishing a minimum level of safety for the	7-056 (NRC) NO	7-056 SURVEYS AFTER SOURCE IMPLANT AND REMOVAL 7-056.01 Immediately after implanting sources in a patient or a human research subject, the licensee must make a survey to locate and account for all

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	removal		aph (c) is D.	medical use of agreement materials by reducing the likelihood of a medical event, and overexposures in excess of Part 20 limits. The essential objective of this requirement is to assure that patient and area surveys are performed immediately after removal of sources from the patient or human research subject. The H&S two or fewer failure test scenario: If a licensee does not perform a patient radiation survey after implanting sources, sources could be misplaced and the public and workers could be exposed to radiation in excess of basic radiation protection limits in Part 20 and a medical event could occur.		sources that have not been implanted. 7-056.02 Immediately after removing the last temporary implant source from a patient or a human research subject, the licensee must make a survey of the patient or the human research subject with a radiation detection survey instrument to confirm that all sources have been removed. 7-056.03 A licensee must retain a record of the surveys in accordance with 180 NAC 7-102.
§35.406	Brachytherapy sources accountability		H&S, except paragraph (c) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) and (b) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a lost source, medical event, public and worker overexposure. The essential objective of this requirement is to assure the accountability of sources after use. The H&S two or fewer failure test scenario: If a licensee does not maintain source accountability a	7-057 (NRC) NO	7-057 BRACHYTHERAPY SOURCES INVENTORY 7-057.01 A licensee must maintain accountability at all times for all brachytherapy sources in storage or use. 7-057.02 Promptly after removing sources from a patient or a human research subject, a licensee must return brachytherapy sources to a secure storage area. 7-057.03 A licensee must maintain a record of the brachytherapy source accountability in accordance with 180 NAC 7-103.
§35.410	Safety instruction		H&S, except paragraph (b) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraph (a) was designated a H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of exposure to members of the public. The essential objective of this requirement is to assure that personnel caring for a patient receive proper radiation safety instruction. The H&S two or fewer failure test scenario: If the personnel caring for patients are not properly instructed, then the personnel could be overexposed and persons visiting the patient could be overexposed.	7-058 (NRC) NO	7-058 SAFETY INSTRUCTION: In addition to the requirements of 180 NAC 10-003, 7-058.01 The licensee must provide radiation safety instruction, initially and at least annually, to personnel caring for a patient or human research subjects that are undergoing implant therapy and can not be released under 180 NAC 7-037. The instruction must be commensurated with the duties of the personnel and will include the following: 1. Size and appearance of the brachytherapy sources; 2. Safe handling and shielding instructions; 3. Patient or human research subject control; 4. Visitor control, including both: a. Routine visitation of hospitalized individual in accordance with 180 NAC 4-013.01 and b. Visitation authorized in accordance with 180

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						NAC 4-013.01; and 5. Notification of the Radiation Safety Officer or his/her designee, and authorized user if the patient or the human research subject dies or has a medical emergency. The licensee will also notify the Department in accordance with 180 NAC 7-119 if it is possible that any individual could receive exposures in excess of 5 mSv (500 mrem) as a result of the deceased's body. 7-058.02 A licensee must retain a record of individuals receiving instruction required by 180 NAC 7-101.
§35.415	Safety precautions		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, these provisions were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of worker and public exposure. The essential objective of these requirements is to limit patient contact with members of the public, to assure the availability of emergency response equipment and to assure that proper notifications are made if the patient dies. The H&S two or fewer failure test scenario: If the safety precautions are not taken, then hospital personnel could be overexposed and persons visiting the patient could be overexposed. In addition, if the proper persons are not notified if a patient dies or, if a medical emergency occurs, other hospital personnel could be overexposed and material could be released into the public domain, and public overexposures could occur.	7-059 (SSR) NO	7-059 SAFETY PRECAUTIONS FOR PATIENTS OR HUMAN RESEARCH SUBJECTS RECEIVING BRACHYTHERAPY 7-059.01 For each patient or human research subject that is receiving brachytherapy that cannot be released pursuant to 180 NAC 7-037 a licensee must: 1. Not quarter the patient or the human research subject in the same room as an individual who is not receiving radiation therapy; 2. Visibly post the patient's or human research subject's door with a "Caution: Radioactive Materials" sign; and note on the door or the patient's or human research subject's chart where and how long visitors may stay in the patient's or human research subject's room. 7-059.02 A licensee must have radiological emergency response equipment available near each treatment room to respond to a source that inadvertently becomes: 4. Dislodged from the patient; and 5. Lodged within the patient following removal of the source applicators. 7-059.03 The Radiation Safety Officer, or his/her designee, and authorized user must be notified immediately if the hospitalized patient or human research subject has a medical emergency or dies.
§35.432	Calibration measurements of		H&S, except	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, these provisions were designated H&S. These provisions assist in	7-060 (SSR) NO	7-060 CALIBRATION MEASUREMENTS OF BRACHYTHERAPY SOURCES 7-060.01 Prior to the first medical use of a brachytherapy source on or after [the effective date of

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	brachytherapy sources		paragraph (d) is D.	establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that full calibration measurements on sources are performed before the first use of the source or source/applicator configuration. The H&S two or fewer failure test scenario: If a licensee does not perform full calibration measurements of brachytherapy sources, a medical event could occur.		these regulations], a licensee must have performed the following: 1. Determine the source output or activity using a dosimetry system that meets the requirements of 180 NAC 7-072.01; 2. Determine source positioning accuracy within applicators; and 3. Use published protocols currently accepted by nationally recognized bodies to meet the requirements of 180 NAC 7-060.01, item 1. and 2. 7-060.02 A licensee may use measurements provided by the source manufacturer or by a calibration laboratory accredited by the American Association of Physicists in Medicine that are made in accordance with 180 NAC 7-060.01. 7-060.03 A licensee must mathematically correct the outputs or activities determined in 180 NAC 7-060.01 for physical decay at intervals consistent with one percent physical decay. 7-060.04 An authorized medical physicist must perform or review the calculation measurements made pursuant to 180 NAC 7-060.01, 7-060.02, or 7-060.03. 7-060.05 Only an authorized medical physicist must calculate the activity of each strontium-90 source that is used to determine the treatment times for ophthalmic treatments. The decay must be based on the activity determined in accordance with 180 NAC 7-060.01, 7-060.02, or 7-060.03. 7-060.06 A licensee must retain a record of each calibration in accordance with 180 NAC 7-104. 7-060.07 A licensee must retain a record of decay calculations required by 180 NAC 7-060.5 in accordance with 180 NAC 7-105.
§35.433	Decay of strontium-90 sources for ophthalmic treatments		H&S-(a), except paragraph (b) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, these provisions were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that the source is properly decayed to identify the correct source strength. The H&S two or fewer failure test scenario: If a	NA	

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				licensee does not properly decay the source and it's strength is not accurately determined, a medical event could occur.		
§35.457	Therapy-related computer systems		H&S	Based upon Handbook 5.9 Part paragraphs (a) and (b) was designated II, "Categorization Criteria," Section E, this provision was designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood a medical event. The essential objective of this requirement is to assure that therapy related computer systems are functioning properly and testing is done in accordance with national protocols. The H&S two or fewer failure test scenario: If a licensee does not verify that computerized treatment planning systems are operating properly, and a medical event occurs.	7-061 (NRC) NO	7-061 THERAPY-RELATED COMPUTER SYSTEMS: The licensee must perform acceptance testing on the treatment planning system of therapy-related computer systems in accordance with published protocols accepted by nationally recognized bodies. At a minimum, the acceptance testing must include, as applicable, verification of: 7-061.01 The source-specific input parameters required by the dose calculation algorithm; 7-061.02 The accuracy of dose, dwell time, and treatment time calculations at representative points; 7-061.03 The accuracy of isodose plots and graphic displays; and 7-061.04 The accuracy of the software used to determine sealed source positions from radiographic images.
§35.490	Training for use of manual brachytherapy sources		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-063 NO	7-063 TRAINING FOR USE OF MANUAL BRACHYTHERAPY SOURCES: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of a manual brachytherapy source for the uses authorized under 180 NAC 7-055 to be a physician who: 7-063.01 Is certified by a medical specialty board whose certification has been recognized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission (NRC), and who meets to requirements of 180 NAC 7-063.03. (The names of board certifications which have been recognized an Agreement State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to: 1. Successfully complete a minimum of three years of residency training in a radiation oncology program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and 2. Pass an examination, administered by

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						diplomats of the specialty board, that tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use manual brachytherapy; or 7-063.02 The physician: 1. Has completed a structured educational program in basic radionuclide handling techniques applicable to the use of manual brachytherapy sources that includes: a. 200 hours of classroom and laboratory training in the following areas: 1. Radiation physics and instrumentation; 2. Radiation protection; 3. Mathematics pertaining to the use and measurement of radioactivity; and 4. Radiation biology; and b. 500 hours of work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements at a medical institution, involving: 1. Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys; 2. Checking survey meters for proper operation; 3. Preparing, implanting, and removing brachytherapy sources; 4. Maintaining running inventories of material on hand; 5. Using administrative controls to prevent a misadministration involving the use of radioactive material; 6. Using emergency procedures to control radioactive material; and 2. Has completed three years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements in 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements, as a part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdocutoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the

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						supervised work experience required by 180 NAC 7-063.02, item 1.b.; and 6. Meet the requirements of 180 NAC 7-063.03. 7-063.03 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-063, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-063.01, item 1 or 7-063.02, item 2 and has achieved a level of competency sufficient to independently function as an authorized user of manual brachytherapy sources for the medical uses authorized under 180 NAC 7-055.
§35.491	Training for ophthalmic use of strontium-90		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-064 (NRC) NO Except Missing Podiatrist and Dentist but will add)	7-064 TRAINING FOR OPHTHALMIC USE OF STRONTIUM-90: Except as provided in 180 NAC 7-026, the licensee must require the authorized user of strontium-90 for ophthalmic uses authorized under 180 NAC 7-055 to be a physician who: 7-064.01 Is an authorized user under 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements; or 7-064.02 The physician: 1. Has completed 24 hours of classroom and laboratory training applicable to the medical use of strontium-90 for ophthalmic radiotherapy. The training must include: a. Radiation physics and instrumentation; b. Radiation protection; c. Mathematics pertaining to the use and measurement of radioactivity; and d. Radiation biology; and 2. Supervised clinical training in ophthalmic radiotherapy under the supervision of an authorized user at a medical institution, clinic, or private practice that includes the use of strontium-90 for the ophthalmic treatment of five individuals. This supervised clinical training must involve: a. Examination of each individual to be treated; b. Calculation of the dose to be administered; c. Administration of the dose; and d. Follow up and review of each individual's case history; and 3. Has obtained written attestation, signed by a preceptor authorized user who meets the

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						requirements in 180 NAC 7-063 or 7-064 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-064.01 and 7-064.02 and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use.
§35.500	Use of sealed sources for diagnosis		[C]	This section is a bracketed Category C, because it is already required by 10 CFR § 30.32 (g) and § 32.74. Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(f), 10 CFR § 30.32 (g) was designated a Category C. This section requires the use of sealed sources in the SS&D Registry by all specific licensees. In addition, 10 CFR § 32.74, "Manufacture and distribution of sources or devices containing byproduct material for medical use," is designated a Category B. This designation was based upon Handbook 5.9 Part II, "Categorization Criteria," Section (B), paragraph (b), requirements for approval of products that are distributed nationwide. If an Agreement State has adopted 10 CFR § 30.32 (g) and 10 CFR § 32.74, it is not necessary to adopt this section since the requirements are covered by these provisions.	7-065 (SSR) NO	7-065 USE OF SEALED SOURCES FOR DIAGNOSIS: A licensee must use only sealed sources for diagnostic medical uses: 7-065.01 Approved in the U.S. Nuclear Regulatory Commission's Sealed Source and Device Registry; and 7-065.02 Handled in accordance with the manufacturer's radiation safety instructions.
§35.590	Training for use of sealed sources for diagnosis		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-066 (NRC) NO Except Missing Podiatrist and Dentist but will add)	7-066 TRAINING FOR USE OF SEALED SOURCES FOR DIAGNOSIS: Except as provided in 180 NAC 7-026, the licensee must require the authorized user of a diagnostic sealed source for use in a device authorized under 180 NAC 7-065 to be a physician who: 7-066.01 Is certified by a specialty board whose certification includes all of the requirements in 180 NAC 7-066.02 and 7-066.03 whose certification has been recognized by, an Agreement State or the U.S. Nuclear Regulatory Commission (NRC). (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's web page.); or 7-066.02 The physican: 1. Has completed eight hours of classroom and laboratory training in basic radionuclide handling

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						techniques specifically applicable to the use of the device. The training must include: a. Radiation physics and instrumentation; b. Radiation protection; c. Mathematics pertaining to the use and measurement of radioactivity; and d. Radiation biology; and 7-066.03 Has completed training in the use of the device for the uses requested.
§35.600	Use of a sealed sources in a remote afterloader unit, teletherapy unit, or gamma stereotactic radiosurgery unit		[C]	This section is a bracketed Category C, because it is already required by 10 CFR § 30.32 (g) and § 32.74. Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(f), 10 CFR § 30.32 (g) was designated a Category C. This section requires the use of sealed sources in the SS&D Registry by all specific licensees. In addition, 10 CFR § 32.74, "Manufacture and distribution of sources or devices containing byproduct material for medical use," is designated a Category B. This designation was based upon Handbook 5.9 Part II, "Categorization Criteria," Section (B), paragraph (b), requirements for approval of products that are distributed nationwide. If an Agreement State has adopted 10 CFR § 30.32 (g) and 10 CFR § 32.74, it is not necessary to adopt this section since the requirements are covered by these provisions.	7-067 (NRC) NO	7-067 USE OF A SEALED SOURCE IN A REMOTE AFTERLOADER UNITS, TELETHERAPY UNITS, A licensee must use sealed sources in photon emitting remote afterloader units, or gamma stereotactic radiosurgery units for therapeutic medical uses: 7-067.01 As approved in the U.S. Nuclear Regulatory Commission Sealed Source and Device Registry; or 7-067.02 For research in accordance with an active Investigational Device Exemption (IDE) application that has been accepted by the FDA provided the requirements of 180 NAC 7-021.01 are met.
§35.604	Surveys of patients and human research subjects treated with a remote afterloader unit		H&S, except paragraph (b) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraph (a) was designated H&S. This provision assists in establishing a minimum level of safety for the medical use of agreement materials on a nationwide basis by reducing the likelihood of a lost source, medical event, and public/worker overexposure. The essential objective of this requirement is to assure that a survey is conducted on the patient and the device after source(s) removal from the patient or human research subject. The H&S two or fewer failure test scenario: If a licensee does not perform a patient radiation survey after implanting sources, sources could be	7-068 (NRC) NO	7-068 SURVEYS OF PATIENTS AND HUMAN RESEARCH SUBJECTS TREATED WITH A REMOTE AFTERLOADER UNIT 7-068.01 Before releasing a patient or a human research subject from licensee control, a licensee must make a survey of the patient or the human research subject and the remote afterloader unit with a portable radiation detection survey instrument to confirm that the source(s) has been removed from the patient or human research subject and returned to the shielded position. 7-068.02 A licensee must retain a record of surveys in accordance with 180 NAC 7-102.

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				misplaced and the public and workers could be exposed to radiation in excess of radiation protection limits in Parts 20 and 35 and a medical event could occur.		
§35.605	Installation, maintenance, adjustment and repair		H&S, except paragraph (d) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, these provisions were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event and public and worker overexposure. The essential objective of these requirements is to assure that installation, maintenance, and adjustments are performed by a person specifically licensed by the Commission or an Agreement State. The H&S two or fewer failure test scenario: If a licensee does not use a person who is specifically licensed to install and service devices and an equipment failure occurs, the person servicing the device could become overexposed. In addition, the public and workers could receive exposures in excess of the radiation protection limits in Part 20, if the device is not serviced properly.	7-069 (NRC) NO	7-069 INSTALLATION, MAINTENANCE, ADJUSTMENT, AND REPAIR 7-069.01 Only a person specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State may install, maintain, adjust, or repair a remote afterloader unit, teletherapy unit, or gamma stereotactic radiosurgery unit that involves work on the source(s) shielding, the source(s) driving unit, or other electronic or mechanical component that could expose the source(s), reduce the shielding around the source(s), or compromise the radiation safety of the unit or the source(s). 7-069.02 Except for low dose-rate remote afterloader units, only a person specifically licensed by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State may install, replace, relocate, or remove a sealed source or source contained in other remote afterloader units, teletherapy units, or gamma stereotactic radiosurgery units. 7-069.03 For a low dose-rate remote afterloader unit, only a person specifically licensed by the Department, the U.S. Nuclear Regulatory Commission, an Agreement State or an authorized medical physicist may install, replace, relocate, or remove a sealed source(s) contained in the unit. 7-069.04 A licensee must retain a record of the installation, maintenance, adjustment, and repair of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units in accordance with 180 NAC 7-106.
§35.610	Safety procedures and instructions for remote afterloader units, teletherapy units, and		H&S, except paragraphs (f) & (g) are D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, these provisions were designated H&S. These provisions assist in establishing a minimum level of safety for agreement materials by reducing the likelihood of a medical event and public and worker overexposure. The essential objective of these requirements is to assure the establishment and use of safety procedures and instructions for remote	7-070 (NRC) NO	7-070 SAFETY PROCEDURES AND INSTRUCTIONS FOR REMOTE AFTERLOADER UNITS, TELETHERAPHY UNITS, AND GAMMA STEREOSTACTIC RADIOSURGERY UNITS 7-070.01 A licensee must: 1. Secure the unit, the console, the console keys, and the treatment room when not in use or unattended; 2. Permit only individuals approved by the authorized user, Radiation Safety Officer, or

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	gamma stereotactic radiosurgery units			afterloaders, teletherapy units and gamma stereotactic radiosurgery units. The H&S two or fewer failure test scenario: If a licensee does not develop and implement safety procedures and instructions, and radioactive material is mishandled, workers and the public could receive radiation exposures in excess of the radiation protection limits in Part 20 and a medical event could occur.		authorized medical physicist to be present in the treatment room during treatment with the source(s); 3. Prevent dual operation of more than one radiation producing device in a treatment room if applicable; and 4. Develop, implement, and maintain written procedures for responding to an abnormal situation when the operator is unable to place the source(s) in the shielded position, or remove the patient or human research subject from the radiation field with controls from outside the treatment room. These procedures must include: a. Instructions for responding to equipment failures and the names of the individuals responsible for implementing corrective actions; b. The process for restricting access to and posting of the treatment area to minimize the risk of inadvertent exposure; and c. The names and telephone numbers of the authorized users, the authorized medical physicist, and the Radiation Safety Officer to be contacted if the unit or console operates abnormally. 7-070.02 A copy of the procedures required by 180 NAC 7-070.01, item 4 must be physically located at the unit console. 7-070.03 A licensee must post instructions at the unit console to inform the operator of: 1. The location of the procedures required by 180 NAC 7-70.01, item 4; and 2. The names and telephone numbers of the authorized users, the authorized medical physicist, and the Radiation Safety Officer to be contacted if the unit or console operates abnormally. 7-070.04 A licensee must provide instruction, initially and at least annually, to all individuals who operate the unit, as appropriate to the individual's assigned duties, in: 1. The procedures identified in 180 NAC 7-070.01, item 4; and 2. The operating procedures for the unit. 7-070.05 A licensee must ensure that operators, authorized medical physicists, and authorized users participate in drills of the emergency procedures, initially and at least annually. 7-070.06 A licensee must retain a record of individuals receiving instruction required by 180 NAC 7-070.04, in accordance with 180 NAC 7-101.

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§35.615	Safety precautions for remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units		H&S	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, these provisions were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event, worker and public exposure. The essential objective of these requirements is to assure that controls are implemented, to require the physical presence of the authorized user and/or authorized medical physicist during the use of the device, and to assure the accessibility of emergency equipment. The H&S two or fewer failure test scenario: If a licensee does not control access to therapy equipment and treatment rooms, and an equipment failure occurs, the public and workers could receive exposures in excess of the radiation protection limits in Part 20 and a medical event could occur.	7-071 (SSR) NO	7-071 SAFETY PRECAUTIONS FOR REMOTE AFTERLOADER UNITS, TELETHERAPY UNITS, AND GAMMA STEREOTACTIC RADIOSURGERY UNITS 7-071.01 A licensee must control access to the treatment room by a door at each entrance. 7-071.02 A licensee must equip each entrance to the treatment room with an electrical interlock system that will: 1. Prevent the operator from initiating the treatment cycle unless each treatment room entrance door is closed; 2. Cause the source(s) to be shielded promptly when an entrance door is opened; and 3. Prevent the source(s) from being exposed following an interlock interruption until all treatment room entrance doors are closed and the source(s) on-off control is reset at the console. 7-071.03 A licensee must require any individual entering the treatment room to assure, through the use of appropriate radiation monitors, that radiation levels have returned to ambient levels. 7-071.04 Except for low-dose remote afterloader units, a licensee will construct or equip each treatment room with viewing and intercom systems to permit continuous observation of the patient or the human research subject from the treatment console during irradiation. 7-071.05 For licensed activities where sources are placed within the patient's or human research subject's body, a licensee shall only conduct treatments which allow for expeditious removal of a decoupled or jammed source. 7-071.06 In addition to the requirements specified in 180 NAC 7-071.01 through 7-071.05, a licensee must: 1. For low dose-rate, medium dose-rate and pulsed dose-rate remote afterloader units, require: a. An authorized medical physicist and either an authorized user or a physician, under the supervision of an authorized user, who has been trained in the operation and emergency response for the unit to be physically present during the initiation of all patient treatments involving the unit; and

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						b. An authorized medical physicist and either an authorized user or an individual, under the supervision of an authorized user, who has been trained to remove the source applicator(s) in the event of an emergency involving the unit, to be immediately available during continuation of all patient treatments involving the unit. 2. For high dose-rate remote afterloader units, require: a. An authorized user and an authorized medical physicist to be physically present during the initiation of all patient treatments involving the unit; and b. An authorized medical physicist and either an authorized user or a physician, under the supervision of an authorized user, who has been trained in the operation and emergency response for the unit, to be physically present during continuation of all patient treatments involving the unit. 3. For gamma stereotactic radiosurgery units, require an authorized user and an authorized medical physicist to be physically present throughout all patient treatments involving the unit. 4. Notify the Radiation Safety Officer, or his/her designee, and an authorized user as soon as possible if the patient or human research subject has a medical emergency and immediately if the patient dies. 7-071.07 A licensee must have applicable radiological emergency response equipment available near each treatment room to respond to a source that inadvertently: 1. Remains in the unshielded position; or 2. Lodges within the patient following completion of the treatment.
§35.630	Dosimetry equipment		H&S, except paragraph (c) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) and (b) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure the use of a dosimetry system that has been calibrated in accordance with national standards.	7-072 (NRC) NO	7-072 DOSIMETRY EQUIPMENT 7-072.01 Except for low dose-rate remote afterloader sources where the source output or activity is determined by the manufacturer, a licensee must have a calibrated dosimetry system available for use. To satisfy this requirement, one of the following conditions must be met. 1. The system must have been calibrated using a system or source traceable to the National Institute of Science and Technology (NIST) and published

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				The H&S two or fewer failure test scenario: If a licensee does not calibrate and check dosimetry equipment in accordance with industry standards, and an equipment failure occurs, the public and workers could be exposed to radiation in excess of radiation limits in Part 20 and a medical event could occur.		protocols accepted by nationally recognized bodies; or by a calibration laboratory accredited by the American Association of Physicists in Medicine (AAPM). The calibration must have been performed within the previous two years and after any servicing that may have affected system calibration; or 2. The system must have been calibrated within the previous four years. Within 18 to 30 months after that calibration, the system must have been intercompared with another dosimetry system that was calibrated within the past 24 months by NIST or by a calibration laboratory accredited by the AAPM. The results of the intercomparison must have indicated that the calibration factor of the licensee's system had not changed by more than 2%. The licensee may not use the intercomparison result to change the calibration factor. When intercomparing dosimetry systems to be used for calibrating sealed sources for therapeutic units, the licensee must use a comparable unit with beam attenuators or collimators, as applicable, and sources of the same radionuclide as the source used at the licensee's facility. 7-072.02 The licensee must have available for use a dosimetry system for spot-check output measurements, if applicable. To satisfy this requirement, the system may be compared with a system that has been calibrated in accordance with 180 NAC 7-072.01. This comparison must have been performed within the previous year and after each servicing that may have affected system calibration. The spot-check system may be the same system used to meet the requirement in 180 NAC 7-072.01. 7-072.03 The licensee must retain a record of each calibration, intercomparison, and comparison in accordance with 180 NAC 7-107.
§35.632	Full calibration measurements on teletherapy units		H&S, except paragraph (g) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) through (f) were designated H&S. These provisions assist in establishing a minimum level of safety basis by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that the medical device is performing properly. The H&S two or fewer failure test scenario: If a licensee does not perform full calibration	7-073 (NRC) NO	7-073 FULL CALIBRATION MEASUREMENTS ON TELETHERAPY UNITS 7-073.01 A licensee authorized to use a teletherapy unit for medical use must perform full calibration measurements on each teletherapy unit: 1. Before the first medical use of the unit; and 2. Before medical use under the following conditions: a. Whenever spot-check measurements indicate that the output differs by

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				measurements on teletherapy units in accordance with industry standards, and an equipment failure occurs, the public and workers could be exposed to radiation in excess of the radiation protection limits in Part 20 and a medical event could occur.		more than 5% from the output obtained at the last full calibration corrected mathematically for radioactive decay; b. Following replacement of the source or following reinstallation of the teletherapy unit in a new location; and c. Following any repair of the teletherapy unit that includes removal of the source or major repair of the components associated with the source exposure assembly; and 3. At intervals not exceeding one year. 7-073.02 To satisfy the requirement of 180 NAC 7-073.01, full calibration measurements must include determination of: 1. The output within +/-3% for the range of field sizes and for the distance or range of distances used for medical use; The coincidence of the radiation field and the field indicated by the light beam localizing device; The uniformity of the radiation field and its dependence on the orientation of the useful beam; 4. Timer accuracy, and linearity over the range of use; 5. "On-off" error; and 6. The accuracy of all distance measuring and localization devices in medical use. 7-073.03 A licensee must use the dosimetry system described in 180 NAC 7-072.01 to measure the output for one set of exposure conditions. The remaining radiation measurements required by 7-073.02, item 1. may then be made using a dosimetry system that indicates relative dose rates. 7-073.04 A licensee must make full calibration measurements required by 180 NAC 7-073.01 in accordance with published protocols accepted by nationally recognized bodies. 7-073.05 A licensee must mathematically correct the outputs determined in 180 NAC 7-073.02, item 1, for physical decay for intervals not exceeding one month for cobalt-60, six months for cesium-137, or at intervals consistent with 1% decay for all other nuclides. 7-073.06 Full calibration measurements required by 180 NAC 7-073.01 and physical decay corrections required by 180 NAC 7-073.05 must be performed by

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						a authorized medical physicist. 7-073.07 A licensee must maintain a record of each calibration in accordance with 180 NAC 7-108.
§35.633	Full calibration measurements on remote afterloader units		H&S, except paragraph (i) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) through (f) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that the medical device is performing properly. The H&S two or fewer failure test scenario: If a licensee does not perform full calibration measurements on remote afterloaders in accordance with industry standards, and an equipment failure occurs, the public and workers could be exposed to radiation in excess of the radiation protection limits in Part 20 and a medical event could occur.	7-074 (SSR & NRC) NO	7-074 FULL CALIBRATION MEASUREMENTS ON REMOTE AFTERLOADER UNITS 7-074.01 A licensee authorized to use a remote afterloader unit for medical use must perform full calibration measurements on each unit: 1. Before the first medical use of the unit; 2. Before medical use under the following conditions: a. Following replacement of the source or following reinstallation of the unit in a new location outside the facility; and b. Following any repair of the unit that includes removal of the source or major repair of the components associated with the source exposure assembly; and 3. At intervals not exceeding one calendar quarter for high dose-rate, medium dose-rate, and pulsed dose-rate remote afterloader units with sources whose half-life exceeds 75 days; and 4. At intervals not exceeding one year for low dose-rate remote afterloader units. 7-074.02 To satisfy the requirement of 7-074.01, full calibration measurements must include, as applicable, determination of: 1. The output within ± 5%; 2. Source positioning accuracy to within ±1 millimeter; 3. Source retraction with backup battery upon power failure; 4. Length of the source transfer tubes; 5. Timer accuracy and linearity over the typical range of use; 6. Length of the applicators; and 7. Function of the source transfer tubes, applicators, and transfer tube-applicator interfaces. 7-074.03 In addition to the requirements for full calibration for low dose-rate remote afterloader units in 180 NAC 7-074.02, a licensee must perform an autoradiograph of the source(s) to verify inventory and source(s) arrangement at intervals not exceeding one calendar quarter. 7-074.04 A licensee must use the dosimetry system

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						described in 180 NAC 7-072.01 to measure the output. 7-074.05 A licensee must make full calibration measurements required by 180 NAC 7-074.01 in accordance with published protocols accepted by nationally recognized bodies. 7-074.06 For low dose-rate remote afterloader units, a licensee may use measurements provided by the source manufacturer that are made in accordance with180 NAC 7-074.01 through 7-074.05. 7-074.07 A licensee must mathematically correct the outputs determined in 180 NAC 7-074.02, item 1 for physical decay at intervals consistent with one percent physical decay. 7-074.08 Full calibration measurements required by 180 NAC 7-074.01 and physical decay corrections required by 180 NAC 7-074.07 must be performed by the authorized medical physicist. 7-074.09 A licensee must retain a record of each calibration in accordance with 180 NAC 7-108.
§35.635	Full calibration measurements on gamma stereotactic radiosurgery units		H&S, except paragraph (g) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) through (f) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that the medical device is performing properly. The H&S two or fewer failure test scenario: If a licensee does not perform full calibration measurements on gamma stereotactic radiosurgery units in accordance with industry standards, and an equipment failure occurs, the public and workers could be exposed to radiation in excess of the radiation protection limits in Part 20 and a medical event could occur.	7-075 (SSR) NO	7-075 FULL CALIBRATION MEASUREMENTS ON GAMMA STEREOTACTIC RADIOSURGERY UNITS 7-075.01 A licensee authorized to use a gamma stereotactic radiosurgery unit for medical use must perform full calibration measurements on each unit: 1. Before the first medical use of the unit; 2. Before medical use under the following conditions: a. Whenever spot-check measurements indicate that the output differs by +/- 5% from the output obtained at the last full calibration corrected mathematically for radioactive decay; b. Following replacement of the sources or following reinstallation of the gamma stereotactic radiosurgery unit in a new location; and c. Following any repair of the gamma stereotactic radiosurgery unit that includes removal of the sources or major repair of the components associated with the source assembly; and 3. At intervals not exceeding one year, with the exception that relative helmet factors need only be determined before the first medical use of a helmet and following any damage to a helmet. 7-075.02 To satisfy the requirement of 180 NAC 7-075.01, full calibration measurements must include

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						determination of: 1. The output within ±3%; 2. Relative helmet factors; (to verify that the helmet material provides the required shielding to the patient); 3. Isocenter coincidence; (to confirm the centering accuracy of the radiation beam relative to the alignment helmet openings); 4. Timer accuracy and linearity over the range of use; 5. On-off error; 6. Trunnion centricity; (to determine the rotational center of the source relative to the alignment helmet openings); 7. Treatment table retraction mechanism, using backup battery power or hydraulic backups with the unit off; 8. Helmet microswitches; (to determine if the switches terminate the radiation beam when); 9. Emergency timing circuits; and 10. Stereotactic frames and localizing devices (trunnions). 7-075.03 A licensee must use the dosimetry system described in 180 NAC 7-072.01 to measure the output for one set of exposure conditions. The remaining radiation measurements required in paragraph 180 NAC 7-075.02, item 1 may be made using a dosimetry system that indicates relative dose rates. 7-075.04 A licensee must make full calibration measurements required by 180 NAC 7-075.01 in accordance with published protocols accepted by nationally recognized bodies. 7-075.05 A licensee must mathematically correct the outputs determined in 180 NAC 7-075.02, item 1 at intervals not exceeding one month for cobalt-60 and at intervals consistent with 1% physical decay for all other radionuclides. 7-075.06 Full calibration measurements required by 180 NAC 7-075.01 and physical decay corrections required by 180 NAC 7-075.05 must be performed by the authorized medical physicist. 7-075.07 A licensee must retain a record of each calibration in accordance with 180 NAC 7-108.
					7-076 (NRC)	7-076 PERIODIC SPOT-CHECKS FOR

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§35.642	Periodic spot-checks for teletherapy units		H&S, except paragraph (f) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) through (e) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement material by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that the medical device is performing properly. The H&S two or fewer failure test scenario: If a licensee does not perform periodic spot checks of teletherapy units, and an equipment failure occurs, the public and workers could receive exposures in excess of radiation protection limits in Part 20 and a medical event could occur.	NO	TELETHERAPY UNITS 7-076.01 A licensee authorized to use teletherapy units for medical use must perform output spot-checks on each teletherapy unit once in each calendar month that include determination of: 1. Timer accuracy, and timer linearity over the range of use; 2. On-off error; 3. The coincidence of the radiation field and the field indicated by the light beam localizing device; 4. The accuracy of all distance measuring and localization devices used for medical use; 5. The output for one typical set of operating conditions measured with the dosimetry system described in 180 NAC 7-072.02; and 6. The difference between the measurement made in 180 NAC 7-076.01, item 5 and the anticipated output, expressed as a percentage of the anticipated output (i.e., the value obtained at last full calibration corrected mathematically for physical decay). 7-076.02 A licensee must perform measurements required by 180 NAC 7-076.01 in accordance with written procedures established by the authorized medical physicist. The authorized medical physicist need not actually perform the spot-check measurements. 7-076.03 A licensee must have the authorized medical physicist review and sign the results of each spot-check within 15 days. The authorized medical physicist must notify the licensee within 10 days in writing of the results of each spot-check. 7-076.04 A licensee authorized to use a teletherapy unit for medical use must perform safety spot-checks of each teletherapy facility once in each calendar month and after each source installation to assure proper operation of: 1. Electrical interlocks at each teletherapy room entrance; 2. Electrical or mechanical stops installed for the purpose of limiting use of the primary beam of radiation (restriction of source housing angulation or elevation, carriage or stand travel and operation of the beam on-off mechanism); 3. Source exposure indicator lights on the teletherapy unit, on the control console, and in the

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						facility; 4. Viewing and intercom systems; 5. Treatment room doors from inside and outside the treatment room; and 6. Electrically assisted treatment room doors with the teletherapy unit electrical power turned off. 7-076.05 If the results of the checks required in 180 NAC 7-076.02 and 7-076.04 indicate the malfunction of any system, a licensee must lock the control console in the off position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system. 7-076.06 A licensee must retain a record of each spot-check required by 180 NAC 7-076.01 and 7-076.04 and in accordance with 180 NAC 7-109.
§35.643	Periodic spot-checks for remote afterloader units		H&S, except paragraph (f) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) through (e) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event. The essential objective of this requirement is to assure that the medical device is performing properly. The H&S two or fewer failure test scenario: If a licensee does not perform periodic spot checks of high dose-rate and pulsed dose-rate remote afterloaders, and an equipment failure occurs, the public and workers could receive exposures in excess of radiation protection limits in Part 20 and a medical event could occur.	7-077 (SSR) NO	7-077 PERIODIC SPOT-CHECKS FOR REMOTE AFTERLOADER UNITS 7-077.01 A licensee authorized to use a remote afterloader unit for medical use must perform spot-checks of each remote afterloader facility and on each unit: 1. At the beginning of each day of use of a high dose-rate, medium dose-rate, or pulsed dose-rate remote afterloader unit; 2. Prior to each patient treatment with a low dose-rate remote afterloader unit; and 3. After each source installation. 7-077.02 The licensee must have the authorized medical physicist establish written procedures for performing the spot-checks required in 180 NAC 7-077.01. The authorized medical physicist need not actually perform the spot-check measurements. 7-077.03 A licensee must have the authorized medical physicist review and sign the results of each spot-check within 15 days. The authorized medical physicist must notify the licensee within 10 days in writing of the results of each spot-check. 7-077.04 To satisfy the requirements of 180 NAC 7-077.01, spot-checks must, at a minimum, assure proper operation of: 1. Electrical interlocks at each remote afterloader unit room entrance; 2. Source exposure indicator lights on the remote afterloader unit, on the control console, and in the facility;

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						3. Viewing and intercom systems in each high dose-rate, medium dose-rate, and pulsed dose-rate remote afterloader facility; 4. Radiological emergency response equipment; 5. Radiation monitors used to indicate the source position; 6. Timer accuracy; 7. Clock (date and time) in the unit's computer; and 8. Decayed source(s) activity in the unit's computer. 7-077.05 If the results of the checks required in 180 NAC 7-077.04 indicate the malfunction of any system, a licensee must lock the control console in the off position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system. 7-077.06 A licensee must retain a record of each check required by 180 NAC 7-077.04 in accordance with 180 NAC 7-110.
§35.645	Periodic spot-checks for gamma stereotactic radiosurgery units		H&S, except paragraph (g) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) through (f) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a medical event by checking instrument performance between maintenance and full calibrations. The essential objective of this requirement is to assure that the medical device is performing properly. The H&S two or fewer failure test scenario: If a licensee does not perform periodic spot checks of gamma stereotactic radiosurgery units, and an equipment failure occurs, then the public and workers could receive exposures in excess of radiation protection limits in Part 20 and a medical event could occur.	7-078 (SSR) NO	7-078 PERIODIC SPOT-CHECKS FOR GAMMA STEREOTACTIC RADIOSURGERY UNITS 7-078.01 A licensee authorized to use a gamma stereotactic radiosurgery unit for medical use must perform spot-checks of each gamma stereotactic radiosurgery facility and on each unit: 1. Monthly; 2. Before the first use of the unit on a given day; and 3. After each source installation. 7-078.02 The licensee must have the authorized medical physicist: 1. Establish written procedures for performing the spot-checks required in 180 NAC 7-078.01; and 2. Review and sign the results of each spot-check required by 180 NAC 7-078.01 within 15 days of the check. The authorized medical physicist need not actually perform the spot-check measurements. The authorized medical physicist must notify the licensee within 10 days in writing of the results of the spot check. 7-078.03 To satisfy the requirements of 180 NAC 7-078.01, item 1, spot-checks must, at a minimum: 1. Assure proper operation of:

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a. Treatment table retraction mechanism, using backup battery power or hydraulic backups with the unit off;
b. Helmet microswitches;
c. Emergency timing circuits; and
d. Stereotactic frames and localizing devices (trunnions).
2. Determine:
a. The output for one typical set of operating conditions measured with the dosimetry system described in 180 NAC 7-072.02;
b, The difference between the measurement made in 180 NAC 7-078.03, item b. and the anticipated output, expressed as a percentage of the anticipated output, (that is, the value obtained at last full calibration corrected mathematically for physical decay);
c. Source output against computer calculation;
d. Timer accuracy and linearity over the range of use;
e. On-off error; and
f. Trunnion centricity.

7-078.04 To satisfy the requirements of 180 NAC 7-078.01, item 2 and 3, spot-checks must assure proper operation of:
1. Electrical interlocks at each gamma stereotactic radiosurgery room entrance;
2. Source exposure indicator lights on the gamma stereotactic radiosurgery unit, on the control console, and in the facility;
3. Viewing and intercom systems;
4. Timer termination;
5. Radiation monitors used to indicate room exposures; and
6. Emergency off buttons.

7-078.05 A licensee must arrange for the repair of any system identified in 180 NAC 7-078.03 that is not operating properly.

7-078.06 If the results of the checks required in 180 NAC 7-078.04 indicate the malfunction of any system, a licensee must lock the control console in the off position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system.

7-078.07 A licensee must retain a record of each check required by 180 NAC 7-078.03 and 7-078.04 and in accordance with 180 NAC 7-111.

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§35.647	Additional technical requirements for mobile remote afterloader units		H&S - paragraphs (a) through (d) for those States which authorize this activity, except (e) is D. D - for other States.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraph (a) was designated a H&S those Agreement States which authorize this service. This provision assists in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of a public exposure. The essential objective of this requirement is to assure that the appropriate radiation surveys are performed and that the proper administrative controls are utilized. The H&S two or fewer failure test scenario: If these requirements are not adopted, a mobile remote afterloader licensee would not be required to check survey instruments and verify sources after use, then sources could be misplaced and the public and workers could be exposed to radiation in excess of radiation protection limits in Part 20 and a medical event could occur.	7-079 (SSR) NO	7-079 ADDITIONAL TECHNICAL REQUIREMENTS FOR MOBILE REMOTE AFTERLOADER UNITS 7-079.01 A licensee providing mobile remote afterloader service must: 1. Check survey instruments for consistent response before medical use at each address of use or on each day of use, whichever is more frequent; and 2. Account for all sources before departure from a client's address of use. 7-079.02 In addition to the periodic spot-checks required by 180 NAC 7-077 a licensee authorized to use mobile afterloaders for medical use will perform checks on each remote afterloader unit before use at each address of use. At a minimum, checks must be made to verify the operation of: 1. Electrical interlocks on treatment area access points; 2. Source exposure indicator lights on the remote afterloader unit, on the control console, and in the facility; 3. Viewing and intercom systems; 4. Applicators, source transfer tubes, and transfer tube-applicator interfaces; 5. Radiation monitors used to indicate room exposures; 6. Source positioning (accuracy); and 7. Radiation monitors used to indicate whether the source has returned to a safe shielded position. 7-079.03 In addition to the requirements for checks 180 NAC 7-079.02, a licensee must ensure overall proper operation of the remote afterloader unit by conducting a simulated cycle of treatment before use at each address of use. 7-079.04 If the results of the checks required in 180 NAC 7-079.02 indicate the malfunction of any system, a licensee must lock the control console in the off position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system. 7-079.05 A licensee must retain a record of each check required by 180 NAC 7-079.02 in accordance with 180 NAC 7-112.
					7-080 (NRC)	7-080 RADIATION SURVEYS

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§35.652	Radiation surveys		H&S, except paragraph (c) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) and (b) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood of public and worker overexposures. The essential objective of this requirement is to assure that exposure to the source(s) in the shielded position does not exceed the levels stated in the SS&D registry. The H&S two or fewer failure test scenario: If a licensee does not perform these radiation surveys, and the radiation safety of the device is compromised, then the public and workers could receive exposures in excess of radiation protection limits in Part 20.	NO	7-080.01 In addition to the survey requirement in 180 NAC 4-021, a person licensed to possess or a use remote afterloader, teletherapy or gamma stereotactic radiosurgery unit must perform surveys of the device and ensure the results of the surveys from the surface of the main source safe, with the sources in the shielded position, do not exceed the maximum and average radiation levels listed in the sealed source and device registry. 7-080.02 The licensee must make the survey required by 180 NAC 7-080.01 upon installation of a new source and following repairs to the source(s) shielding, the source(s) driving unit, or other electronic or mechanical component that could expose the source, reduce the shielding around the source(s), or compromise the radiation safety of the unit or the source(s). 7-080.03 A licensee must retain a record of the radiation surveys required by 180 NAC 7-080.01 in accordance with 180 NAC 7-113.
§35.655	Five-year inspection for teletherapy and gamma stereotactic radiosurgery units		H&S, except paragraph (c) is D.	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section E, paragraphs (a) and (b) were designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood a medical event, and public and worker exposure. The essential objective of this requirement is to assure that the inspection and servicing of teletherapy and gamma stereotactic radiosurgery units during source replacements or at intervals not to exceed 5 years and this inspection and servicing is performed by a person specifically licensed by the Commission or an Agreement State. The H&S two or fewer failure test scenario: If a licensee does not have their teletherapy and gamma stereotactic radiosurgery units inspected and serviced at 5-year intervals and an equipment failure occurs, the public and workers could receive radiation exposures in excess of radiation protection limits in Part 20 and a medical event could occur.	7-081 (NRC) NO	7-081 FIVE-YEAR INSPECTION FOR TELETHERAPY AND GAMMA STEREOTACTIC RADIOSURGERY UNITS 7-081.01 A licensee must have each teletherapy unit and gamma stereotactic radiosurgery unit fully inspected and serviced during source replacement or at intervals not to exceed five years, whichever comes first, to assure proper functioning of the source exposure mechanism. 7-081.02 This inspection and servicing must only be performed by persons specifically licensed to do so by the Department, the U.S. Nuclear Regulatory Commission, or an Agreement State. 7-081.03 A licensee must maintain a record of the inspection and servicing in accordance with 180 NAC 7-114.
					7-082	7-082 THERAPY-RELATED COMPUTER

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§35.657	Therapy-related computer systems		H&S	Based upon Handbook 5.9 Part paragraphs (a) and (b) was designated II, "Categorization Criteria," Section E, this provision was designated H&S. These provisions assist in establishing a minimum level of safety for the medical use of agreement materials by reducing the likelihood a medical event. The essential objective of this requirement is to assure that therapy related computer systems are functioning properly and testing is done in accordance with national protocols. The H&S two or fewer failure test scenario: If a licensee does not verify that computerized treatment planning systems are operating properly, and a medical event occurs.	(NRC) NO	SYSTEMS: The licensee must perform acceptance testing on the treatment planning system in accordance with published protocols accepted by nationally recognized bodies. At a minimum, the acceptance testing must include, as applicable, verification of: 7-082.01 The source-specific input parameters required by the dose calculation algorithm; 7-082.02 The accuracy of dose, dwell time, and treatment time calculations at representative points; 7-082.03 The accuracy of isodose plots and graphic displays; 7-082.04 The accuracy of the software used to determine radioactive source positions from radiographic images; and 7-082.05 The accuracy of electronic transfer of the treatment delivery parameters to the treatment delivery unit from the treatment planning system.
§35.690	Training for use of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units		B	To be included in Category B, an NRC program element is to be one that applies to activities that have direct and significant effects in multiple jurisdictions. The Commission directed the staff to revise the compatibility level assigned to the training and experience requirements for all categories of physician authorized users and other individuals from "C" to "B" to ensure that the training and experience requirements for the medical use of byproduct material are consistent between NRC and Agreement States.	7-084 (NRC) No	7-084 TRAINING FOR USE OF REMOTE AFTERLOADER UNITS, TELETHERAPY UNITS, AND GAMMA STEREOTACTIC RADIOSURGERY UNITS: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of a sealed source for a use authorized under 180 NAC 7-067 to be a physician who: 7-084.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) and who meets the requirements of 180 NAC 7-084.03 and 7-084.04. (The names of board certifications which have been recognized the Department, an Agreement State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's web page.) To be recognized, a specialty board must require all candidates for certification to: 2. Successfully complete a minimum of three years of residency training in a radiation therapy program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and 3. Pass an examination, administered by diplomats of the specialty board, which tests

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						knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use of stereotactic radiosurgery, high and low dose-rate brachytherapy, and external beam therapy; or 7-084.02 The physician: 1. Has completed a structured educational program in basic radionuclide techniques applicable to the use of a sealed source in a therapeutic medical unit that includes: a. 200 hours of classroom and laboratory training in the following areas: (1) Radiation physics and instrumentation; (2) Radiation protection; (3) Mathematics pertaining to the use and measurement of radioactivity; and (4) Radiation biology; and b. 500 hours of work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-084.01, 7-084.02 or equivalent U.S. Nuclear Regulatory or Agreement State requirements at a medical institution, involving: (1) Reviewing full calibration measurements and periodic spot-checks; (2) Preparing treatment plans and calculating treatment doses and times; (3) Using administrative controls to prevent a misadministration involving the use of radioactive material; (4) Implementing emergency procedures to be followed in the event of the abnormal operation of the medical unit or console; (5) Checking and using survey meters; and (6) Selecting the proper dose and how it is to be administered; and 2. Has completed three years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements in 180 NAC 7-084, or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the

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						supervised work experience required by 180 NAC 7-084.02, item 1.b.; and 3. Meets the requirements of 180 NAC 7-084.03 and 7-084.04. 7-084.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-084.01, item 1 or 7-084.02, item 1 and 2, and 7-084.04 has achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-084 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and 7-084.04 Has received training in device operation, safety procedures, and clinical use of the type(s) of use for which authorization is sought. This training requirement may be satisfied by satisfactory completion of a training program provided by the vendor for new users or by receiving training supervised by an authorized user or authorized medical physicist, as appropriate, who is authorized for the type(s) of use for which the individual is seeking authorization.
Subpart J - Retained for 2-year Transition Period	Training & Experience Requirements		No compatibility category changes	A two year "Transition Period" has been established starting on the effective date of the revised Part 35. The current Subpart J addressing training and experience requirements will be accepted along with the revised requirements.	NA	
§35.900	Radiation Safety Officer		D		NA	
§35.910	Training for uptake,		D		NA	

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	dilution, and excretion studies					
§35.920	Training for imaging and localization studies		D		NA	
§35.930	Training for Therapeutic use of unsealed byproduct material		D		NA	
§35.932	Training for treatment of hyperthyroidism		D		NA	
§35.934	Training for treatment of thyroid carcinoma		D		NA	
§35.940	Training for use of brachytherapy sources		D		NA	
§35.941	Training for ophthalmic use of strontium-90		D		NA	
§35.950	Training for use of sealed sources for		D		NA	

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	diagnosis					
§35.960	Training for use of therapeutic medical devices		D		NA	
§35.961	Training for authorized medical physicist		D		NA	
§35.980	Training for an authorized nuclear pharmacist		D		NA	
§35.981	Training for experienced nuclear pharmacist		D		NA	
§35.1000	Other medical uses of byproduct material or radiation from byproduct material		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-085	180 NAC 7-085
§35.2024	Records of authority and responsibilities for radiation protection programs		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-086	180 NAC 7-086
					7-087	180 NAC 7-087

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§35.2026	Records of radiation protection program changes		D	Does not meet any of the criteria of Category A, B, C, or H&S.		
§35.2040	Records of written directives		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-088	180 NAC 7-088
§35.2041	Records for procedures for administrations requiring a written directive		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-089	180 NAC 7-089
§35.2060	Records of calibrations of instruments used to measure the activity of unsealed byproduct materials		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-091	180 NAC 7-091
§35.2061	Records of radiation survey instrument calibrations		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-092	180 NAC 7-092
§35.2063	Records of dosage of unsealed byproduct material for medical use		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-093	Draft 2006
					7-094	180 NAC 7-094

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§35.2067	Records of leak test and inventory of sealed sources and brachytherapy sources		D	Does not meet any of the criteria of Category A, B, C, or H&S.		
§35.2070	Records of surveys for ambient radiation exposure rate		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-095	180 NAC 7-095
§35.2075	Records of the release of individuals containing unsealed byproduct material or implants containing byproduct material		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-096	180 NAC 7-096
§35.2080	Records of mobile medical services		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-097	180 NAC 7-097
§35.2092	Records of decay-in-storage		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-098	180 NAC 7-098
§35.2204	Records of molybdenum-99 concentrations		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-099	180 NAC 7-099
					7-101	180 NAC 7-101

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§35.2310	Records of safety instruction		D	Does not meet any of the criteria of Category A, B, C, or H&S.		
§35.2404	Records of surveys after source implant and removal		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-102	180 NAC 7-101
§35.2406	Records of brachytherapy source accountability		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-103	180 NAC 7-102
§35.2432	Records of calibration measurements of brachytherapy sources		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-0104	180 NAC 7-104
§35.2433	Records of decay of strontium-90 sources for ophthalmic treatments		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-0105	180 NAC 7-105
§35.2605	Records of installation, maintenance, adjustment and repair of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-106	180 NAC 7-106

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	units					
§35.2610	Records of safety procedures		D	Does not meet any of the criteria of Category A, B, C, or H&S.		
§35.2630	Records of dosimetry equipment used for remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-107	180 NAC 7-17
§35.2632	Records of teletherapy, remote afterloader, and gamma stereotactic radiosurgery full calibrations		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-108	180 NAC 7-108
§35.2642	Records of periodic spot-checks for teletherapy units		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-109	180 NAC 7-109
§35.2643	Records of periodic spot-checks for remote afterloader		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-110	180 NAC 7-110

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
	units					
§35.2645	Records of periodic spot-checks for gamma stereotactic radiosurgery units		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-111	180 NAC 7-111
§35.2647	Records of additional technical requirements for mobile remote afterloader units		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-112	180 NAC 7-112
§35.2652	Records of surveys of therapeutic treatment units		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-0113	180 NAC 7-113
§35.2655	Records of 5-year inspection of teletherapy and gamma stereotactic radiosurgery units		D	Does not meet any of the criteria of Category A, B, C, or H&S.	7-114	180 NAC 7-114
§35.3045	Report and notification of a medical event		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(c), this requirement was designated a Category C because absent this provision there could be a potential preclusion of an effective review or evaluation by the Commission and Agreement State programs for agreement material with respect to protection of public health and safety. The essential objective of this requirement is to assure that medical events	7-115 (SSR) NO	7-115 REPORT AND NOTIFICATION OF MISADMINISTRATION 7-115.01 Other than events that result from intervention by a patient or human research subject, a licensee must report any event in which the administration of radioactive material or radiation from radioactive material results in: 1. A dose that differs from the prescribed dose by more than 0.05 Sv (5 rem) effective dose equivalent, 0.5 Sv (50 rem) to an organ or tissue, or

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
				are reported to the radiation control program and in order to assess the effectiveness of the national program for control of Atomic Energy Act materials.		0.5 Sv (50 rem) shallow dose equivalent to the skin; and either a. The total dose delivered differs from the prescribed dose by 20% or more; or b. The total dosage delivered differs from the prescribed dosage by 20% or more or falls outside the prescribed dosage range; or c. The fractionated dose delivered differs from the prescribed dose, for a single fraction, by 50% or more. 2. A dose that exceeds 0.05 Sv (5 rem) effective dose equivalent, 0.5 Sv (50 rem) to an organ or tissue, or 0.5 Sv (50 rem) shallow dose equivalent to the skin from any of the following: a. An administration of a wrong radioactive drug; b. An administration of a radioactive drug containing radioactive material by the wrong route of administration; c. An administration of a dose or dosage to the wrong individual or human research subject; d. An administration of a dose or dosage delivered by the wrong mode of treatment; or e. A leaking sealed source. 3. A dose to the skin or an organ or tissue other than the treatment site that exceeds by 0.5 Sv (50 rem) to an organ or tissue and 50% or more of the dose expected from the administration defined in the written directive (excluding, for permanent implants, seeds that were implanted in the correct site but migrated outside the treatment site). 7-115.02 A licensee must report any event resulting from intervention of a patient or human research subject in which the administration of radioactive material or radiation from radioactive material results, or will result in, unintended permanent functional damage to an organ or a physiological system, as determined by a physician. 7-115.03 The licensee must notify the Department by telephone, no later than the next business day after the discovery of a misadministration. 7-115.04 The licensee must submit a written report to the Department within 15 days after discovery of the misadministration. 1. The written report must include: a. The licensee's name; b. The name of the prescribing physician;

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status

c. A brief description of the event;
d. Why the event occurred;
e. The effect, if any, on the individual(s) who received the administration;
f. What actions, if any, have been taken or are planned to prevent recurrence; and
g. Certification that the licensee notified the individual (or the individual's responsible relative or guardian), and if not, why not.

2. The report can not contain the individual's name or any other information that could lead to identification of the individual.

7-115.05 The licensee must provide notification of the misadministration to the referring physician and also notify the individual who is the subject of the misadministration no later than 24 hours after its discovery, unless the referring physician personally informs the licensee either that s/he will inform the individual or that, based on medical judgment, telling the individual would be harmful. The licensee is not required to notify the individual without first consulting the referring physician. If the referring physician or the affected individual cannot be reached within 24 hours, the licensee must make the appropriate notifications as soon as possible thereafter. The licensee may not delay any appropriate medical care for the individual, including any necessary remedial care as a result of the medical event, because of any delay in notification. To meet the requirements of 180 NAC 7-115.05, the notification of the individual who is the subject of the misadministration may be made instead to that individual's responsible relative or guardian. If a verbal notification is made, the licensee must inform the individual, or appropriate responsible relative or guardian, that a written description of the event can be obtained from the licensee upon request. The licensee must provide such a written description if requested.

7-115.06 Aside from the notification requirement, nothing in 180 NAC 7-115 affects any rights or duties of licensees and physicians in relation to each other, to individuals affected by the misadministration, or to that individual's responsible relatives or guardians.

7-115.07 A licensee must retain a record of a misadministration in accordance with 180 NAC 7-089. A copy of the record required under 180 NAC 7-089 must be provided to the referring physician if other

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
						than the licensee, within 15 days after discovery of the misadministration.
§35.3047	Report and notification of a dose to an embryo/fetus or a nursing child		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(c), this requirement was designated a Category C because absent this provision there could be a potential preclusion of an effective review or evaluation by the Commission and Agreement State programs for agreement material with respect to protection of public health and safety. The essential objective of this requirement is to assure that doses to the embryo/fetus or nursing child are reported to the radiation control program.	7-117 (SSR) NO	7-117 REPORT AND NOTIFICATION OF A DOSE TO AN EMBRYO/FETUS OR A NURSING CHILD 7-117.01 A licensee must report any dose to an embryo/fetus that is greater than 5 mSv (500 mrem) dose equivalent that is a result of an administration of radioactive material or radiation from radioactive material to a pregnant individual unless the dose to the embryo/fetus was specifically approved, in advance, by the authorized user. 7-117.02 A licensee must report any dose to a nursing child that was not specifically approved, in advance, by the authorized user; that is a result of an administration of radioactive material to a breast-feeding individual that: 1. Is greater than 5 mSv (500 mrem) total effective dose equivalent; or 2. Has resulted in unintended permanent functional damage to an organ or a physiological system of the child, as determined by a physician. 7-117.03 The licensee must notify by telephone the Department no later than the next calendar day after discovery of a dose to the embryo/fetus or nursing child that requires a report in 180 NAC 7-117.01 or 7-117.02. 7-117.04 The licensee must submit a written report to the Department within 15 days after discovery of a dose to the embryo/fetus or nursing child that requires a report in 180 NAC 7-117.01 or 7-117.02. 1. The written report must include: a. The licensee's name; b. The name of the prescribing physician; c. A brief description of the event; d. Why the event occurred; e. The effect, if any, on the embryo/fetus or the nursing child; f. What actions, if any, have been taken or are planned to prevent recurrence; and g. Certification that the licensee notified the pregnant individual or mother (or the mother's or child's responsible relative or guardian), and if not, why not. 2. The report can not contain the individual's or

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
						child's name or any other information that could lead to identification of the individual or child. 7-117.05 The licensee must provide notification of the event to the referring physician and also notify the pregnant individual or mother, both hereafter referred to as the mother, no later than 24 hours after discovery of an event that would require reporting in 180 NAC 7-117.01 and 7-117.02, unless the referring physician personally informs the licensee either that s/he will inform the mother or that, based on medical judgment, telling the mother would be harmful. The licensee is not required to notify the mother without first consulting with the referring physician. If the referring physician or mother cannot be reached within 24 hours, the licensee must make the appropriate notifications as soon as possible thereafter. The licensee may not delay any appropriate medical care for the embryo/fetus or for the nursing child, including any necessary remedial care as a result of the event, because of any delay in notification. To meet the requirements of 180 NAC 7-117.05, the notification may be made to the mother's or child's responsible relative or guardian instead of the mother. If a verbal notification is made, the licensee must inform the mother, or the mother's or child's responsible relative or guardian, that a written description of the event can be obtained from the licensee upon request. The licensee must provide such a written description if requested. 7-117.06 A licensee must retain a record of a dose to an embryo/fetus or a nursing child in accordance with 180 NAC 7-090. A copy of the record required under 180 NAC 7-090 must be provided to the referring physician, if other than the licensee, within 15 days after the discovery of the event.
§35.3067	Report of a leaking source		C	Based upon Handbook 5.9 Part II, "Categorization Criteria," Section (C), paragraph (2)(c), this requirement was designated a Category C because absent this provision there could be a potential preclusion of an effective review or evaluation by the Commission and Agreement State programs for agreement material with respect to protection of public health and safety. The essential objective of	7-118 (SSR) NO	7-118 REPORTS OF LEAKING SOURCES A licensee must file a report within 5 days if a leak test required by 180 NAC 7-033 reveals the presence of 185 Bq (0.005 µCi) or more of removable contamination. The written report must include the model number and serial number if assigned, of the leaking source; the radionuclide and its estimated activity; the results of the test; the date of the test;

REG SECTION #	SECTION TITLE	SSRs	COMPAT./ H&S CAT.	SUMMARY OF CHANGE	180 NAC	Status
				this requirement is to assure that leaking sources are reported to the radiation control program.		and the action taken.
§35.4001	Violations		D	Does not meet any of the criteria of Category A, B, C, or H&S.	NA	
§35.4002	Criminal penalties		D	Does not meet any of the criteria of Category A, B, C, or H&S.	NA	

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TITLE 180 CONTROL OF RADIATION

CHAPTER 1 GENERAL PROVISIONS

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ATTACHMENTS

Copies of the Code of Federal Regulations (CFR) cited in this Chapter are available for inspection at the Department of Health and Human Services Regulation and Licensure, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska.

10 CFR 1 through 199 (January 1, 2005)
40 CFR 100 through 135 and 190 through 265 (July 1, 2005)
49 CFR 100 through 399 (October 1, 2005)

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TITLE 180 CONTROL OF RADIATION

CHAPTER 1 GENERAL PROVISIONS

1-001 SCOPE AND AUTHORITY:

1-001.01 Except as otherwise specifically provided, Title 180 applies to all persons who receive, possess, use, transfer, own, or acquire: (1) any radiation generating equipment; (2) any naturally occurring or accelerator produced radioactive material; and (3) any radioactive: (a) source material; (b) byproduct material; and, (c) special nuclear material; in quantities not sufficient to form a critical mass. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Rev. Stat. §§ 71-3501 to 71-3520.

1-001.02 10 Code of Federal Regulations (CFR), as published on January 1, 2005; 40 CFR as published on July 1, 2005 and 49 CFR as published on October 1, 2005 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services Regulation and Licensure, Public Health Assurance Division, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

1-002 DEFINITIONS: As used in Title 180 , these terms have the definitions set forth below. Additional definitions used only in certain Title 180 Chapters will be found in that Chapter.

A_1 means the maximum activity of special form radioactive material permitted in a Type A package. This value is either listed in Appendix A of 180 NAC 13, Table A-1, or may be derived in accordance with the procedure prescribed in Appendix A of 180 NAC 013.

A_2 means the maximum activity of radioactive material, other than special form, Low Specific Activity (LSA) and Surface Contaminated Object (SCO) material, permitted in a Type A package. These values are either listed in Appendix A of 180 NAC 13, Table A-1, or may be derived in accordance with the procedure prescribed in Appendix A of 180 NAC 013.

Absorbed Dose (D) means the energy imparted by ionizing radiation to matter. Absorbed dose is determined as the quotient of dE by dM, where dE is the mean energy imparted by ionizing radiation to matter of mass dM. The SI Unit of absorbed dose is joule per kilogram and the special name of the unit of absorbed dose is the gray (Gy). The previously used special unit of absorbed dose (rad) is being replaced by the gray.

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Deleted: Absorbed dose means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the gray (Gy) and the rad.¶
¶

Accelerator means any machine capable of accelerating electrons, protons, deuterons, or other charged particles in a vacuum and of discharging the resultant particulate or other radiation into a medium. For purposes of this definition, Particle accelerator is an equivalent term.

Accelerator produced material means any material made radioactive by a particle accelerator.

Act means Radiation Control Act Neb.Rev.Stat. §§ 71-3501 through 71-3520, Reissue Revised Statutes of Nebraska, 1943. As amended.

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Activity means the rate of disintegration or transformation or decay of radioactive material. The units of activity are the becquerel (Bq) and the curie (Ci).

Administrator means the administrator of radiation control designated pursuant to Neb.Rev.Stat. § 71-3504.

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Adult means an individual 18 or more years of age.

Agency means the Department of Health and Human Services Regulation and Licensure.

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

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

Airborne radioactivity area means a room, enclosure, or area in which airborne radioactive materials exist in concentrations

(1) In excess of the derived air concentrations (DACs) specified in Appendix B, Table I of 180 NAC 4, or

(2) To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6% of the annual limit on intake (ALI) or 12 DAC-hours.

As low as is reasonably achievable (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these regulations as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

Background radiation means radiation from cosmic sources; naturally occurring radioactive materials, including radon, except as a decay product of source or special nuclear material, and including global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not

under the control of the licensee. Background radiation does not include sources of radiation from radioactive materials regulated by the Department.

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Becquerel (Bq) means the SI unit of activity. One becquerel is equal to 1 disintegration or transformation per second (dps or tps).

Bioassay means the determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement, in vivo counting, or by analysis and evaluation of materials excreted or removed from the human body. For purposes of Title 180, radiobioassay is an equivalent term.

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

Byproduct material means:

1. Any radioactive material, except special nuclear material, yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material; and

2. The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium or thorium solution extraction processes. Underground ore bodies depleted by solution extraction operations do not constitute byproduct material.

Calendar quarter means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year will begin in January and subsequent calendar quarters will be so arranged such that no day is included in more than one calendar quarter and no day in any one year is omitted from inclusion within a calendar quarter. No licensee or registrant shall change their method for determining calendar quarters except at the beginning of a year.

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Calibration means the determination of (1) the response or reading of an instrument relative to a series of known radiation values over the range of the instrument, or (2) the strength of a source of radiation relative to a standard.

CFR means Code of Federal Regulations.

Chelating agent means amine polycarboxylic acids, hydroxycarboxylic acids, gluconic acid, and polycarboxylic acids.

Civil penalty means any monetary penalty levied on a licensee or registrant because of violations of statutes, rules, regulations, licenses, or registration certificates, but does not include criminal penalties.

Collective dose means the sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

Committed dose equivalent (CDE) ($H_{T,50}$) means the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

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

Constraint (dose constraint) means a value above which specified licensee actions are required.

Critical Group means the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

Curie means a unit of quantity of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 3.7E+10 disintegrations or transformations per second (dps or tps).

Custodial care means the continued observation, monitoring, and care of a management facility for a minimum of one hundred years following transfer of ownership of the management facility from the operator to the Department.

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Decommission means to remove a facility or site safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use or release of the property under restricted conditions and termination of license.

Decommissioning means final operational activities at a facility to dismantle site structures, to decontaminate site surfaces and remaining structures, to stabilize and contain residual radioactive material, and to carry out any other activities to prepare the site for postoperational care.

Deep dose equivalent (DDE) (H_d), which applies to external whole body exposure, means the dose equivalent at a tissue depth of 1 centimeter (1000 mg/cm^2).

Department means the Department of Health and Human Services.

Depleted uranium means the source material uranium in which the isotope uranium-235 is less than 0.711 weight percent of the total uranium present. Depleted uranium does not include special nuclear material.

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

Deleted: Director means Director of Regulation and Licensure.¶
¶

Dose is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, total organ dose equivalent, or total effective dose equivalent. For purposes of 180 NAC, radiation dose is an equivalent term.

Dose equivalent (H_t) means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert (Sv) and rem.

Dose limits means the permissible upper bounds of radiation doses established in accordance with these regulations. For purposes of these regulations, limits is an equivalent term.

Effective dose equivalent (EDE) (H_E means the sum of the products of the dose equivalent to each organ or tissue (H_T) and the weighting factor (w_T) applicable to each of the body organs or tissues that are irradiated ($H_E = \sum w_T H_T$).

Electronic product means any manufactured product, device, assembly, or assemblies of such products or devices which, during operation in an electronic circuit, can generate or emit a physical field of radiation.

Embryo/fetus means the developing human organism from conception until the time of birth.

Entrance or access point means any opening through which an individual or extremity of an individual could gain access to radiation areas or to licensed or registered radioactive materials. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.

Explosive material means any chemical compound, mixture, or device which produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame.

E (Exponent) indicates that the number 10 is to be raised to a given power. This power is indicated to the right of the symbol E. For example: 3E+4 symbolizes 3×10^4 and 3E-4 symbolizes 3×10^{-4}.

Exposure means being exposed to ionizing radiation or to radioactive material.

Exposure[1] means the quotient of dQ by dm where "dQ" is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass "dm" are completely stopped in air. The SI unit of exposure is the coulomb per kilogram (C/kg). See 180 NAC 1-015.01 Units of Exposure and Dose for the special unit .

Exposure rate means the exposure per unit of time, such as roentgen per minute (R/min) or milliroentgen per hour (mR/h).

External dose means that portion of the dose equivalent received from any source of radiation outside the body.

Extremity means hand, elbow, arm below the elbow, foot, knee, and leg below the knee.

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[1]When not underlined as above [or indicated as "exposure" (X)] the term "exposure" has a more general meaning in Title 180.

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

Generally applicable environmental radiation standards means standards issued by the U.S. Environmental Protection Agency (EPA) under the authority of the Atomic Energy Act of 1954, as amended, that impose limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment outside the boundaries of locations under the control of persons possessing or using radioactive material.

Gray (Gy) means the SI unit of absorbed dose, kerma, and specific energy imparted equal to 1 joule per kilogram. The previous unit of absorbed dose (rad) is being replaced by the gray [1 Gy=100rad].

Deleted: Gray (Gy) means the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rad).¶

Hazardous waste means those wastes designated as hazardous in 40 CFR Chapter I, Part 261, Subpart A, §§ 261.2 - 261.4 and Subpart D.

Healing arts means diagnostic and/or healing treatment of human and animal maladies including but not limited to the following which are duly licensed by the State of Nebraska for the lawful practice of: medicine and its associated specialties, dentistry, veterinary medicine, osteopathy, chiropractic, and podiatry.

High-level radioactive waste means:

1. Irradiated reactor fuel;

2. Liquid wastes resulting from the operation of the first cycle solvent extraction system or equivalent and the concentrated wastes from subsequent extraction cycles or the equivalent in a facility for reprocessing irradiated reactor fuel; and

3. Solids into which such liquid wastes have been converted.

4. Other highly radioactive waste material as defined by the U.S. Nuclear Regulatory Commission.

High radiation area means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour at 30 centimeters from the radiation source or 30 centimeters from any surface that the radiation penetrates.

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

Individual means any human being.

Individual monitoring means the assessment of:

1. Dose equivalent (a) by the use of individual monitoring devices or (b) by the use of survey data; or

2. Committed effective dose equivalent (a) by bioassay or (b) by determination of the time-weighted air concentrations to which an individual has been exposed, that is, DAC-hours. [See the definition of DAC-hours in 180 NAC 4].

Individual monitoring devices (individual monitoring equipment) means devices designed to be worn by a single individual for the assessment of dose equivalent such as film badges, termoluminescence dosimeters (TLD's), pocket ionization chambers, and personal ("lapel") air sampling devices. For the purposes of these regulations, personnel dosimeter and dosimeter are equivalent terms.

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. The licensee or registrant is notified of any items of noncompliance and/or recommendation of the Department.

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

Internal dose means that portion of the dose equivalent received from radioactive material taken into the body.

Lens dose equivalent(LDE) applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg/cm^2).

License means a license issued by the Department in accordance with the regulations adopted by the Department.

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Licensed material means radioactive material received, possessed, used, transferred or disposed of under a general or specific license issued by the Department.

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Licensed practitioner means a person licensed to practice medicine, dentistry, podiatry, chiropractic, osteopathic medicine and surgery, or as an osteopathic physician.

Licensee means any person who is licensed by the Department in accordance with these regulations and the Act.

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Limits [See Dose limits]

Lost or missing source of radiation means source of radiation whose location is unknown. This definition includes licensed material that has been shipped but has not reached its planned destination and whose location cannot be readily traced in the transportation system.

Low-level radioactive waste means radioactive waste not defined as high-level radioactive waste, spent nuclear fuel, or byproduct material as defined in 180 NAC 1-002 byproduct material item 2.

Major processor means a user processing, handling, or manufacturing radioactive material exceeding Type A quantities as unsealed sources or material, or exceeding 4 times Type B quantities as sealed sources, but does not include nuclear medicine programs, universities,

industrial radiographers, or small industrial programs. Type A and B quantities are defined in 180 NAC 13-002, and in 10 CFR Chapter I, Part 71, Subpart A, § 71.4.

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Management facility means the land, buildings, and equipment which is intended to be used for the management of radioactive wastes.

Management of low-level radioactive waste means the handling, processing, storage, reduction in volume, disposal, or isolation of such waste from the biosphere in any manner.

Deleted: , except the commercial disposal of low-level radioactive waste in a disposal facility, designated by the Central Interstate Low-Level Radioactive Waste Compact Commission.

Member of the public means any individual except when that individual is receiving an occupational dose.

Minor means an individual less than 18 years of age.

Mixed waste means low-level radioactive waste that also contains hazardous waste that is identified in Title 128, Nebraska Administrative Code.

Monitoring means the measurement of radiation, radioactive material concentrations, surface area activities or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses. For the purposes of Title 180 radiation monitoring and radiation protection monitoring are equivalent terms.

NARM means any naturally occurring or accelerator-produced radioactive material. It does not include byproduct, source, or special nuclear material.

Nationally tracked source means a sealed source containing a quantity equal to or greater than Category 1 or Category 2 levels of any radioactive material listed in Appendix H of 180 NAC 4. In this context a sealed source is defined as radioactive material that is sealed in a capsule or closely bonded, in a solid form and which is not exempt from regulatory control. It does not mean material encapsulated solely for disposal, or nuclear material contained in any fuel assembly, subassembly, fuel rod, or fuel pellet. Category 1 nationally tracked sources are those containing radioactive material sources ial at a quantity equal to or greater than the Category 1. Category 2 nationally tracked sources are those containing radioactive material at a quantity equal to or greater than the Category 2 threshold but less than the Category 1 threshold.

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Natural radioactivity means radioactivity of naturally occurring nuclides.

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

Occupational dose means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to sources of radiation from licensed/registered or unlicensed/unregistered sources of radiation, whether in the possession of the licensee, registrant, or other person. Occupational dose does not include doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-037, from voluntary participation in medical research programs, or as a member of the public.

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Package means the packaging together with its radioactive contents as presented for transport.

Particle accelerator [See "Accelerator"]

Person means any individual, corporation, partnership, limited liability company, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this State, any other State or political subdivision or agency thereof, and any legal successor, representative, agent, or agency of the foregoing.

Personnel dosimeter: [See Individual monitoring devices].

Personnel monitoring equipment [See Individual monitoring devices].

Pharmacist means any person licensed by the State of Nebraska to practice pharmacy.

Physician means any person authorized to practice medicine in this state as provided in Neb. Rev. Stat. §§71-102 to 71-110.

Public dose means the dose received by a member of the public from exposure to sources of radiation released by a licensee or registrant, or to any other source of radiation under the control of a licensee or registrant. Public dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-037, or *from voluntary participation in medical research programs.*

Pyrophoric liquid means any liquid that ignites spontaneously in dry or moist air at or below 130°F (54.4 °C). A pyrophoric solid is any solid material, other than one classed as an explosive, which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious transportation, handling, or disposal hazard. Included are spontaneously combustible and water-reactive materials.

Quality factor (Q) means the modifying factor, listed in Tables I and II of 180 NAC 1-015, that is used to derive dose equivalent from absorbed dose.

Rad means the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 erg per gram or 0.01 joule per kilogram (0.01 gray).

Radiation means ionizing and nonionizing radiation as follows: (a) Ionizing radiation means gamma rays, x-rays, alpha and beta particles, high-speed electrons, neutrons, protons, and other atomic or nuclear particles or rays, but does not include sound or radiowaves or visible, infrared, or ultraviolet light; and (b) nonionizing radiation means (I) any electromagnetic radiation which can be generated during the operations of electronic products to such energy density levels as to present a biological hazard to occupational and public health and safety and the environment, other than ionizing electromagnetic radiation, and (ii) any sonic, ultrasonic, or infrasonic waves which are emitted from an electronic product as a result of the operation of an electronic circuit in such product and to such energy density levels as to present a biological hazard to occupational and public health and safety, and the environment.

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Deleted: to compound and dispense drugs, prescriptions, and poisons.

Deleted: means an individual licensed by this State to dispense drugs in the practice of medicine

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Radiation area means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 mSv (0.005 rem) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

Radiation Dose [See "Dose]

Radiation generating equipment means any manufactured product or device, component part of such a product or device, or machine or system which during operation can generate or emit radiation except devices which emit radiation only from radioactive material.

Radiation safety officer means an individual who has the knowledge and responsibility to apply appropriate radiation protection regulations.

Radioactive material means any material whether solid, liquid, or gas, which emits ionizing radiation spontaneously. Radioactive material includes, but is not limited to, accelerator-produced material, byproduct material, naturally occurring material, source material, and special nuclear material.

Radioactivity means the transformation of unstable atomic nuclei by the emission of radiation.

Radiobioassay. [See Bioassay]

Registrant means any person who is registered with the Department and is legally obligated to register with the Department pursuant to Title 180 and the Act.

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Registration means registration with the Department pursuant to the Act and in accordance with the regulations adopted by the Department.

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Regulations of the U.S. Department of Transportation means the regulations in 49 CFR Parts 100-189.

Rem means the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 Sv).

Research and development means (1) theoretical analysis, exploration, or experimentation; or (2) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes. Research and development does not include the internal or external administration of radiation or radioactive material to human beings.

Residual radioactivity means radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the licensee's control. This includes radioactivity from all licensed and unlicensed sources used by the licensee, but excludes background radiation. It also includes radioactive materials remaining at the site as a result of routine or accidental releases of radioactive material at the site and previous burials at the site, even if those burials were made in accordance with the provisions of 180 NAC 4.

Restricted area means an area, access to which is limited by the licensee or registrant for the purpose of protecting individuals against undue risks from exposure to sources of radiation. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

Roentgen means the special unit of exposure. One roentgen (R) equals 2.58E-4 coulombs per kilogram of air (see "Exposure" and 180 NAC 1-015).

Sealed source means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material .

Shallow dose equivalent (SDE) (H_s), which applies to the external exposure of the skin or an extremity, means the dose equivalent at a tissue depth of 0.007 centimeter ($7mg/cm^2$) averaged over an area of 1 square centimeter.

SI means the abbreviation for the International System of Units.

Sievert means the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100 rem).

Source material means:

(1) Uranium or thorium, or any combination thereof, in any physical or chemical form; or

(2) Ores which contain by weight one-twentieth of 1%(0.05%) or more of uranium, thorium or any combination of uranium and thorium. Source material does not include special nuclear material.

Source material milling means any processing of ore, including underground solution extraction of unmined ore, primarily for the purpose of extracting or concentrating uranium or thorium there from and which results in the production of source material mill tailings.

Sources of radiation means any radioactive material, any radiation-generating equipment or any device or equipment emitting or capable of emitting radiation or radioactive material.

Special form radioactive material means radioactive material that satisfies the following conditions:

(1) It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule;

(2) The piece or capsule has at least one dimension not less than 5 millimeters (0.2 inch); and

Deleted:

(3) It satisfies the test requirements specified by the U.S. Nuclear Regulatory Commission. A special form encapsulation designed in accordance with the U.S. Nuclear Regulatory Commission requirements in effect on June 30, 1983, and constructed prior to July 1, 1985, may continue to be used. A special form encapsulation either designed in accordance with the Nuclear Regulatory Commission requirements in effect on March

31, 1996, and constructed prior to April 1, 1998, may continue to be used. A special form encapsulation either designed or constructed after April 1, 1998, must meet requirements of this definition applicable at the time of its design or construction.

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Special nuclear material means:

(1) Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the U.S. Nuclear Regulatory Commission, pursuant to the provisions of section 51 of the Atomic Energy Act of 1954, as amended, determines to be special nuclear material, but does not include source material; or

(2) Any material artificially enriched by any material listed in part (1) of this definition, but does not include source 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; uranium-233 in quantities not exceeding 200 grams; plutonium 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 of the kinds of special nuclear material in combination must not exceed 1. For example, the following quantities in combination would not exceed the limitation and are within the formula:

$$\frac{175(\text{grams contained U - 235})}{350} + \frac{50(\text{grams U - 233})}{200} + \frac{50(\text{grams Pu})}{200} = 1$$

Spent nuclear fuel means fuel that has been withdrawn from a nuclear reactor following irradiation, has undergone at least one year of decay since being used as a source of energy in a power reactor, and has not been chemically separated into its constituent elements by reprocessing. Spent nuclear fuel includes the special nuclear material, byproduct material, source material, and other radioactive material associated with fuel assemblies.

Deleted: irradiated nuclear

Survey means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of sources of radiation. When appropriate, such evaluation includes, but is not limited to, tests, physical examinations, and measurements of levels of radiation or concentrations of radioactive material present.

Test means the process of verifying compliance with an applicable regulation.

These regulations mean all Chapters of Title 180 "Control of Radiation".

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

Total organ dose equivalent (TODE) means the sum of the deep dose equivalent and the committed dose equivalent to the organ receiving the highest dose as described in 180 NAC 4-052.01, item 1.

Transuranic waste means radioactive waste material containing alpha-emitting radioactive elements, with radioactive half-lives greater than five years, having an atomic number greater than 92 in concentrations in excess of one hundred nanocuries per gram.

Deleted: transuranic

U.S. Department of Energy means the Department of Energy established by Public Law 95-91, August 4, 1977, 91 Stat. 565, 42 U.S.C. 7101 *et seq.*, to the extent that the Department exercises functions formerly vested in the U.S. Atomic Energy Commission, its Chairman, members, officers and components and transferred to the U.S. Energy Research and Development Administration and to the Administrator thereof pursuant to §§ 104(b), (c) and (d) of the Energy Reorganization Act of 1974 (Public Law 93-438, October 11, 1974, 88 Stat. 1233 at 1237, 42 U.S.C. 5814, effective January 19, 1975) and retransferred to the Secretary of Energy pursuant to § 301(a) of the Department of Energy Organization Act (Public Law 95-91, August 4, 1977, 91 Stat. 565 at 577-578, 42 U.S.C. 7151, effective October 1, 1977.)

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

Unrestricted area means an area, access to which is neither limited nor controlled by the licensee or registrant. For purposes of these regulations, uncontrolled area is an equivalent term.

Violation means an infringement of any rule, license or registration condition, order of the Department, or any provision of the Act.

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Waste means those low-level radioactive wastes that are acceptable for disposal in a management facility. For the purposes of this definition, low-level waste has the same meaning as in the Low-Level Radioactive Waste Policy Act, P.L. 96-573, as amended by P.L. 99-240, effective January 15, 1986; that is, radioactive waste (a) not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in § 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste) and (b) classified as low-level radioactive waste consistent with existing law and in accordance with (a) by the U.S. Nuclear Regulatory Commission.

Waste handling licensees mean persons licensed to receive and store radioactive wastes prior to disposal and/or persons licensed to dispose of radioactive waste.

Week means 7 consecutive days starting on Sunday.

Whole body means, for purposes of external exposure, head, trunk including male gonads, arms above the elbow, or legs above the knee.

Worker means an individual engaged in work under a license or registration issued by the Department and controlled by a licensee or registrant, but does not include the licensee or registrant.

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Working level (WL) means any combination of short-lived radon daughters in 1 liter of air that will result in the ultimate emission of 1.3E+5 MeV of potential alpha particle energy. The short-lived radon daughters are -- for radon-222: polonium-218, lead-214, bismuth-214, and polonium-214; and for radon-220: polonium-216, lead-212, bismuth-212, and polonium-212.

Working level month (WLM) means an exposure to 1 working level for 170 hours -- 2,000 working hours per year divided by 12 months per year is approximately equal to 170 hours per month.

X-ray system means an assemblage of components for the controlled production of x-rays, including but not limited to, an x-ray high-voltage generator, an x-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components which function with the system are considered integral parts of the system.

Year means the period of time beginning in January used to determine compliance with the provisions of Title 180. The licensee or registrant may change the starting date of the year used to determine compliance by the licensee or registrant provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

1-003 EXEMPTIONS

1-003.01 General Provision: The Department may, upon application or upon its own initiative, grant such exemptions or exceptions from the requirements of Title 180 of NAC 180 as it determines are authorized by law and will not result in undue hazard to public health and safety or property.

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1-003.02 U.S. Department of Energy Contractors and U.S. Nuclear Regulatory Commission Contractors: Any U.S. Department of Energy contractor or subcontractor and any U.S. Nuclear Regulatory Commission contractor or subcontractor of the following categories operating within this State is exempt from these regulations to the extent that such contractor or subcontractor under his contract receives, possesses, uses, transfers, or acquires sources of radiation:

1. Prime contractors performing work for the U.S. Department of Energy at U.S. Government-owned or -controlled sites, including the transportation of sources of radiation to or from such sites and the performance of contract services during temporary interruptions of such transportation;

2. Prime contractors of the U.S. Department of Energy performing research in, or development, manufacture, storage, testing, or transportation of, atomic weapons or components thereof;

3. Prime contractors of the U.S. Department of Energy using or operating nuclear reactors or other nuclear devices in a United States Government-owned vehicle or vessel; and

4. Any other prime contractor or subcontractor of the U.S. Department of Energy or of the U.S. Nuclear Regulatory Commission when the State and the U.S. Nuclear Regulatory Commission jointly determine:

    a. That the exemption of the prime contractor or subcontractor is authorized by law; and

b. That, under the terms of the contract or subcontract, there is adequate assurance that the work thereunder can be accomplished without undue risk to the public health and safety.

1-004 RECORDS: Each licensee and registrant must maintain records showing the receipt, transfer, and disposal of all sources of radiation. Additional record requirements are specified elsewhere in Title 180.

1-005 INSPECTIONS

1-005.01 Each licensee and registrant must afford the Department at all reasonable times opportunity to inspect sources of radiation and the premises and facilities wherein such sources of radiation are used or stored. Deleted: Agency

1-005.02 Each licensee and registrant must make available to the Department for inspection, upon reasonable notice, records maintained pursuant to Title 180. Deleted: Agency

1-006 TESTS: Each licensee and registrant must perform upon instructions from the Department, or must permit the Department to perform, such reasonable tests as the Department deems appropriate or necessary including, but not limited to, tests of: Deleted: Agency Deleted: Agency Deleted: Agency

1. Sources of radiation;
2. Facilities wherein sources of radiation are used or stored;
3. Radiation detection and monitoring instruments; and
4 Other equipment and devices used in connection with utilization or storage of licensed or registered sources of radiation.

1-007 ADDITIONAL REQUIREMENTS: The Department may, by rule, regulation, or order, impose upon any licensee or registrant such requirements in addition to those established in these regulations as it deems appropriate or necessary to minimize danger to public health and safety or property. Deleted: Agency

1-008 VIOLATIONS: An injunction or other court order may be obtained prohibiting any violation of any provision of the Act. Any person who violates any provision of the Act may be guilty of a Class IV misdemeanor and, upon conviction, may be punished as determined by the court. (See 180 NAC 17.)

1-009 IMPOUNDING: Sources of radiation are subject to impounding pursuant to § 71-3516 of the Act.

1-010 PROHIBITED USES

1. A hand-held fluoroscopic screen must not be used with x-ray equipment unless it has been listed in the Registry of Sealed Source and Devices or accepted for certification by the U.S. Food and Drug Administration, Center for Devices and Radiological Health.

2. A shoe-fitting fluoroscopic device must not be used.

TESTING FOR LEAKAGE OR CONTAMINATION OF SEALED SOURCES

1-011 TESTS FOR LEAKAGE AND/OR CONTAMINATION OF SEALED SOURCES

1-011.01 The licensee or registrant in possession of any sealed source must assure that:

1. Each sealed source, except as specified in 180 NAC 1-011.02, is tested for leakage or contamination and the test results are received before the sealed source is put into use unless the licensee or registrant has a certificate from the transferor indicating that the sealed source was tested within six months before transfer to the licensee or registrant. Deleted: 6

2. Each sealed source that is not designed to emit alpha particles is tested for leakage or contamination at intervals not to exceed six months or at alternative intervals approved by the Department, after evaluation of information specified by 180 NAC 3-014.12, item 4 and 5 of these regulations, or by an Agreement State, or the U.S. Nuclear Regulatory Commission. Deleted: 6 Deleted: Agency

3. Each sealed source that is designed to emit alpha particles is tested for leakage or contamination at intervals not to exceed 3 months or at alternative intervals approved by the Department, after evaluation of information specified by 180 NAC 3-014.12, item 4 and 5, or by an Agreement State or the U.S. Nuclear Regulatory Commission. Deleted: Agency

4. For each sealed source that is required to be tested for leakage or contamination, at any other time there is reason to suspect that the sealed source might have been damaged or might be leaking, the licensee or registrant must assure that the sealed source is tested for leakage or contamination before further use.

5. Tests for leakage for all sealed sources, except brachytherapy sources manufactured to contain radium, must be capable of detecting the presence of 185 Bq (0.005 μCi) of radioactive material on a test sample. Test samples must be taken from the sealed source or from the surfaces of the container in which one might expect contamination to accumulate. For a sealed source contained in a device, test samples are obtained when the source is in the "off" position.

6. The test for leakage for brachytherapy sources manufactured to contain radium must be capable of detecting an absolute leakage rate of 37 Bq (0.001 μCi) of radon-222 in a 24 hour period when the collection efficiency for radon-222 and its daughters has been determined with respect to collection method, volume and time.

7. Tests for contamination from radium daughters must be taken on the interior surface of brachytherapy source storage containers and must be capable of detecting the presence of 185 Bq (0.005 μCi) of a radium daughter which has a half-life greater than four days. Deleted: 4

1-011.02 A licensee or registrant need not perform test for leakage or contamination on the following sealed sources:

1. Sealed sources containing only radioactive material with a half-life of less than 30 days;
2. Sealed sources containing only radioactive material as a gas;
3. Sealed sources containing 3.7 MBq (100 μCi) or less of beta or photon-emitting material or 370 kBq (10 μCi) or less of alpha-emitting material;
4. Sealed sources containing only hydrogen-3;
5. Seeds of iridium-192 encased in nylon ribbon; and
6. Sealed sources, except teletherapy and brachytherapy sources, which are stored, not being used and identified as in storage. The licensee or registrant must, however, test each such sealed source for leakage or contamination and receive the test results before any use or transfer unless it has been tested for leakage or contamination within 6 months before the date of use or transfer.

1-011.03 Tests for leakage or contamination from sealed sources must be performed by persons specifically authorized by the Department, an Agreement State, or the U.S. Nuclear Regulatory Commission to perform such services.

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1-011.04 Test results must be kept in units of Becquerel or microcurie and maintained for inspection by the Department.

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1-011.05 The following must be considered evidence that the sealed source is leaking:

1. The presence of 185 Bq (0.005 μCi) or more of removable contamination on any test sample.
2. sources manufactured to contain radium.
3. The presence of removable contamination resulting from the decay of 185 Bq (0.005 μCi) or more of radium.

1-011.06 The licensee or registrant must immediately withdraw a leaking sealed source from use and must take action to prevent the spread of contamination. The leaking sealed source must be repaired or disposed of in accordance with180 NAC 1.

1-011.07 Reports of test results for leaking or contaminated sealed sources must be made pursuant to 180 NAC 4-064.

1-011.08 No sealed source shall be stored for a period of more than three years without being tested for leakage or contamination.

1-012 COMMUNICATIONS: All communications and reports concerning Title 180, and applications filed thereunder, should be addressed to the Department at its office located at

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Department of Health and Human Services,
Division of Public Health,
301 Centennial Mall South
P.O. Box 95026
Lincoln, Nebraska 68509-5026

Deleted: Regulation and Licensure
Deleted: Assurance Division
Deleted: 07
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1-013 RESERVED

1-014 DISCRIMINATION PROHIBITED: The Department must not exclude any person on the ground of sex from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity licensed by this Department. This provision will be enforced through provisions established, with respect to racial and other discrimination, under the Nebraska Fair Employment Act. This remedy is not exclusive, however, and will not prejudice or cut off any other legal remedies available to a discriminatee.

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1-015 UNITS OF EXPOSURE AND DOSE

1-015.01 As used in Title 180, the unit of exposure is the coulomb per kilogram (C/kg) of air. One roentgen is equal to 2.58E-4 coulomb per kilogram of air.

1-015.02 As used in 180 NAC, the units of dose are:

1. Gray (Gy) is the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (100 rad).
2. Rad is the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 erg per gram or 0.01 joule per kilogram (0.01 Gy).
3. Rem is the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 Sv).
4. Sievert is the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100 rem).

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1-015.03 As used in Title 180, the quality factors for converting absorbed dose to dose equivalent are shown in Table I.

TABLE I

QUALITY FACTORS AND ABSORBED DOSE EQUIVALENCIES

TYPE OF RADIATION	Quality Factor (Q)	Absorbed Dose Equal to a Unit Dose Equivalent[a]
X, gamma, or beta radiation and high-energy electrons	1	1
Alpha particles, multiple-charged particles, fission fragments and heavy particles of unknown charge	20	0.05

Neutrons of unknown energy	10	0.1
High-energy protons	10	0.1

[a]Absorbed dose in gray equal to 1 Sv or the absorbed dose in rad equal to 1 rem.

1-015.04 If it is more convenient to measure the neutron fluence rate than to determine the neutron dose equivalent rate in rems per hour or sieverts per hour, as provided in 001.15C, 0.01 Sv (1 rem) of neutron radiation of unknown energies may, for purposes of these regulations, be assumed to result from a total fluence of 25 million neutrons per square centimeter incident upon the body. If sufficient information exists to estimate the approximate energy distribution of the neutrons, the licensee or registrant may use the fluence rate per unit dose equivalent or the appropriate Q value from Table II to convert a measured tissue dose in gray or rad to dose equivalent in sievert or rem.

TABLE II

MEAN QUALITY FACTORS, Q, AND FLUENCE PER UNIT DOSE EQUIVALENT FOR MONOENERGETIC NEUTRONS

	Neutron Energy (MeV)	Quality Factor[a] (Q)	Fluence per Unit Dose Equivalent[b] (neutrons cm^{-2} rem^{-1})	Fluence per Unit Dose Equivalent[b] (neutrons cm^{-2} $sievert^{-1}$)
(thermal)	2.5E-8	2	980E+6	980E+8
	1E-7	2	980E+6	980E+8
	1E-6	2	810E+6	810E+8
	1E-5	2	810E+6	810E+8
	1E-4	2	840E+6	840E+8
	1E-3	2	980E+6	980E+8
	1E-2	2.5	1010E+6	1010E+8
	1E-1	7.5	170E+6	170E+8
	5E-1	11	39E+6	39E+8
	1	11	27E+6	27E+8
	2.5	9	29E+6	29E+8
	5	8	23E+6	23E+8
	7	7	24E+6	24E+8
	10	6.5	24E+6	24E+8
	14	7.5	17E+6	17E+8
	20	8	16E+6	16Ex8
	40	7	14E+6	14E+8
	60	5.5	16E+6	16E+8
	1E+2	4	20E+6	20E+8
	2E+2	3.5	19E+6	19E+8
	3E+2	3.5	16E+6	16E+8
	4E+2	3.5	14E+6	14E+8

[a]Value of quality factor (Q) at the point where the dose equivalent is maximum in a 30-centimeter diameter cylinder tissue-equivalent phantom.

[b]Monoenergetic neutrons incident normally on a 30-centimeter diameter cylinder tissue-equivalent phantom.

1-016 UNITS OF ACTIVITY: For the purposes of these regulations, activity is expressed in the SI unit of becquerel (Bq) or in the special unit of curie (Ci), or their multiples, or disintegrations or transformations per unit of time.

1. One becquerel (Bq) = 1 disintegration or transformation per second (dps or tps).

2. One curie = 3.7E+10 disintegrations or transformations per second (dps or tps) = 3.7E+10 becquerel (Bq) = 2.22E+12 disintegrations or transformations per minute (dpm or tpm).

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TITLE 180 CONTROL OF RADIATION

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Deleted: Form NRH-5A . Application for Radioactive Material License – Medical Teletherapy

Form NRH-11 Certificate – Use of Depleted Uranium Under General License
Form NRH-17 Certificate – In Vitro Testing With Radioactive Material General License
Form NRH-60 Certificate of Disposition of Materials
Form NRH 653, A & B Transfers of Industrial Devices Report

Copies of the Code of Federal Regulations (CFR) cited in this Chapter are available for inspection at the Department of Health and Human Services, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska.

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10 CFR 1 through 199 (January 1, 2002)

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TITLE 180 CONTROL OF RADIATION

CHAPTER 3 LICENSING OF RADIOACTIVE MATERIAL

3-001 SCOPE AND AUTHORITY

3-001.01 180 NAC 3 provides for the licensing of radioactive material. No person will receive, possess, use, transfer, own, dispose or acquire radioactive material except as authorized in a specific or general license issued pursuant to 180 NAC 3 or as otherwise provided in 180 NAC 3, 5, 7, 9, 12, 13 or 19. The regulations are authorized by and implement the Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

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3-001.02 In addition to the requirements of 180 NAC 3, all licensees are subject to the requirements of 180 NAC 1, 4, 10, 13, 15, 17, and 18. Licensees engaged in industrial radiographic operations are subject to the requirements of 180 NAC 5, licensees using sealed and unsealed sources in the healing arts are subject to the requirements of 180 NAC 7, licensees engaged in the management of radioactive waste are subject to the requirements of 180 NAC 12, licensees engaged in well logging and subsurface tracer studies are subject to the requirements of 180 NAC 14, and licensees using sealed sources containing radioactive materials in irradiators are subject to the requirements of 180 NAC 19.

3-001.03 10 Code of Federal Regulations (CFR), as published on January 1, 2005 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Division of Public Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

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3-002 DEFINITIONS: As used in 180 NAC 3.

Alert means events may occur, are in progress, or have occurred that could lead to a release of radioactive material but that the release is not expected to require a response by offsite response organizations to protect persons offsite.

Site area emergency means events may occur, are in progress, or have occurred that could lead to a significant release of radioactive material and that could require a response by offsite response organizations to protect persons offsite.

Principal activities means activities authorized by the license which are essential to achieving the purpose(s) for which the license was issued or amended. Storage during which no license material is accessed for use or disposal and activities incidental to decontamination or decommissioning are not principal activities.

Site area emergency means events may occur, are in progress, or have occurred that could lead to a significant release of radioactive material and that could require a response by offsite response organizations to protect persons offsite.

Principal activities means activities authorized by the license which are essential to achieving the purpose(s) for which the license was issued or amended. Storage during which no license material is accessed for use or disposal and activities incidental to decontamination or decommissioning are not principal activities.

EXEMPTIONS

3-003 SOURCE MATERIAL

3-003.01 Any person is exempt from 180 NAC 3 to the extent that the person receives, possesses, uses, owns, or transfers source material in any chemical mixture, compound, solution, or alloy in which the source material is by weight less than 1/20 of 1 % (0.05 %) of the mixture, compound, solution, or alloy.

3-003.02 Any person is exempt from 180 NAC 3 to the extent that such person receives, possesses, uses, or transfers unrefined and unprocessed ore containing source material; provided that, except as authorized in a specific license, the person must not refine or process such ore.

3-003.03 Any person is exempt from 180 NAC 3 to the extent that the person receives, possesses, uses, or transfers:

1. Any quantities of thorium contained in:

    a. incandescent gas mantles,
    b. vacuum tubes,
    c. welding rods,
    d. electric lamps for illuminating purposes provided that each lamp does not contain more than 50 milligrams of thorium,
    e. germicidal lamps, sunlamps, and lamps for outdoor or industrial lighting provided that each lamp does not contain more than 2 grams of thorium,
    f. rare earth metals and compounds, mixtures, and products containing not than 0.25% by weight thorium, uranium, or any combination of these, or
    g. personnel neutron dosimeters, provided that each dosimeter does not contain more than 50 milligrams of thorium;

2. Source material contained in the following products:

    a. glazed ceramic tableware, provided that the glaze contains not more than 20% by weight source material,
    b. glassware, containing not more than 10% by weight source material, but not including commercially manufactured glass brick, pane glass, ceramic tile or other glass, or ceramic used in construction,

c. glass enamel or glass enamel frit containing not more than 10% by weight source material imported or ordered for importation into the United States, or initially distributed by manufacturers in the United States, before July 25, 1983,[1] or

d. piezoelectric ceramic containing not more than 2% by weight source material;

3. Photographic film, negatives, and prints containing uranium or thorium;

4. Any finished product or part fabricated of, or containing, tungsten-thorium or magnesium-thorium alloys, provided that the thorium content of the alloy does not exceed 4% by weight and that the exemption contained in this subpart does not authorize the chemical, physical, or metallurgical treatment or processing of any such product or part;

5. Uranium contained in counterweights installed in aircraft, rockets, projectiles, and missiles, or stored or handled in connection with installation or removal of such counterweights, provided that:

a. the counterweights are manufactured in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, authorizing distribution by the licensee pursuant to 10 CFR 40;

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b. each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM",[2]

c. each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED",[3] and

d. the exemption contained in this division does not authorize the chemical, physical, or metallurgical treatment or processing of any such counterweights other than repair or restoration of any plating or other covering;

6. Natural or depleted uranium metal used as shielding constituting part of any shipping container, provided that:

a. The shipping container is conspicuously and legibly impressed with the legend "CAUTION - RADIOACTIVE SHIELDING - URANIUM", and

[1]On July 25, 1983, the exemption of glass enamel or glass enamel frit was suspended. The exemption was eliminated on September 11, 1984.

[2]The requirements specified in 180 NAC 3-003.03, items 5.b. and 5.c. need not be met by counter weights manufactured prior to December 31, 1969; provided, that such counter weights are impressed with the legend, "CAUTION, RADIOACTIVE MATERIAL - URANIUM", as previously required by Title 180.

[3]Ibid. p. 3

b. The uranium metal is encased in mild steel or equally fire resistant metal of minimum wall thickness of one-eighth inch (3.2mm).

7. Thorium contained in finished optical lenses, provided that each lens does not contain more than 30% by weight of thorium, and that the exemption does not authorize either:

   a. the shaping, grinding, or polishing of such lens or manufacturing processes other than the assembly of such lens into optical systems and devices without any alteration of the lens, or
   b. the receipt, possession, use, or transfer of thorium contained in contact lenses, or in spectacles, or in eyepieces in binoculars or other optical instruments;

8. Uranium contained in detector heads for use in fire detection units, provided that each detector head contains not more than 185 Bq (0.005 microcurie) of uranium; or

9. Thorium contained in any finished aircraft engine part containing nickel-thoria alloy, provided that:

   a. the thorium is dispersed in the nickel-thoria alloy in the form of finely divided thoria (thorium dioxide), and
   b. the thorium content in the nickel-thoria alloy does not exceed 4% by weight.

3-003.04 The exemptions in 180 NAC 3-003.03 do not authorize the manufacture of any of the products described.

3-004 RADIOACTIVE MATERIAL OTHER THAN SOURCE MATERIAL

3-004.01 Exempt Concentrations.

1. Except as provided in 3-004.01, item 2 any person is exempt from this 180 NAC 3 to the extent that such person receives, possesses, uses, transfers, owns or acquires products containing radioactive material introduced in concentrations not in excess of those listed in 180 NAC 3, Appendix 3-A.
2. 180 NAC 3-004.01 must not be deemed to authorize the import of radioactive material or products containing radioactive material.
3. A manufacturer, processor, or producer of a product or material in an Agreement State is exempt from the requirements for a license in 180 NAC 3-004, 3-005, 3-006, 3-008, 3-013, 3-014, 3-016 through 3-024, 180 NAC 5, 14 and 19 to the extent that they transfers radioactive material contained in a product or material in concentrations not in excess of those specified in 180 NAC 3, Appendix 3-1 and introduced into the product or material by a licensee holding a specific license issued by the Department, an Agreement State, or the U.S. Nuclear Regulatory Commission expressly authorizing such introduction. This exemption does not apply to the transfer of radioactive material contained in any food, beverage,

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cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

4. No person may introduce radioactive material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under 180 NAC 3-004.01, item 1 or equivalent regulations of the U.S. Nuclear Regulatory Commission, or any Agreement State, except in accordance with a specific license issued pursuant to 180 NAC 3-014.01 or the general license provided in 180 NAC 3-028.

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3-004.02 Exempt Quantities.

1. Except as provided in 180 NAC 3-004.02 , items 2 and 3., any person is exempt from Title 180 to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in individual quantities each of which does not exceed the applicable quantity set forth in 180 NAC 3, Appendix 3-B.
2. 180 NAC 3-004.02 does not authorize the production, packaging, repackaging, or transfer of radioactive material for purposes of commercial distribution, or the incorporation of radioactive material into products intended for commercial distribution.
3. No person may, for purposes of commercial distribution, transfer radioactive material in the individual quantities set forth in 180 NAC 3, Appendix 3-B knowing or having reason to believe that such quantities of radioactive material will be transferred to persons exempt under 180 NAC 3-004.02 or equivalent regulations of the U.S. Nuclear Regulatory Commission, or any Agreement State, except in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 32.18, or by the Department pursuant to 180 NAC 3-014.02 which license states that the radioactive material may be transferred by the licensee to persons exempt under 180 NAC 3-004.02 or the equivalent regulations of the U.S. Nuclear Regulatory Commission, or any Agreement State.

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3-004.03 Exempt Items.

1. Certain Items Containing Radioactive Material. Except for persons who apply radioactive material to, or persons who incorporate radioactive material into the following products, or persons who initially transfer for sale or for distribution the following products containing radioactive material any person is exempt from Title 180 to the extent that s/he receives, possesses, uses, transfers, owns, or acquires the following products:

   a. Timepieces or hands or dials containing not more than the following specified quantities of radioactive material and not exceeding the following specified radiation dose rate:

      (1) 925 MBq (25 millicuries) of tritium per timepiece.
      (2) 185 MBq (5 millicuries) of tritium per hand.

(3) 555 MBq (15 millicuries) of tritium per dial (The Department considers bezels when used to be part of the dial). Deleted: Agency

(4) 3.7 MBq (100 microcuries) of promethium-147 per watch or 7.4 MBq (200 microcuries) of promethium-147 per any other timepiece.

(5) 0.74 MBq (20 microcuries) of promethium-147 per watch hand or 1.48 MBq (40 microcuries) of promethium-147 per other timepiece hand.

(6) 2.22 MBq (60 microcuries) of promethium-147 per watch dial or 4.44 MBq (120 microcuries) of promethium-147 per other timepiece dial (bezels when used will be considered as part of the dial).

(7) 1.11 kBq (0.03 microcurie) of radium per hand.

(8) 3.33 kBq (0.09 microcurie) of radium per dial (when used bezels will be considered as part of the dial).

(9) The radiation dose rate from hands and dials containing promethium-147 will not exceed the following, when measured through 50 milligrams per square centimeter of absorber:

(a) For wrist watches, 1 μGy (0.1 millirad) per hour at 10 centimeters from any surface.

(b) For pocket watches, 1 μGy (0.1 millirad) per hour at 1 centimeter from any surface.

(c) For any other timepiece, 2 μGy (0.2 millirad) per hour at 10 centimeters from any surface.

(10) 37 kBq (one microcurie) of radium-226 per timepiece in timepieces acquired prior to August 22, 1982.

b. Lock illuminators containing not more than 555 MBq (15 millicuries) of tritium or not more than 74 MBq (2 millicuries) of promethium-147 installed in automobile locks. The radiation dose rate from each lock illuminator containing promethium-147 will not exceed 10 μGy (1 millirad) per hour at 1 centimeter from any surface when measured through 50 milligrams per square centimeter of absorber.

c. Precision balances containing not more than 37 MBq (1 millicurie) of tritium per balance or not more than 18.5 MBq (0.5 millicurie) of tritium per balance part.

d. Automobile shift quadrants containing not more than 925 MBq (25 millicuries) of tritium.

e. Marine compasses containing not more than 27.8 GBq (750 millicuries) of tritium gas and other marine navigational instruments containing not more than 9.25 GBq (250 millicuries) of tritium gas.

f. Thermostat dials and pointers containing not more than 925 MBq (25 millicuries) of tritium per thermostat.

g. Electron tubes; provided, that each tube does not contain more than one of the following specified quantities of radioactive material:

(1) 5.55 GBq (150 millicuries) of tritium per microwave receiver protector tube or 370 MBq (10 millicuries) of tritium per any other electron tube.

(2) 37 kBq (1 microcurie) of cobalt-60.
(3) 185 kBq (5 microcuries) of nickel-63.
(4) 1.11 MBq (30 microcuries) of krypton-85.
(5) 185 kBq (5 microcuries) of cesium-137.
(6) 1.11 MBq (30 microcuries) of promethium-147.

And provide further, that the levels of radiation from each electron tube containing radioactive material will not exceed 10 μGy (1 millirad) per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber.[4]

h. Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, one or more sources of radioactive material provided that:

(1) Each source contains no more than one exempt quantity set forth in 180 NAC 3, Appendix 3-B, and
(2) Each instrument contains no more than 10 exempt quantities. An instrument's source(s) may contain either one type or different types of radionuclides and an individual exempt quantity may be composed of fractional parts of one or more of the exempt quantities in 180 NAC 3, Appendix 3-B provided that the sum of such fractions does not exceed unity.
(3) For americium-241, 1.85 kBq (0.05 microcurie) is considered an exempt quantity under 180 NAC 3-004.03, item 1.h.

i. Spark gap irradiators containing not more than 37 kBq (1 microcurie) of cobalt-60 per spark gap irradiator for use in electrically ignited fuel oil burners having a firing rate of at least 3 gallons (11.4 liters) per hour.

2. Self-luminous products containing radioactive material.

a. Tritium, krypton-85, or promethium-147. Except for persons who manufacture, process, produce, or initially transfer for sale or distribution self-luminous products containing tritium, krypton-85, or promethium-147, any person is exempt from Title 180 to the extent that such person receives, possesses, uses, transfers, owns, or acquires tritium, krypton-85 or promethium-147 in self-luminous products manufactured, processed, produced, imported, or transferred in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to § 32.22 of 10 CFR 32, which license authorizes the transfer of the product to persons who are exempt from regulatory requirements. The exemption in 180 NAC

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[4]For purposes of this division, "electron tubes" include spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pickup tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents.

3-004.03, item 2 does not apply to tritium, krypton-85, or promethium-147 used in products for frivolous purposes or in toys or adornments.

b. Radium-226. Any person is exempt from Title 180 to the extent that such person receives, possesses, uses, transfers, or owns articles containing less than 3.7 kBq (0.1 microcuries) of radium-226 which were acquired prior to August 22, 1982.

3. Gas and aerosol detectors containing radioactive material.

a. Except for persons who manufacture, process, produce or initially transfer for sale or distribution gas and aerosol detectors containing radioactive material, any person is exempt from Title 180 to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in gas and aerosol detectors designed to protect life or property from fires and airborne hazards provided that detectors containing radioactive material must have been manufactured, imported, or transferred in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 32.26, or an Agreement State, pursuant to 180 NAC 3-014.03, which authorizes the transfer of the detectors to persons who are exempt from regulatory requirements.

b. Gas and aerosol detectors previously manufactured and distributed to general licensees in accordance with a specific license issued by an Agreement State are considered exempt under 180 NAC 3-004.03, item 1., provided that the device is labeled in accordance with the specific license authorizing distribution of the generally licensed device, and provided further that they meet the requirements of 180 NAC 3-014.03.

4. Resins Containing Scandium-46 and Designed for Sand Consolidation in Oil Wells. Any person is exempt from Title 180 to the extent that such person receives, possesses, uses, transfers, owns or acquires synthetic plastic resins containing scandium-46 which are designed for sand consolidation in oil wells. Such resins must have been manufactured or initially transferred for sale or distribution, in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, or must have been manufactured in accordance with the specifications contained in a specific license issued by the Department or any Agreement State to the manufacturer of such resins pursuant to licensing requirements equivalent to those in § 10 CFR 32.16 and 32.17 of the regulations of the U.S. Nuclear Regulatory Commission. This exemption does not authorize the manufacture of any resins containing scandium-46.

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LICENSES

3-005 TYPES OF LICENSES: Licenses for radioactive materials are of two types: general and specific:

3-005.01 General licenses provided in 180 NAC 3 are effective without the filing of applications with the Department or the issuance of licensing documents to the particular persons. However, registration or certification with the Department may be required by the particular general license. The general licensee is subject to all other applicable portions of Title 180 and any limitations based on the type and quantity of radioactive material of the general license.

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3-005.02 Specific licenses require the submission of an application to the Department and the issuance of a licensing document by the Department. The licensee is subject to all applicable portions of Title 180 as well as any limitations based on quantities and types of radioactive materials, proposed use and upon the training and experience of the user(s) specified in the licensing document.

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3-006 RADIOACTIVE DRUG: CAPSULES CONTAINING CARBON-14 UREA FOR "IN-VIVO" DIAGNOSTIC USE FOR HUMANS

3-006.01 Except as provided in 180 NAC 3-006.02, any person is exempt from the requirements for a license set forth in the Act and from the regulations in 180 NAC 3 and 7 provided that such person receives, possesses, uses, transfers, owns or acquires capsules containing 37 kBq (1μCi) carbon-14 urea (allowing for nominal variation that may occur during the manufacturing process) each for "in vivo" diagnostic use for humans.

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3-006.02 Any person who desires to use the capsules for research involving human subjects must apply for and receive a specific license pursuant to 180 NAC 7.

3-006.03 Any person who desires to manufacture, prepare, process, produce, package, repackage, or transfer for commercial distribution such capsules must apply for and receive a specific license from the Nuclear Regulatory Commission pursuant to 10 CFR 32.21.

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3-006.04 Nothing in 180 NAC 3-006 relieves persons from complying with applicable FDA, other Federal, and State requirements governing receipt, administration, and use of drugs.

GENERAL LICENSES

3-007 GENERAL LICENSES - SOURCE MATERIAL

3-007.01 A general license is hereby issued authorizing commercial and industrial firms, research, educational and medical institutions and Federal, State and local government agencies to use and transfer not more than 15 pounds (6.82 kg) of source material at any one time for research, development, educational, commercial or operational purposes. A person authorized to use or transfer source material, pursuant to this general license, may not receive more than a total of 150 pounds (68.2 kg) of source material in any one calendar year.

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3-007.02 Persons who receive, possess, use, or transfer source material pursuant to the general license issued in 180 NAC 3-007.01 are exempt from the provisions of 180 NAC 4 and 10 to the extent that such receipt, possession, use, or transfer is within the terms of such general license; provided, however, that this exemption does not apply to any such

person who is also in possession of source material under a specific license issued pursuant to 180 NAC 3.

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3-007.03 A general license is hereby issued authorizing the receipt of title to source material without regard to quantity. This general license does not authorize any person to receive, possess, use, or transfer source material.

3-007.04 Depleted Uranium In Industrial Products and Devices.

1. A general license is hereby issued to receive, acquire, possess, use, or transfer, in accordance with the provisions of 180 NAC 3-007.04 items 2 through 5, depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of the product or device.

2. The general license in 180 NAC 3-007.04, item 1 applies only to industrial products or devices which have been manufactured either in accordance with a specific license issued to the manufacturer of the products or devices pursuant to 180 NAC 3-014.13 or in accordance with a specific license issued to the manufacturer by the U.S. Nuclear Regulatory Commission or an Agreement State which authorizes manufacture of the products or devices for distribution to persons generally licensed by the U.S. Nuclear Regulatory Commission or an Agreement State.

3. Persons who receive, acquire, possess, or use depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1 must:

   a. File Department Form NRH-11 "Certificate - Use of Depleted Uranium Under General License," with the Department. The form must be submitted within 30 days after the first receipt or acquisition of such depleted uranium. The registrant must furnish on Department Form NRH-11 the following information and such other information as may be required by that form:

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      (1) Name and address of the general licensee;
      (2) A statement that the general licensee has developed and will maintain procedures designed to establish physical control over the depleted uranium described in 180 NAC 3-007.04, item 1 and designed to prevent transfer of such depleted uranium in any form, including metal scrap, to persons not authorized to receive the depleted uranium; and
      (3) Name and/or title, address, and telephone number of the individual duly authorized to act for and on behalf of the general licensee in supervising the procedures identified in 180 NAC 3-007.04, item 3.a.(2).

   b. Report in writing to the Department any changes in information furnished by him/her in Department Form NRH-11 "Certificate - Use of Depleted Uranium Under General License." The report must be submitted within 30 days after the effective date of such change.

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4. A person who receives, acquires, possesses, or uses depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1 must:

   a. Not introduce such depleted uranium, in any form, into a chemical, physical, or metallurgical treatment or process, except a treatment or process for repair or restoration of any plating or other covering of the depleted uranium.

   b. Not abandon such depleted uranium.

   c. Transfer or dispose of such depleted uranium only by transfer in accordance with the provisions of 180 NAC 3-025 and 4-039. In the case where the transferee receives the depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1, the transferor must furnish the transferee a copy of these regulations and a copy of Department Form NRH-11. In the case where the transferee receives the depleted uranium pursuant to a general license contained in the U.S. Nuclear Regulatory Commission or Agreement State's regulation equivalent to 180 NAC 3-007.04, item 1, the transferor must furnish the transferee a copy of Title 180 and a copy of Department Form NRH-11 accompanied by a note explaining that use of the product or device is regulated by the U.S. Nuclear Regulatory Commission or Agreement State under requirements substantially the same as those in Title 180.

   d. Within 30 days of any transfer, report in writing to the Department the name and address of the person receiving the depleted uranium pursuant to such transfer.

5. Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1 is exempt from the requirements of 180 NAC 4 and 10 with respect to the depleted uranium covered by that general license.

3-007.05 Persons who receive, possess, use, or transfer source material pursuant to the general license in 180 NAC 3-007.01 are prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as may be authorized by the Department in a specific license.

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3-008 GENERAL LICENSES - RADIOACTIVE MATERIAL OTHER THAN SOURCE MATERIAL[5]

3-008.01 Certain Devices and Equipment: A general license is hereby issued to transfer, receive, acquire, own, possess, and use radioactive material incorporated in the following devices or equipment which have been manufactured, tested and labeled by the manufacturer in accordance with a specific license issued to the manufacturer by the U.S. Nuclear Regulatory Commission for use pursuant to 10 CFR 31.3. This general license is

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[5]Note: Different general licenses are issued in 180 NAC 3-008, each of which has its own specific conditions and requirements.

subject to the provisions of 180 NAC 1-004 through 009, 180 NAC 3-004.01, item 2, 180 NAC 3-017, 3-025, and 3-026, 3-030, 180 NAC 4,[6] and 180 NAC 10, 13, 17 and 18.

1. Static Elimination Device. Devices designed for use as static eliminators which contain, as sealed source or sources, radioactive material consisting of a total of not more than 18.5 MBq (500 microcuries) of polonium-210 per device.

2. Ion Generating Tube. Devices designed for ionization of air which contain, as a sealed source or sources, radioactive material consisting of a total of not more than 18.5 MBq (500 microcuries) of polonium-210 per device or a total of not more than 1.85 GBq (50 millicuries) of hydrogen-3 (tritium) per device.

3-008.02 Reserved

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3-008.03 Reserved

3-008.04 Certain Measuring, Gauging and Controlling Devices[7]

1. A general license is hereby issued to commercial and industrial firms and to research, educational and medical institutions, individuals in the conduct of their business, and state or local government agencies to own, receive, acquire, possess, use or transfer in accordance with the provisions of 180 NAC 3-008.04, items, 2, 3 and 4, radioactive material, excluding special nuclear material, contained in devices 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.

2. The general license in 180 NAC 3-008.04, item 1 applies only to radioactive material contained in devices which have been manufactured or initially transferred and labeled in accordance with the specification contained in a specific license issued under 180 NAC 3-014.04; or an equivalent specific license issued by the U. S. Nuclear Regulatory Commission or an Agreement State.

   The devices must have been received from one of the specific licensees described in this paragraph or through a transfer made under 180 NAC 3-008.04, item 3.i.

3. Any person who owns, receives, acquires, possesses, uses, or transfers radioactive material in a device pursuant to the general license in 180 NAC 3-008.04, item 1 must:

[6]Attention is directed particularly to the provisions of 180 NAC 4 which relate to the labeling of containers.

[7]Persons possessing radioactive material in devices under 180 NAC 3-008.04 before January 1975, may continue to possess, use, or transfer that material in accordance with the labeling requirements of 180 NAC 3-008.04 in effect on January 14, 1975.

a. Assure that all labels affixed to the device at the time of receipt, and bearing a statement that removal of the label is prohibited, are maintained thereon and comply with all instructions and precautions provided by such labels;

b. Assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than six-month intervals or at such other intervals as are specified in the label, however,

(1) Devices containing only krypton need not be tested for leakage of radioactive material, and
(2) Devices containing only tritium or not more than 3.7 MBq (100 microcuries) of other beta and/or gamma emitting material or 0.37 MBq (10 microcuries) of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose;

c. Assure that the tests required by 180 NAC 3-008.04, item 3.b. and other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:

(1) In accordance with the instructions provided by the labels; or
(2) By a person holding an applicable specific license from the Department, the U.S. Nuclear Regulatory Commission, or an Agreement State to perform such activities;

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d. Maintain records showing compliance with the requirements of 180 NAC 3-008.04, items 3.b. and 3.c. The records must show the results of the tests. The records also must show the dates of performance of, and the names of persons performing, testing, installation, servicing, and removal from installation concerning the radioactive material, its shielding or containment. The licensee must retain these records as follows:

(1) Each record of test for leakage of radioactive material required by 180 NAC 3-008.04, item 3.b. must be maintained until the sealed source is transferred or disposed of.
(2) Each record of tests of the on/off mechanism and indicator required by 180 NAC 3-008.04, item 3.b. must be retained for 3 years after the next required test of the "on-off" mechanism and indicator is performed or until the sealed source is transferred or disposed of.
(3) Each record which is required by 180 NAC 3-008.04, item 3.c. must be retained for a period of three years from the date of the recorded event or until the device is transferred or disposed of;

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e. Immediately suspend operation of the device if there is a failure of, or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on-off mechanism or indicator, or

upon the detection of 185 becquerel (0.005 microcurie) or more removable radioactive material. The device may not be operated until it has been repaired by the manufacturer or other person holding a specific license to repair such devices that was issued by this Department, the U.S. Nuclear Regulatory Commission or by an Agreement State. The device and any radioactive material from the device may only be disposed of by transfer to a person authorized by a specific license to receive the radioactive material in the device or as otherwise approved by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State. A report containing a brief description of the event and the remedial action taken; and, in the case of detection of 185 becqueral (0.005 microcurie) or more removable radioactive material or failure of or damage to a source likely to result in contamination of the premises or the environs, a plan for ensuring that the premises and environs are acceptable for unrestricted use, must be furnished to the Department within 30 days. Under these circumstances, the criteria set out in 180 NAC 4-016, "Radiological Criteria for Unrestricted Use," may be applicable, as determined by the Department on a case-by-case basis;

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f. Not abandon the device containing radioactive material;

g. Not export the device containing byproduct material except in accordance with 10 CFR, 110.

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h. Transfer or Disposal of Device Containing Radioactive Material

(1) Transfer or dispose of the device containing radioactive material only by export as provided by 180 NAC 3-008.04 item 3.g., by transfer to another general licensee as authorized in paragraph 180 NAC 3-008.04, item 3. i., or to a person authorized to receive the device by a specific license issued under 180 NAC 3, or 180 NAC 12 that authorized waste collection, or equivalent regulations of the U.S. Nuclear Regulatory Commission or an Agreement State, or as otherwise approved under 180 NAC 3-008.04, item 3. h. (3).

(2) Furnish a report to the Department within 30 days after the transfer of a device to a specific licensee or export. The report must contain:

(a) The identification of the device by manufacturer's (or initial transferor's) name, model number, and serial number;
(b) The name, address, and license number of the person receiving the device (license number not applicable if exported); and
(c) The date of the transfer.

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(3) Obtain written Department approval before transferring the device to any other specific licensee not specifically identified in 180 NAC 3-008.04 item 3.h.(1).

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i. Transfer the device to another general licensee only if:

(1) The device remains in use at a particular location. In such case the transferor must give the transferee a copy of 180 NAC 3-008.01, 3-030, 4-057, and 4-058, and any safety documents identified in the label of the device. Within 30 days of the transfer, the transferor must report to the Department:

(a) The manufacturer's (or initial transferor's) name;
(b) The model number and the serial number of the device transferred;
(c) The transferee's name and mailing address for the location of use; and
(d) The name, title, and phone number of the responsible individual identified by the transferee in accordance with 180 NAC 3-008.04, item 3., I. to have knowledge of and authority to take actions to ensure compliance with the appropriate regulations and requirements; or

(2) The device is held in storage by an intermediate person in the original shipping container at its intended location of use prior to initial use by a general licensee.

j. Comply with the provisions of 180 NAC 4-057 and 4-058 for reporting radiation incidents, theft, or loss of licensed material, but will be exempt from the other reporting requirements of 180 NAC 4 and 10.

k. Respond to written requests from the Department to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it must, within the same time period, request a longer period to supply information by submitting a letter to the Radioactive Material Program Manager, Nebraska Health and Human Services, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026 and provide written justification as to why it cannot comply.

l. Appoint an individual responsible for having knowledge of the appropriate regulations and requirements and the authority for taking required actions to comply with appropriate regulations and requirements. The general licensee, through this individual, must ensure the day-to-day compliance with appropriate regulations and requirements. This appointment does not relieve the general licensee of any of its responsibility in this regard.

m. Register general license devices.

(1) Register, in accordance with 180 NAC 3-008.04, item 3., m., (2) and

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(3), devices containing at least 370 MBq (10 mCi) of cesium-137, 3.7 MBq (0.1 mCi) of strontium-90, 37 MBq (1 mCi) of cobalt-60, or 37 MBq (1 mCi) of americium-241 or any other transuranic (i.e., element with atomic number greater than uranium (92)), based on the activity indicated on the label. Each address for a location of use, as described in 180 NAC 3-008.04, item 3., m., (3), d., represents a separate general licensee and requires a separate registration and fee.

(2) If in possession of a device meeting the criteria of 180 NAC 3-008.04, item 3., m., (1), must register these devices annually with the Department and must pay the fee required by 180 NAC 18. Registration must be done by verifying, correcting, and/or adding to the information provided in a request for registration received from the Department. The registration information must be submitted to the Department within 30 days of the date of the request for registration or as otherwise indicated in the request. In addition, a general licensee holding devices that meet the criteria of 180 NAC 3-008.04, item 3 m. (1) is subject to the bankruptcy notification requirement in 180 NAC 3-017.05.

(3) In registering devices, the general licensee must furnish the following information and any other information specifically requested by the Department:

(a) Name and mailing address of the general licensee.
(b) Information about each device: the manufacturer (or initial transferor), model number, serial number, the radionuclide and activity (as indicated on the label).
(c) Name, title, and telephone number of the responsible person designated as a representative of the general licensee in 180 NAC 3-008.04, item 3. l.
(d) Address or location at which the device(s) are used and/or stored. For portable devices, the address of the primary place of storage.
(e) Certification by the responsible representative of the general licensee that the information concerning the device(s) has been verified through a physical inventory and checking of label information.
(f) Certification by the responsible representative of the general licensee that they are aware of the requirements of the general license.

(4) Persons generally licensed by an Agreement State or the NRC, with respect to devices meeting the criteria in paragraph 180 NAC 3-008.04, item 3., m. (1) are not subject to registration requirements if the devices are used in areas subject to Department jurisdiction for a period less than 180 days in any calendar year. The Department will not request registration information from such licensees.

n. Report changes to the mailing address for the location of use (including

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change in name of general licensee) to the Radioactive Materials Program Director , Nebraska Health and Human Services, 301 Centennial Mall South, P.O. Box 95026, Lincoln, NE 68509-5026 within 30 days of the effective date of the change. For a portable device, a report of address change is only required for a change in the device's primary place of storage.

o. Not hold unused devices for longer than 2 years. If devices with shutters are not being used, the shutter must be locked in the closed position. The testing required by 180 NAC 3-008.04, item 3. b. need not be performed during the period of storage only. However, when devices are put back into service or transferred to another person, and have not been tested within the required test interval, they must be tested for leakage before use or transfer and the shutter tested before use. Devices kept in standby for future use are excluded from the two-year time limit if the general licensee performs quarterly physical inventories of these devices while they are in standby.

4. The general license in 180 NAC 3-008.04, item 1. does not authorize the manufacture or import of devices containing radioactive material.

5. The general license provided in 180 NAC 3-008.04, item 1. is subject to the provisions of 180 NAC 1-004 through 1-009, 180 NAC 3-017, 3-025, 3-027, and 180 NAC 13 .

3-008.05 Luminous Safety Devices for Aircraft

1. A general license is hereby issued to own, receive, acquire, possess, and use tritium or promethium-147 contained in luminous safety devices for use in aircraft, provided:

   a. Each device contains not more than 370 GBq (l0 curies) of tritium or 11.1 GBq (300 millicuries) of promethium-147; and
   b. Each device has been manufactured, assembled or initially transferred in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, or each device has been manufactured or assembled in accordance with the specifications contained in a specific license issued by the Department or any Agreement State to the manufacturer or assembler of such device pursuant to licensing requirements equivalent to those in 10 CFR 30.33. and 32.53.

2. Persons who own, receive, acquire, possess, or use luminous safety devices pursuant to the general license in 180 NAC 3-008.05, item 1. are exempt from the requirements of 180 NAC 4 and 10 except that they must comply with the provisions of 180 NAC 4-057 and 4-058.

3. This general license does not authorize the manufacture, assembly, repair, or import of luminous safety devices containing tritium or promethium-147.

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4. This general license does not authorize ownership, receipt, acquisition, possession or use of promethium-147 contained in instrument dials.

5. This general license is subject to the provisions of 180 NAC 1-004 through 1-009, 180 NAC 3-017, 3-025, 3-027, and 13.

6. This general license does not authorize the export of luminous safety devices containing tritium or promethium-147.

3-008.06 Ownership of Radioactive Material: A general license is hereby issued to own radioactive material without regard to quantity. Notwithstanding any other provisions of 180 NAC 3, this general license does not authorize the manufacture, production, transfer, receipt, possession or use of radioactive material.

3-008.07 Calibration and Reference Sources

1. A general license is hereby issued to those persons listed below to own, receive, acquire, possess, use, and transfer, in accordance with the provisions of 180 NAC 3-008.07, items 4. and 5., americium-241 in the form of calibration or reference sources:

   a. Any person who holds a specific license issued by the Department which authorizes the licensee to receive, possess, use, and transfer radioactive material; and
   b. Any person who holds a specific license issued by the U.S. Nuclear Regulatory Commission which authorizes the licensee to receive, possess, use, and transfer special nuclear material.

2. A general license is hereby issued to own, receive, possess, use, and transfer plutonium in the form of calibration or reference sources in accordance with the provisions of 180 NAC 3-008.07, items 4. and 5. to any person who holds a specific license issued by the Department which authorizes the license to receive, possess, use, and transfer radioactive material.

3. A general license is hereby issued to own, receive, possess, use, and transfer radium-226 in the form of calibration or reference sources in accordance with the provisions of 180 NAC 3-008.07, items 4 and 5 to any person who holds a specific license issued by the Department which authorizes the licensee to receive, possess, use, and transfer radioactive material.

4. The general licenses in 180 NAC 3-008.07, items 1. through 3. apply only to calibration or reference sources which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer or importer of the sources by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 30.33, in accordance with the specifications contained in a specific license issued to the manufacturer by the Department, or any Agreement State

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pursuant to licensing requirements equivalent to those contained in 10 CFR 30.33.

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5. The general licenses provided in 180 NAC 3-008.07, items 1. through 3. are subject to the provisions of 180 NAC 1-004 through 1-009, 180 NAC 3-017, 3-025, 3-027, 180 NAC 4, 10, and 13. In addition, persons who own, receive, acquire, possess, use or transfer one or more calibration or reference sources pursuant to these general licenses must:

   a. Not possess at any one time, at any one location of storage or use, more than 185 kBq (5 microcuries) of americium-241, 185 kBq (5 microcuries) of plutonium, and 185 kBq (5 microcuries) of radium-226 in such sources;

   b. Not receive, possess, use, or transfer such source unless the source, or the storage container, bears a label which includes the following statement or a substantially similar statement which contains the information called for in the following statement.

      (1) The receipt, possession, use and transfer of this source Model _____, Serial No. _____, are subject to a general license and the regulations of the U.S. Nuclear Regulatory Commission or of a State with which the Commission has entered into an agreement for the exercise of regulatory authority. Do not remove this label.

      CAUTION - RADIOACTIVE MATERIAL - THIS SOURCE CONTAINS (RADIUM-226) (AMERICIUM-241). (PLUTONIUM)[8] DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE.

      _____
      Name of manufacturer or importer

   c. Not transfer, abandon, or dispose of such source except by transfer to a person authorized by a license from the Department, the U.S. Nuclear Regulatory Commission, or any other Agreement State to receive the source;

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   d. Store such source, except when the source is being used, in a closed container adequately designed and constructed to contain americium-241, plutonium, or radium-226 which might otherwise escape during storage; and

   e. Not use such source for any purpose other than the calibration of radiation detectors or the standardization of other sources.

[8]Showing only the name of the appropriate material.

6. These general licenses do not authorize the manufacture of calibration or reference sources containing americium-241, plutonium, or radium-226.

3-008.08 Reserved

3-008.09 General License for Use of Radioactive Material for Certain In Vitro Clinical or Laboratory Testing

1. A general license is hereby issued to any physician, veterinarian in the practice of veterinary medicine, clinical laboratory or hospital to receive, acquire, possess, transfer or use, for any of the following stated tests, in accordance with the provisions of 180 NAC 3-008.09, items 2. through 6., the following radioactive materials in prepackaged units for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals:

   a. Iodine-125, iodine-131, selenium-75, cobalt-57, and carbon-14 in units not exceeding 370 kBq (10 microcuries) each.
   b. Hydrogen-3 (tritium), in units not exceeding 1.85 MBq (50 microcuries) each.
   c. Iron-59, in units not exceeding 740 kBq (20 microcuries) each.
   d. Mock Iodine-125 reference or calibration sources, in units not exceeding 1.85 kBq (0.05 microcurie) of iodine-129 and 1.85 Bq (0.005 microcurie) of americium-241 each.

2. No person receives, acquires, possesses, uses or transfers radioactive material pursuant to the general license established by 180 NAC 3-008.09, item 1. until s/he has filed Department Form NRH-17, "Certificate - In Vitro Testing with Radioactive Material Under General License", with the Department and received from the Department a validated copy of Department Form NRH-17 with certification number assigned. The physician, veterinarian, clinical laboratory or hospital must furnish on Department Form NRH-17 the following information and such other information as may be required by that form:

   a. Name and address of the physician, veterinarian, clinical laboratory or hospital;
   b. The location of use; and
   c. A statement that the physician, veterinarian in the practice of veterinary medicine, clinical laboratory or hospital has appropriate radiation measuring instruments to carry out in vitro clinical or laboratory tests with radioactive material as authorized under the general license in 180 NAC 3-008.09, item 1. and that such tests will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive material.

3. A person who receives, acquires, possesses or uses radioactive material pursuant to the general license established by 180 NAC 3-008.09, item 1. must comply with the following:

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a. The general licensee must not possess at any one time, pursuant to the general license in 180 NAC 3-008.09, item 1. at any one location of storage or use a total amount of iodine-125, iodine-131, iron-59, cobalt-57 and/or selenium-75 in excess of 7.4 MBq (200 microcuries).

b. The general licensee must store the radioactive material, until used, in the original shipping container or in a container providing equivalent radiation protection.

c. The general licensee must use the radioactive material only for the uses authorized by 180 NAC 3-008.09, item 1.

d. The general licensee must not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the Department, the U.S. Nuclear Regulatory Commission, or any Agreement State, nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the supplier.

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e. The general licensee must dispose of the Mock Iodine-125 reference or calibration sources described in 180 NAC 3-008.09, item 1.d. as required by 180 NAC 4-039 and 4-044.

4. The general licensee must not receive, acquire, possess, or use radioactive material pursuant to 180 NAC 3-008.09, item 1.:

a. Except as prepackaged units which are labeled in accordance with the provisions of an applicable specific license issued pursuant to 180 NAC 3-014.08 or in accordance with the provisions of a specific license issued by the U.S. Nuclear Regulatory Commission, or any Agreement State which authorizes the manufacture and distribution of iodine-125, iodine-131, carbon-14, hydrogen-3 (tritium), iron-59, selenium-75, cobalt-57, or Mock Iodine-125 to persons generally licensed under 180 NAC 3-008.09 or its' equivalent, and

b. Unless the following statement, or substantially similar statement which contains the information called for in the following statement, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

This radioactive material is received, acquired, possessed, and used only by physicians, veterinarians in the practice of veterinary medicine, clinical laboratories or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to the regulations and a general license of the U.S. Nuclear Regulatory Commission or of a State with which the

Commission has entered into an agreement for the exercise of regulatory authority.

_____
Name of Manufacturer

5. The physician, veterinarian in the practice of veterinary medicine, clinical laboratory or hospital possessing or using radioactive material under the general license of 180 NAC 3-008.09, item 1. must report in writing to the Department, any changes in the information furnished by him/her in the "Certificate - In Vitro Testing with Radioactive Material Under General License", Department Form NRH-17. The report must be furnished within 30 days after the effective date of such change.

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6. Any person using radioactive material pursuant to the general license of 180 NAC 3-008.09, item 1 is exempt from the requirements of 180 NAC 4 and 10 with respect to radioactive material covered by that general license, except that such persons using the Mock Iodine-125 described in 180 NAC 3-008.09 item 1.d. must comply with the provisions of 180 NAC 4-039, 4-057, and 4-058.

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3-008.10 Ice Detection Devices

1. A general license is hereby issued to own, receive, acquire, possess, use, and transfer strontium-90 contained in ice detection devices, provided each device contains not more than 1.85 MBq (50 microcuries) of strontium-90 and each device has been manufactured or imported in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission or each device has been manufactured in accordance with the specifications contained in a specific license issued by the Department or any Agreement State to the manufacturer of such device pursuant to licensing requirements equivalent to those in 10 CFR 32.61.

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2. Persons who own, receive, acquire, possess, use, or transfer strontium-90 contained in ice detection devices pursuant to the general license in 180 NAC 3-008.10, item 1,

   a. Must upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating to the device, discontinue use of the device until it has been inspected, tested for leakage, and repaired by a person holding a specific license from the U.S. Nuclear Regulatory Commission or an Agreement State to manufacture or service such devices; or must dispose of the device pursuant to the provisions of 180 NAC 4-039;

   b. Must assure that all labels affixed to the device at the time of receipt, and which bear a statement which prohibits removal of the labels, are maintained thereon; and

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c. Are exempt from the requirements of 180 NAC 4 and 10 except that such persons must comply with the provisions of 180 NAC 4-039, 4-057, and 4-058.

3. This general license does not authorize the manufacture, assembly, disassembly, repair or import of strontium-90 in ice detection devices.

4. This general license is subject to the provisions of 180 NAC 1-004 through 1-009, 180 NAC 3-017, 180 NAC 3-025, 180 NAC 3-027, and 180 NAC 13.

3-009 RESERVED

SPECIFIC LICENSES

3-010 FILING APPLICATION FOR SPECIFIC LICENSES

3-010.01 Applications for specific licenses must be filed on form NRH-7 (medical) for all medical licenses and form NRH-5 for all other licenses.

3-010.02 The Department may at any time after the filing of the original application require further statements in order to enable the Department to determine whether the application should be granted or denied or whether a license should be modified or revoked.

3-010.03 Each application must be signed by the applicant or licensee or a person duly authorized to act for and on his/her behalf.

3-010.04 An application for a license may include a request for a license authorizing one or more activities.

3-010.05 In the application, the applicant may incorporate by reference information contained in previous applications, statements, or reports filed with the Department provided such references are clear and specific.

3-010.06 Applications and documents submitted to the Department may be made available for public inspection except that the Department may withhold any document or part thereof from public inspection if disclosure of its content is not required in the public interest and would adversely affect the interest of a person concerned.

3-010.07 As provided by 180 NAC 3-018 certain applications for specific licenses filed under 180 NAC 3, 5, and 7, must contain a proposed decommissioning funding plan or a certification of financial assurance for decommissioning.

3-010.08 An application for a specific license to use radioactive material in the form of a sealed source or in a device that contains the sealed source must either:

1. Identify the source or device by manufacturer and model number as registered with the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or with an Agreement State; or

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2. Contain the information identified in 10 CFR 32.210(c).

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3-010.09 Emergency Plans

1. Each application to possess radioactive materials in unsealed form, on foils or plated sources, or sealed in glass in excess of the quantities in 180 NAC 3, Appendix 3-E "Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release" must contain either:

   a. An evaluation showing that the maximum dose to a person offsite due to a release of radioactive materials would not exceed 0.01 Sv (1 rem) effective dose equivalent or 0.05 Sv (5 rem) to the thyroid; or
   b. An emergency plan for responding to a release of radioactive material.

2. One or more of the following factors may be used to support an evaluation submitted under 180 NAC 3-010.09, item 1:

   a. The radioactive material is physically separated so that only a portion could be involved in an accident;
   b. All or part of the radioactive material is not subject to release during an accident because of the way it is stored or packaged;
   c. The release fraction in the respirable size range would be lower than the release fraction shown in 180 NAC 3, Appendix 3-E due to the chemical or physical form of the material;
   d. The solubility of the radioactive material would reduce the dose received;
   e. Facility design or engineered safety features in the facility would cause the release fraction to be lower than shown in 180 NAC 3, Appendix 3-E;
   f. Operating restrictions or procedures would prevent a release fraction as large as that shown in 180 NAC 3, or
   g. Other factors appropriate for the specific facility.

3. An emergency plan for responding to a release of radioactive material submitted under 180 NAC 3-010.09 must include the following information:

   a. Facility description: A brief description of the licensee's facility and area near the site.
   b. Types of accidents: An identification of each type of radioactive materials accident for which protective actions may be needed.
   c. Classification of accidents: A classification system for classifying accidents as alerts or site area emergencies.
   d. Detection of accidents: Identification of the means of detecting each type of accident in a timely manner.
   e. Mitigation of consequences: A brief description of the means and equipment for mitigating the consequences of each type of accident, including those provided to protect workers onsite, and a description of the program for maintaining the equipment.
   f. Assessment of releases: A brief description of the methods and equipment to assess releases of radioactive materials.

g. Responsibilities: A brief description of the responsibilities of licensee personnel should an accident occur, including identification of personnel responsible for promptly notifying offsite response organizations and the Department; also responsibilities for developing, maintaining, and updating the plan. Deleted: Agency

h. Notification and coordination: A commitment to and a brief description of the means to promptly notify offsite response organizations and request offsite assistance, including medical assistance for the treatment of contaminated injured onsite workers when appropriate. A control point must to be established. The notification and coordination must be planned so that unavailability of some personnel, parts of the facility, and some equipment will not prevent the notification and coordination. The licensee must also commit to notify the Department immediately after notification of the appropriate offsite response organizations and not later than one hour after the licensee declares an emergency.[9] Deleted: Agency

i. Information to be communicated: A brief description of the types of information on facility status, radioactive releases, and recommended protective actions, if necessary, to be given to offsite response organizations and to the Department. Deleted: Agency

j. Training: A brief description of the frequency, performance objectives and plans for the training that the licensee will provide workers on how to respond to an emergency including any special instructions and orientation tours the licensee would offer to fire, police, medical and other emergency personnel. The training must familiarize personnel with site-specific emergency procedures. Also, the training must thoroughly prepare site personnel for their responsibilities in the event of accident scenarios postulated as most probable for the specific site, including the use of team training for such scenarios.

k. Safe shutdown: A brief description of the means of restoring the facility to a safe condition after an accident.

l. Exercises: Provisions for conducting quarterly communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies. Quarterly communications checks with offsite response organizations must include the check and update of all necessary telephone numbers. The licensee must invite offsite response organizations to participate in the biennial exercises. Participation of offsite response organizations in biennial exercises although recommended is not required. Exercises must use accident scenarios postulated as most probable for the specific site and the scenarios must not be known to most exercise participants. The licensee must critique each exercise using individuals not having direct implementation responsibility for the plan. Critiques of exercises must evaluate the appropriateness of the plan, emergency procedures, facilities, equipment, training of personnel, and

[9]These reporting requirements do not supersede or release licensees of complying with the requirements under the Emergency Planning and Community Right-to-Know Act of 1986, Title III, P. L. 99-499 or other state or federal reporting requirements.

overall effectiveness of the response. Deficiencies found by the critiques must be corrected.

m. Hazardous chemicals: A certification that the applicant has met its responsibilities under the Emergency Planning and Community Right-to-Know Act of 1986, Title III, P. L. 99-499, if applicable to the applicant's activities at the proposed place of use of the radioactive material.

4. The licensee must allow the offsite response organizations, expected to respond in case of an accident, 60 days to comment on the licensee's emergency plan before submitting it to the Department. The licensee must provide any comments received within the 60 days to the Department with the emergency plan.

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3-011 GENERAL REQUIREMENTS FOR THE ISSUANCE OF SPECIFIC LICENSES: A license application will be approved if the Department determines that:

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1. The applicant is qualified by reason of training and experience to use the material in question for the purpose requested in accordance with Title 180 in such a manner as to minimize danger to public health and safety or property;

2. The applicant's proposed equipment, facilities, and procedures are adequate to minimize danger to the public health and safety or property;

3. The issuance of the license will not be inimical to the health and safety of the public; and

4. The applicant satisfies any applicable special requirements in 180 NAC 3-013, 180 NAC 3-014, or 180 NAC 3-015, 180 NAC 5, 180 NAC 7, 180 NAC 12, 180 NAC 14 or 180 NAC 19.

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3-011.01 Environmental Report, Commencement of Construction: In the case of an application for a license to receive and possess radioactive material for commercial waste management, source material milling, or for the conduct of any other activity which the Department determines will significantly affect the quality of the environment, the Department, before commencement of construction of the plant or facility in which the activity will be conducted, has concluded, after weighing the environmental, economic, technical and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. Commencement of construction prior to such conclusion is grounds for denial of a license to receive and possess radioactive material in such plant or facility. As used in this paragraph the term "commencement of construction" means any clearing of land, excavation or other substantial action that would adversely affect the environment of a site. The term does not mean site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring or testing to establish background information related to the suitability of the site or the protection of the environmental values.

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3-011.02 Financial Surety Arrangements for Site Reclamation

1. Pursuant to Radiation Control Act §71-3508.04, Reissued Revised Statues of Nebraska 1943, as amended and as otherwise provided, financial surety arrangements for site reclamation which may consist of surety bonds, cash deposits, certificates of deposit, deposits of government securities, letters or lines of credit, or any combination of the above for the categories of licensees listed in 180 NAC 3-011.02 must be established to ensure the protection of the public health and safety in the event of abandonment, default, or other inability of the licensee to meet the requirements of the Act.

   a. The amount of funds to be ensured by such surety arrangements must be based on Department approved cost estimates equal to meet the requirements of 180 NAC 3-011.02, item 1.
   b. Self insurance, or any arrangement which essentially constitutes self insurance, will not satisfy the surety requirement since this provides no additional assurance other than that which already exists through license requirements.

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2. The arrangements required in 180 NAC 3-011.02, item 1. must be established prior to issuance of the license to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the facility, except as provided in 180 NAC 3-011.02, item 3.

3. If application is made to amend an existing license to fall within the purview of 180 NAC 3-011.06 then the financial surety arrangements for site reclamation must be established prior to the issuance of the amendment.

4. The following specific licensees are required to make financial surety arrangements:

   a. Major processors;
   b. Waste management licensees, except the commercial disposal of low-level radioactive waste in a disposal facility, designated by the Central Interstate Low-Level Radioactive Waste Compact Commission;
   c. Former U.S. Atomic Energy Commission or U.S. Nuclear Regulatory Commission licensed facilities;
   d. Source material milling operations; and
   e. All others except persons exempt pursuant to 180 NAC 3-011.02, item 5.

5. The following persons are exempt from the requirements of 180 NAC 3-011.02, item 1. because they are exempt from licensure:

   a. All State, local, or other government agencies unless they are subject to 180 NAC 3-011.02, item 4.b. or 4.d.,
   b. Persons authorized to possess no more than 1,000 times the quantity specified in 180 NAC 3, Appendix 3-B or combination of radioactive material listed therein as given in 180 NAC 3, Appendix 3-B, Note 1.;
   c. Persons authorized to possess hydrogen-3 contained as hydrogen gas in a sealed source; or

d. Persons authorized to possess radioactive noble gases in sealed sources with no radioactive daughter product with half-life greater than 30 days.

6. Long-term Care Requirements: Pursuant to Radiation Control Act §71-3508.04, Reissued Revised Statues of Nebraska, 1943, as amended and as otherwise provided, a long-term care fund must be established by the following specific licensees prior to the issuance of the license or prior to the termination of the license if the applicant chooses at the time of the licensure to provide a surety in lieu of a long-term care fund:

a. Waste management licensees.
b. Source material milling and mill tailings licensees.

3-012 RESERVED

3-013 SPECIAL REQUIREMENTS FOR SPECIFIC LICENSES OF BROAD SCOPE: 180 NAC 3-013 prescribes requirements for the issuance of specific licenses of broad scope for radioactive material ("broad licenses") and certain regulations governing holders of such licenses:

3-013.01 The different types of broad licenses are set forth below:

1. A "Type A specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of the radioactive material specified in the license, but not exceeding quantities specified in the license, for any authorized purpose. The quantities specified are usually in the multicurie range, and the limits are based on types of radioactive materials, proposed use and upon the training and experience of the user(s).

2. A "Type B specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of radioactive material specified in 180 NAC 3, Appendix 3-C for any authorized purpose. The possession limit for a Type B broad license, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in Column I of 180 NAC 3, Appendix 3-C, Column I. If two or more radionuclides are possessed thereunder, the possession limit for each is determined as follows: For each radionuclide, determine the ratio of the quantity possessed to the applicable quantity specified in 180 NAC 3, Appendix 3-C, Column I, for that radionuclide. The sum of the ratios for all radionuclides possessed under the license must not exceed unity.

3. A "Type C specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of radioactive material specified in 180 NAC 3, Appendix 3-C for any authorized purpose. The possession limit for a Type C broad license, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in 180 NAC 3, Appendix 3-C, Column II. If two or more radionuclides are possessed thereunder, the possession limit is determined for each as follows:

For each radionuclide determine the ratio of the quantity possessed to the applicable quantity specified in 180 NAC 3, Appendix 3-C, Column II for that radionuclide. The sum of the ratios for all radionuclides possessed under the license must not exceed unity.

3-013.02 An application for a Type A specific license of broad scope will be approved if:

1. The applicant satisfies the general requirements specified in 180 NAC 3-011;
2. The applicant has engaged in a reasonable number of activities involving the use of radioactive material; and
3. The applicant has established administrative controls and provisions relating to organization and management, procedures, record keeping, material control and accounting, and management review that are necessary to assure safe operations, including:

    a. The establishment of a radiation safety committee composed of such persons as a radiation safety officer, a representative of management, and persons trained and experienced in the safe use of radioactive material;
    b. The appointment of a radiation safety officer who is qualified in training and experience in radiation protection consistent with the requirements of training specified in 180 NAC 15-015.01, item 1, and who is available for advice and assistance on radiation safety matters; and
    c. Authorized users designated by the Radiation Safety Committee must have formal training and experience in the safe handling of radioactive material consistent with the requirements of training specified in 180 NAC 15-015.01, item 2.; and
    d. The establishment of appropriate administrative procedures to assure:

        (1) Control of procurement and use of radioactive material;
        (2) Completion of safety evaluations of proposed uses of radioactive material which takes into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures; and
        (3) Review, approval, and recording by the radiation safety committee of safety evaluations of proposed uses prepared in accordance with 180 NAC 3-013.02, item 3.d.(2). prior to use of the radioactive material.

3-013.03 An application for a Type B specific license of broad scope will be approved if:

1. The applicant satisfies the general requirements specified in 180 NAC 3-011; and
2. The applicant has established administrative controls and provisions relating to organization and management, procedures, record keeping, material control and accounting, and management review that are necessary to assure safe operations, including:

    a. The appointment of a radiation safety officer who is qualified by training and experience in radiation protection consistent with the requirements of

training specified in 180 NAC 15-015.01, item 1 and who is available for advice and assistance on radiation safety matters,

b. Authorized users must have formal training and experience in the safe handling of radioactive material consistent with the requirements of training specified in 180 NAC 15-015.01, item 2; and

c. The establishment of appropriate administrative procedures to assure:

(1) Control of procurement and use of radioactive material,

(2) Completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures, and

(3) Review, approval, and recording by the radiation safety officer of safety evaluations of proposed uses prepared in accordance with 180 NAC 3-013.03, item 2.c. prior to use of the radioactive material.

3-013.04 An application for a Type C specific license of broad scope will be approved if:

1. The applicant satisfies the general requirements specified in 180 NAC 3-011;
2. The applicant submits a statement that radioactive material will be used only by, or under the direct supervision of, individuals who have received:

a. A college degree at the bachelor level, or equivalent training and experience, in the physical or biological sciences or in engineering, and

b. At least 40 hours of formal training and 160 hours experience in the safe handling of radioactive material, and in the characteristics of ionizing radiation, units of radiation dose and quantities, radiation detection instrumentation, and biological hazards of exposure to radiation appropriate to the type and forms of radioactive material to be used; and

3. The applicant has established administrative controls and provisions relating to procurement of radioactive material, procedures, record keeping, material control and accounting, and management review necessary to assure safe operations.

3-013.05 Specific licenses of broad scope are subject to, based on quantities and types of radioactive materials, proposed use and upon the training and experience of the user(s), to the following conditions:

1. Unless specifically authorized, persons licensed pursuant to 180 NAC 3-013 must not:

a. Conduct tracer studies in the environment involving direct release of radioactive material;

b. Receive, acquire, own, possess, use or transfer devices containing 3.7 PBq (100,000 curies) or more of radioactive material in sealed sources used for irradiation of materials;

c. Conduct activities for which a specific license issued by the Department under 180 NAC 3-014, 3-015 or 180 NAC 7, and 12 is required; or

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d. Add or cause the addition of radioactive material to any food, beverage, cosmetic, drug, or other product designed for ingestion or inhalation by, or application to, a human being.

2. Each Type A specific license of broad scope issued under this 180 NAC 3-013.05 is subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety committee.

3. Each Type B specific license of broad scope issued under 180 NAC 3-013.05 is subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety officer.

4. Each Type C specific license of broad scope issued under this 180 NAC 3-013.05, item 4 is subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals who satisfy the requirements of 180 NAC 3-013.04.

3-014 SPECIAL REQUIREMENTS FOR A SPECIFIC LICENSE TO MANUFACTURE, ASSEMBLE, REPAIR, OR DISTRIBUTE COMMODITIES, PRODUCTS, OR DEVICES WHICH CONTAIN RADIOACTIVE MATERIAL

3-014.01 Licensing the Introduction of Radioactive Material Into Products In Exempt Concentrations

1. In addition to the requirements set forth in 180 NAC 3-011, a specific license authorizing the introduction of radioactive material into a product or material owned by or in the possession of the licensee or another to be transferred to persons exempt under 180 NAC 3-004.01, item 1 will be issued if:

   a. The applicant submits a description of the product or material into which the radioactive material will be introduced, intended use of the radioactive material and the product or material into which it is introduced, method of introduction, initial concentration of the radioactive material in the product or material, control methods to assure that no more than the specified concentration is introduced into the product or material, estimated time interval between introduction and transfer of the product or material, and estimated concentration of the radioactive material in the product or material at the time of transfer; and

   b. The applicant provides reasonable assurance that the concentrations of radioactive material at the time of transfer will not exceed the concentrations in 180 NAC 3, Appendix 3-A, that reconcentration of the radioactive material in concentrations exceeding those in Appendix 3-A of 180 NAC 3 is not likely, that use of lower concentrations is not feasible, and that the product or material is not likely to be incorporated in any food,

beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

2. Each person licensed under 180 NAC 3-014.01 must file an annual report with the Department which identifies the type and quantity of each product or material into which radioactive material has been introduced during the reporting period; name and address of the person who owned or possessed the product or material, into which radioactive material has been introduced, at the time of introduction; the type and quantity of radionuclide introduced into each such product or material; and the initial concentrations of the radionuclide in the product or material at time of transfer of the radioactive material by the licensee. If no transfers of radioactive material have been made pursuant to 180 NAC 3-014.01 during the reporting period, the report must so indicate. The report must cover the year ending June 30, and must be filed within 30 days thereafter.

3. The Radiation Safety Officer and/or authorized user must have training and experience requirements consistent with training specified in 180 NAC 15-018.01.

3-014.02 Reserved.

3-014.03 Licensing the Incorporation of Naturally Occurring Accelerator-Produced Radioactive Material Into Gas and Aerosol Detectors. An application for a specific license authorizing the incorporation of NARM into gas and aerosol detectors to be distributed to persons exempt under 180 NAC 3-004.03, item 3 will be approved if the application satisfies the requirements of 10 CFR 32.26. The maximum quantity of radium-226 in each device must not exceed 3.7 kBq (0.1 microcurie).

3-014.04 Licensing the Manufacture and Distribution of Devices to Persons Generally Licensed Under 180 NAC 3-008.04

1. An application for a specific license to manufacture or distribute devices containing radioactive material, excluding special nuclear material, to persons generally licensed under 180 NAC 3-008.04 or equivalent regulations of the U.S. Nuclear Regulatory Commission, or an Agreement State will be approved if:

   a. The applicant satisfies the general requirements of 180 NAC 3-011;
   b. The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control, labels, proposed uses, installation, servicing, leak testing, operating and safety instructions, and potential hazards of the device to provide reasonable assurance that:

      (1) The device can be safely operated by persons not having training in radiological protection;
      (2) Under ordinary conditions of handling, storage, and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in one year a dose in excess of 10% of the annual limits specified in 180 NAC 4-005.01; and

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¶
1. . An application for a specific license to distribute NARM, to persons exempted from Title 180 pursuant to 180 NAC 3-004.02 will be approved if:¶
¶
a. . The radioactive material is not contained in any food, beverage, cosmetic, drug, or other commodity designed for ingestion or inhalation by, or application to, a human being;¶
b. . The radioactive material is in the form of processed chemical elements, compounds, or mixtures, tissue samples, bioassay samples, counting standards, plated or encapsulated sources, or similar substances, identified as radioactive and to be used for its radioactive properties, but is not incorporated into any manufactured or assembled commodity, product, or device intended for commercial distribution;¶
c. . The applicant submits copies of prototype labels and brochures and the

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d. . Out-of-State manufacturers of the product have a license issued by a State with requirements comparable to those under this rule for manufacturer of similar products.¶
¶
2. . The license issued under 180 NAC 3-014.02, item 1 is subject to the following conditions:¶
¶
a. . The licensee must not sell or transfer more than 10 exempt quantities in any single transaction. However, an exempt quantity may be composed of fractional parts of one or more of the exempt quantity provided the sum of the fractions must n... [1]

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(3) Under accident conditions (such as fire and explosion) associated with handling, storage, and use of the device, it is unlikely that any person would receive an external radiation dose or dose commitment in excess of the following organ doses:

Whole body; head and trunk; active blood-forming organs; gonads; or lens of eye	150 mSv (15 rems)
Hands and forearms; feet and ankles; localized areas of skin averaged over areas no larger than 1 square centimeter	2 Sv (200 rems)
Other organs	500 mSv (50 rems)

c. Each device bears a durable, legible, clearly visible label or labels approved by the Department, which contain in a clearly identified and separate statement: Deleted: Agency

(1) Instructions and precautions necessary to assure safe installation, operation, and servicing of the device. Documents such as operating and service manuals may be identified in the label and used to provide this information;

(2) The requirement, or lack of requirement, for leak testing, or for testing any on-off mechanism and indicator, including the maximum time interval for such testing, and the identification of radioactive material by isotope, quantity of radioactivity, and date of determination of the quantity; and

(3) The information called for in the following statement, as appropriate in the same or substantially similar form:

The receipt, possession, use, and transfer of this device Model _____[10], Serial No. _____[10], are subject to a general license or the equivalent and the regulations of the U.S. Nuclear Regulatory Commission or a state with which the U.S. Nuclear Regulatory Commission has entered into an agreement for the exercise of regulatory authority. This label must be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION - RADIOACTIVE MATERIAL

_____
Name of Manufacturer or Distributor[10]

[10]The model, serial number, and name of manufacturer or distributor may be omitted from this label provided the information is elsewhere specified and labeling affixed to the device.

d. Each device having a separable source housing that provides the primary shielding for the source also bears, on the source housing, a durable label containing the device model number and serial number, the radionuclide, and quantity, the words, "Caution-Radioactive Material," the radiation symbol described in 180 NAC 4-033.01, and the name of the manufacturer or initial distributor.

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e. Each device meeting the criteria of 180 NAC 3-008.04, item 3. m. (1), bears a permanent (e.g., embossed, etched, stamped, or engraved) label affixed to the source housing if separable, or the device if the source housing is not separable, that includes the words, "Caution-Radioactive Material," and, if practicable, the radiation symbol described in 180 NAC 4-033.01.

2. In the event the applicant desires that the device be required to be tested at intervals longer than six months, either for proper operation of the on-off mechanism and indicator, if any, or for leakage of radioactive material or for both, the applicant must include in the application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the device or similar devices and by design features which have a significant bearing on the probability or consequences of leakage of radioactive material from the device or failure of the on-off mechanism and indicator. In determining the acceptable interval for the test for leakage of radioactive material, the Department will consider information which includes, but is not limited to:

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a. Primary containment or source capsule;
b. Protection of primary containment;
c. Method of sealing containment;
d. Containment construction materials;
e. Form of contained radioactive material;
f. Maximum temperature withstood during prototype tests;
g. Maximum pressure withstood during prototype tests;
h. Maximum quantity of contained radioactive material;
i. Radiotoxicity of contained radioactive material; and
j. Operating experience with identical devices or similarly designed and constructed devices.

3. In the event the applicant desires that the general licensee under 180 NAC 3-008.04, or under equivalent regulations of U.S. Nuclear Regulatory Commission, or an Agreement State be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on-off mechanism and indicator, or remove the device from installation, the applicant must include in his/her application written instructions to be followed by the general licensee, estimated calendar quarter doses associated with such activity or activities, and bases for such estimates. The submitted information must demonstrate that performance of such activity or activities by an individual untrained in radiological protection, in addition to other handling, storage, and use of devices under the general license, is unlikely to cause that

individual to receive a dose in excess of 10% of the annual limits specified in 180 NAC 4-005.01.

4. Conditions of transferring a device for use under a general license in 180 NAC 3-008.04.

a. If a device containing radioactive material is to be transferred for use under the general license in 180 NAC 3-008.04, each person that is licensed under 180 NAC 3-014.04 must provide the information specified in this paragraph to each person to whom a device is to be transferred. This information must be provided before the device may be transferred. In the case of a transfer through an intermediate person, the information must also be provided to the intended user prior to initial transfer to the intermediate person. The required information includes:

(1) A copy of the general license contained in 180 NAC 3-008.04, item 3. b. through d. or item 3.m. do not apply to the particular device, those paragraphs may be omitted.

(2) A copy of 180 NAC 3-008.01, 180 NAC 3-030, 180 NAC 4-057 and 4-058;

(3) A list of the services that can only be performed by a specific licensee;

(4) Information on acceptable disposal options including estimated costs of disposal; and

(5) An indication that the Department's policy is to issue high civil penalties for improper disposal.

b. If radioactive material is to be transferred in a device for use under an equivalent general license of the U.S. Nuclear Regulatory Commission or an Agreement State, each person that is licensed under 180 NAC 3-014.04 provide the information specified in this paragraph to each person to whom a device is to be transferred. This information must be provided before the device may be transferred. In the case of a transfer through an intermediate person, the information must also be provided to the intended user prior to initial transfer to the intermediate person. The required information includes:

(1) A copy of the 180 NAC 3-008.01, 180 NAC 3-008.04, 180 NAC 4-057 and 058 or a copy of equivalent U.S. Nuclear Regulatory Commission or Agreement State's regulations. If a copy of the U.S. Nuclear Regulatory Commission regulations is provided to a prospective general licensee in lieu of the Department's or Agreement State's regulations, it must be accompanied by a note explaining that use of the device is regulated by the U. S. Nuclear Regulatory Commission or an Agreement State; if certain paragraphs of the regulations do not apply to the particular device, those paragraphs may be omitted.

(2) A list of the services that can only be performed by a specific licensee;

(3) Information on acceptable disposal options including estimated costs

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of disposal; and

(4) The name or title, address, and phone number of the contact at the Department, U.S. Nuclear Regulatory Commission or Agreement State from which additional information may be obtained.

c. An alternative approach to informing customers may be proposed by the licensee for approval by the Department.

d. Each device that is transferred after April 12, 2003 must meet the labeling requirements in 180 NAC 3-014.04, item 1.c. through d.

e. If a notification of bankruptcy has been made under 180 NAC 3-017.05 or the license is to be terminated, each person licensed under 180 NAC 3-014.04 must provide, upon request, to the Department the U.S. Nuclear Regulatory Commission and to any appropriate Agreement State, records of final disposition required under 180 NAC 3-014.04, item 5. c.

5. Material transfer reports and records Each person under 180 NAC 3-014.04 to initially transfer devices to generally licensed persons must comply with the requirements of 180 NAC 3-014.04, item 5.

a. The person must report all transfers of devices to persons for use under the general license in 180 NAC 3-008.04 and all receipts of devices from persons licensed under 180 NAC 3-008.04 to the Radioactive Material Program Manager, Nebraska Health and Human Services, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026. The report must be submitted on a quarterly basis on the NRH Form 653, "Transfers of Industrial Devices Report" or in a clear and legible report containing all of the data required by the form.

(1) The required information for transfers to general licensees includes:

(a) The identity of each general licensee by name and mailing location of use, an alternate address for the general licensee must be submitted along with information on the actual location of use.
(b) The name, title, and phone number of the person identified by the general licensee as having knowledge of and authority to take required actions to ensure compliance with the appropriate regulations and requirements;
(c) The date of transfer;
(d) The type, model number, and serial number of the device transferred; and
(e) The quantity and type of radioactive material contained in the device.

(2) If one or more intermediate persons will temporarily possess the device at the intended place of use before its possession by the user, the report must include the same information for both the intended user and each intermediate person, and clearly designate the

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intermediate person(s).

(3) For devices received from a 180 NAC 3-008.04 general licensee, the report must include the identity of the general licensee by name and address, the type, model number, and serial number of the device received, the date of receipt, and, in the case of devices not initially transferred by the reporting licensee, the name of the manufacturer or initial transferor.

(4) If the licensee makes changes to a device possessed by a 180 NAC 3-008.04 general licensee, such that the label must be changed to update required information, the report must identify the general licensee, the device, and the changes to information on the device label.

(5) The report must cover each calendar quarter, must be filed within 30 days of the end of the calendar quarter, and must clearly indicate the period covered by the report.

(6) The report must clearly identify the specific licensee submitting the report and include the license number of the specific licensee.

(7) If no transfers have been made to or from persons generally licensed under 180 NAC 3-008.04 during the reporting period, the report must so indicate.

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b. The person must report all transfers of devices to persons for use under a general license in an U.S. Nuclear Regulatory Commission or Agreement State's regulations that are equivalent to 180 NAC 3-008.04 and all receipts of devices from general licensees in the U.S. Nuclear Regulatory Commission or Agreement State's jurisdiction to the U.S. Nuclear Regulatory Commission or responsible Agreement State agency. The report must be submitted on the Department's Form 653, "Transfers of Industrial Devices Report" or in a clear and legible report containing all of the data required by the form.

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(1) The required information for transfers to general licensees includes:

(a) The identity of each general licensee by name and mailing address for the location of use; if there is no mailing address for the location of use, an alternate address for the general licensee must be submitted along with information on the actual location of use.

(b) The name, title, and phone number of the person identified by the general licensee as having knowledge of and authority to take required actions to ensure compliance with the appropriate regulations and requirements;

(c) The date of transfer;

(d) The type, model number, and serial number of the device transferred; and

(e) The quantity and type of radioactive material contained in the device.

(2) If one or more intermediate persons will temporarily possess the device at the intended place of use before its possession by the user, the report must include the same information for both the intended user and each intermediate person, and clearly designate the intermediate person(s).

(3) For devices received from a general licensee, the report must include the identity of the general licensee by name and address, the type, model number, and serial number of the device received, the date of receipt, and, in the case of devices not initially transferred by the reporting licensee, the name of the manufacturer or initial transferor.

(4) If the licensee makes changes to a device possessed by a general licensee, such that the label must be changed to update required information, the report must identify the general licensee, the device, and the changes to information on the device label.

(5) The report must cover each calendar quarter, must be filed within 30 days of the end of the calendar quarter, and must clearly indicate the period covered by the report.

(6) The report must clearly identify the specific licensee submitting the report and must include the license number of the specific licensee.

(7) If no transfers have been made to or from the U.S. Nuclear Regulatory Commission or a particular Agreement State during the reporting period, this information must be reported to the U.S. Nuclear Regulatory Commission or responsible Agreement State agency upon request of the Department.

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c. The person must maintain all information concerning transfers and receipts of devices that supports the reports required by this 180 NAC 3-014.04, Item 5. Records required by 180 NAC 3-014.04, item 5 must be maintained for a period of 3 years following the date of the recorded event.

3-014.05 Special Requirements for the Manufacture, Assembly, or Repair of Luminous Safety Devices for Use in Aircraft. An application for a specific license to manufacture, assemble, or repair luminous safety devices containing tritium or promethium-147 for use in aircraft, for distribution to persons generally licensed under 180 NAC 3-008.05 will be approved subject to the following conditions:

1. The applicant satisfies the general requirements specified in 180 NAC 3-011, and

2. The applicant satisfies the requirements of 10 CFR 30.33, 32.53 through 32.56 and 32.101.

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3. The Radiation Safety Officer and/or authorized user must have training and experience requirements consistent with training specified in 180 NAC 15-018.01.

3-014.06 Special Requirements for License to Manufacture Calibration Sources Containing Americium-241, Plutonium or Radium-226 for Distribution to Persons Generally Licensed Under 180 NAC 3-008.07. An application for a specific license to manufacture calibration and reference sources containing americium-241, plutonium or radium-226 to persons

generally licensed under 180 NAC 3-008.07 will be approved subject to the following conditions:

1. The applicant satisfies the general requirement of 180 NAC 3-011, and

2. The applicant satisfies the requirements of 10 CFR 30.33, 30.33, 32.57 through 32.59, 32.102, and 70.39, and

3. The Radiation Safety Officer and/or authorized user must have training and experience requirements consistent with training specified in 180 NAC 15-018.01.

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3-014.07 Reserved

3-014.08 Manufacture and Distribution of Radioactive Material for Certain In Vitro Clinical or Laboratory Testing Under General License. An application for a specific license to manufacture or distribute radioactive material for use under the general license of 180 NAC 3-008.09 will be approved if:

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1. The applicant satisfies the general requirements specified in 180 NAC 3-011.
2. The radioactive material is to be prepared for distribution in prepackaged units of:

   a. Iodine-125 in units not exceeding 370 kBq (10 microcuries) each.
   b. Iodine-131 in units not exceeding 370 kBq (10 microcuries) each.
   c. Carbon-14 in units not exceeding 370 kBq (10 microcuries) each.
   d. Hydrogen-3 (tritium) in units not exceeding 1.85 MBq (50 microcuries) each.
   e. Iron-59 in units not exceeding 740 kBq (20 microcuries) each.
   f. Cobalt-57 in units not exceeding 370 kBq (10 microcuries) each.
   g. Selenium-75 in units not exceeding 370 kBq (10 microcuries) each.
   h. Mock Iodine-125 in units not exceeding 1.85 kBq (0.05 microcurie) of iodine-129 and 185 Bq (0.005 microcurie) of americium-241 each.

3. Each prepackaged unit bears a durable, clearly visible label:

   a. Identifying the radioactive contents as to chemical form and radionuclide, and indicating that the amount of radioactivity does not exceed 370 kBq (10 microcuries) of iodine-125, iodine-131, carbon-14, cobalt-57, or selenium-75; 1.85 MBq (50 microcuries) of hydrogen-3 (tritium); 740 kBq (20 microcuries) of iron-59; or Mock Iodine-125 in units not exceeding 1.85 kBq (0.05 microcurie) of iodine-129 and 185 Bq (0.005 microcurie) of americium-241 each; and

   b. Displaying the radiation caution symbol described in 180 NAC 4-033.01 and the words, "CAUTION, RADIOACTIVE MATERIAL" and "Not for Internal or External Use in Humans or Animals."

4. The following statement, or a substantially similar statement which contains the information called for in the following statement, appears on a label affixed to

each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians in the practice of veterinary medicine, clinical laboratories or hospitals and only for In Vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to the regulations and a general license of the U.S. Nuclear Regulatory Commission or of a State with which the Commission has entered into an agreement for the exercise of regulatory authority.

_____
Name of Manufacturer

5. The label affixed to the unit, or the leaflet or brochure which accompanies the package, contains adequate information as to the precautions to be observed in handling and storing such radioactive material. In the case of Mock Iodine-125 reference or calibration source, the information accompanying the source must also contain directions to the licensee regarding the waste disposal requirements set out in 180 NAC 4-039.

6. The Radiation Safety Officer and/or authorized user must have training and experience requirements consistent with training specified in 180 NAC 15-019.01.

3-014.09 Licensing the Manufacture and Distribution of Ice Detection Devices Containing Strontium 90. An application for a specific license to manufacture and distribute ice detection devices to persons generally licensed under 180 NAC 3-008.10 will be approved subject to the following conditions: The applicant satisfies the general requirements of 180 NAC 3-011, the criteria of 10 CFR 30.33, 32.61, 32.62, and 32.103. The Radiation Safety Officer and/or authorized user must have training and experience requirements consistent with training specified in 180 NAC 15-018.01.

3-014.10 Manufacture, Preparation, or Transfer for Commercial Distribution of Radioactive Drugs Containing Radioactive Material for Medical Use Under 180 NAC 7.

1. An application for a specific license to manufacture, prepare, or transfer for commercial distribution radioactive drugs containing radioactive material for use by persons authorized pursuant to 180 NAC 7, will be approved if:

   a. The applicant satisfies the general requirements specified in 180 NAC 3-011;

   b. The applicant submits evidence that the applicant is at least one of the following:

      (1) Registered or licensed with the U.S. Food and Drug Administration (FDA) as a drug manufacturer;

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(2) Registered or licensed with a state agency as a drug manufacturer;
(3) Licensed according to 175 NAC 8, Pharmacies; or
(4) Operating as a nuclear pharmacy within a Federal medical institution.

c. The applicant submits information on the radionuclide; the chemical and physical form; the maximum activity per vial, syringe, generator, or other container of the radioactive drug; and the shielding provided by the packaging to show it is appropriate for the safe handling and storage of the radioactive drugs by medical use licensees; and

d. The applicant satisfies the following labeling requirements:

(1) A label is affixed to each transport radiation shield, whether it is constructed of lead, glass, plastic, or other material, of a radioactive drug to be transferred for commercial distribution. The label must include the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL"; the name of the radioactive drug or its abbreviation; and the quantity of radioactivity at a specified date and time. For radioactive drugs with a half life greater than 100 days, the time may be omitted.
(2) A label is affixed to each syringe, vial or other container used to hold a radioactive drug to be transferred for commercial distribution. The label must include the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL" and an identifier that ensures that the syringe, vial, or other container can be correlated with the information on the transport radiation shield label.

2. A licensee described by 180 NAC 3-014.10, item 1.b.(3) or 1.b.(4).

a. May prepare radioactive drugs for medical use, as defined in 180 NAC 7-002, provided that the radioactive drug is prepared by either an authorized nuclear pharmacist, as specified in 180 NAC 3-014.10, item 1.b. and d, or an individual under the supervision of an authorized nuclear pharmacist as specified in 180 NAC 7-018.

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b. May allow a pharmacist to work as an authorized nuclear pharmacist if:

(1) This individual qualifies as an authorized nuclear pharmacist as defined in 180 NAC 7-002;
(2) This individual meets the requirements specified in 180 NAC 7-024.02 and 7-027 and the licensee has received an approved license amendment identifying this individual as an authorized nuclear pharmacist, or

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(3) This individual is designated as an authorized nuclear pharmacist in accordance with 180 NAC 3-014.10, item 2.c.

c. The actions authorized in 180 NAC 3-014.10, items 2.a. and b. are permitted in spite of more restrictive language in license conditions.

d. May designate a pharmacist (as defined in 180 NAC 7-002) as an authorized nuclear pharmacist if the individual is identified as of the effective date of these regulations, as an "authorized user" on a nuclear pharmacy license issued by the Department under 180 NAC 3.

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e. Must provide to the Department a copy of each individual's certification by the Board of Pharmaceutical Specialties, the Department, U.S. Nuclear Regulatory Commission, or any Agreement State license, or the permit issued by a licensee of broad scope, and a copy of the state pharmacy licensure or registration, no later than 30 days after the date that the licensee allows, pursuant to 180 NAC 3-014.10, item 2.b.(1) and (3), the individual to work as an authorized nuclear pharmacist.

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3. A licensee must possess and use instrumentation to measure the radioactivity of radioactive drugs. The licensee must have procedures for use of the instrumentation. The licensee must measure, by direct measurement or by combination of measurements and calculations, the amount of radioactivity in dosages of alpha-, beta-, or photon-emitting radioactive drugs prior to transfer for commercial distribution. In addition, the licensee must:

   a. Perform tests before initial use, periodically, and following repair, on each instrument for accuracy, linearity, and geometry dependence, as appropriate for the use of the instrument; and make adjustments when necessary; and
   b. Check each instrument for constancy and proper operation at the beginning of each day of use.

4. Nothing in 180 NAC 3-014.10 relieves the licensee from complying with applicable FDA, other Federal, and State requirements governing radioactive drugs.

3-014.11 Reserved

3-014.12. Manufacture and Distribution of Sources or Devices Containing Radioactive Material for Medical Use. An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed pursuant to 180 NAC 7 for use as a calibration or reference source or for the uses listed in 180 NAC 7-055, 7-065 and 7-067 will be approved if:

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1. The applicant satisfies the general requirements in 180 NAC 3-011.
2. The applicant submits sufficient information regarding each type of source or device pertinent to an evaluation of its radiation safety, including:

   a. The radioactive material contained, its chemical and physical form, and amount,

b. Details of design and construction of the source or device,
c. Procedures for, and results of, prototype tests to demonstrate that the source or device will maintain its integrity under stresses likely to be encountered in normal use and accidents,
d. For devices containing radioactive material, the radiation profile of a prototype device,
e. Details of quality control procedures to assure that production sources and devices meet the standards of the design and prototype tests,
f. Procedures and standards for calibrating sources and devices,
g. Legend and methods for labeling sources and devices as to their radioactive content, and
h. Instructions for handling and storing the source or device from the radiation safety standpoint; these instructions are to be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device; provided, that instructions which are too lengthy for such label may be summarized on the label and printed in detail on a brochure which is referenced on the label.

3. The label affixed to the source or device, or to the permanent storage container for the source or device, contains information on the radionuclide, quantity, and date of assay, and a statement that the Department has approved distribution of the (name of the source or device) to persons licensed to use radioactive material identified in 180 NAC 7-032, 7-055, 7-065 and 7-067 as appropriate, and to persons who hold an equivalent license issued by the U.S. Nuclear Regulatory Commission or an Agreement State.

4. In the event the applicant desires that the source or device be required to be tested for leakage of radioactive material at intervals longer than six months, the applicant must include in his/her application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source.

5. In determining the acceptable interval for test of leakage of radioactive material, the Department will consider information that includes, but is not limited to:

a. Primary containment or source capsule;
b. Protection of primary containment;
c. Method of sealing containment;
d. Containment construction materials;
e. Form of contained radioactive material;
f. Maximum temperature withstood during prototype tests;
g. Maximum pressure withstood during prototype tests;
h. Maximum quantity of contained radioactive material;
i. Radiotoxicity of contained radioactive material; and
j. Operating experience with identical sources or devices or similarly designed and constructed sources or devices.

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6. The Radiation Safety Officer and/or authorized user must have training and experience requirements consistent with training specified in 180 NAC 15-018.01.

3-014.13 Requirements for License to Manufacture and Distribute Industrial Products Containing Depleted Uranium for Mass-Volume Applications

1. An application for a specific license to manufacture industrial products and devices containing depleted uranium for use pursuant to 180 NAC 3-007.04 or equivalent regulations of the U.S. Nuclear Regulatory Commission or an Agreement State will be approved if:

   a. The applicant satisfies the general requirements specified in 180 NAC 3-011;

   b. The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control procedures, labeling or marking, proposed uses, and potential hazards of the industrial product or device to provide reasonable assurance that possession, use, or transfer of the depleted uranium in the product or device is not likely to cause any individual to receive in any period of one year a radiation dose in excess of 10% of the annual limits specified in 180 NAC 4-005.01; and

   c. The applicant submits sufficient information regarding the industrial product or device and the presence of depleted uranium for a mass-volume application in the product or device to provide reasonable assurance that unique benefits will accrue to the public because of the usefulness of the product or device.

2. In the case of an industrial product or device whose unique benefits are questionable, the Department will approve an application for a specific license under 180 NAC 3-014.13 only if the product or device is found to combine a high degree of utility and low probability of uncontrolled disposal and dispersal of significant quantities of depleted uranium into the environment. Deleted: Agency

3. The Department may deny any application for a specific license under 180 NAC 3-014.13 if the end use or uses of the industrial product or device cannot be reasonably foreseen. Deleted: Agency

4. Each person licensed pursuant to 180 NAC 3-014.13 item 1 must:

   a. Maintain the level of quality control required by the license in the manufacture of the industrial product or device, and in the installation of the depleted uranium into the product or device;

   b. Label or mark each unit to: (a) Identify the manufacturer of the product or device and the number of the license under which the product or device was manufactured, the fact that the product or device contains depleted

uranium, and the quantity of depleted uranium in each product or device; and (b) State that the receipt, possession, use, and transfer of the product or device are subject to a general license or the equivalent and the *regulations of the U.S. Nuclear Regulatory Commission or of an Agreement* State;

c. Assure that the depleted uranium before being installed in each product or device has been impressed with the following legend clearly legible through any plating or other covering: "Depleted Uranium";

d. Furnish:

(1) A copy of the general license contained in 180 NAC 3-007.04 and a copy of Department Form NRH-11 to each person to whom the licensee transfers depleted uranium in a product or device for use pursuant to the general license contained in 180 NAC 3-007.04; or

(2) A copy of the general license contained in the U.S. Nuclear Regulatory Commission or Agreement State's regulation equivalent to 180 NAC 3-007.04 and a copy of the U.S. Nuclear Regulatory Commission or Agreement State's certificate; or alternatively, furnish a copy of the general license contained in 180 NAC 3-007.04 and a copy of Department Form NRH-11 to each person to whom the licensee transfers depleted uranium in a product or device for use pursuant to the general license of the U.S. Nuclear Regulatory Commission or an Agreement State, with a note explaining that use of the product or device is regulated by the U.S. Nuclear Regulatory Commission or an Agreement State under requirements substantially the same as those in 180 NAC 3-007.04;

e. Report to the Department all transfers of industrial products or devices to persons for use under the general license in180 NAC 3-007.04. Such report must identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the Department and the general licensee, the type and model number of device transferred, and the quantity of depleted uranium contained in the product or device. The report must be submitted within 30 days after the end of each calendar quarter in which such a product or device is transferred to the generally licensed person. If no transfers have been made to persons generally licensed under 180 NAC 3-007.04 during the reporting period, the report must so indicate;

f. File a report which identifies each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the agency and the general licensee, the type and model number of the device transferred, and the quantity of depleted uranium contained in the product or device. The report must be submitted within 30 days after the

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end of each calendar quarter in which such product or device is transferred to the generally licensed person. The licensee must report:

(1) To the U.S. Nuclear Regulatory Commission all transfers of industrial products or devices to persons for use under the U.S. Nuclear Regulatory Commission general license in 10 CFR 40.25;

(2) To the responsible State agency all transfers of devices manufactured and distributed pursuant to 180 NAC 3-014.13 for use under a general license in that State's regulations equivalent to180 NAC 3-007.04;

(3) To U.S. Nuclear Regulatory Commission if no transfers have been made by the licensees during the reporting period;

(4) To the responsible Agreement State Agency, upon the request of the Department, if no transfers have been made to general licensees within a particular Agreement State during the reporting period; and

5. Keep records showing the name, address, and point of contact for each general licensee to whom the licensee transfers depleted uranium in industrial products or devices for use pursuant to the general license provided in 180 NAC 3-008.04 or equivalent regulations of the U.S. Nuclear Regulatory Commission or of an Agreement State. The records must be maintained for a period of two years and must show the date of each transfer, the quantity of depleted uranium in each product or device transferred, and compliance with the report requirements.

6. The Radiation Safety Officer and/or authorized user must have training and experience consistent with the requirements of training specified in 180 NAC 15-018.01.

3-014.14 Serialization of Nationally Tracked Sources. Each licensee who manufactures a nationally tracked source after February 6, 2007, must assign a unique serial number to each nationally tracked source. Serial numbers must be composed only of alpha-numeric characters.

3-014.15 Acceptance Sampling Procedures Under Certain Specific Licenses.

1. A random sample shall be taken from each inspection lot of devices licensed under 10 CFR 32.14, 180 NAC 3-014.05, or 3-014.09 for which testing is required in accordance with the appropriate Sampling Table in 180 NAC 3-13.12 determined by the designated Lot Tolerance Percent Defective. If the number of defectives in the sample does not exceed the acceptance number in the appropriate Sampling Table 180 NAC 3-014.15, the lot will be accepted. If the number of defectives in the sample exceeds the acceptance number in the appropriate Sampling Table 180 NAC 3-014.15, the entire inspection lot will be rejected.

2. Single sampling tables for Lot Tolerance Percent Defective:
   a. Lot Tolerance Percent Defective 0.5 percent:

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Lot Size	Sample Size	Acceptance No.
1 to 180	All	0
181 to 210	180	0
211 to 250	210	0
251 to 300	240	0
301 to 400	275	0
401 to 500	300	0
501 to 600	320	0
601 to 800	350	0
801 to 1,000	365	0
1,001 to 2,000	410	0
2,001 to 3,000	430	0
3,001 to 4,000	440	0
4,001 to 5,000	445	0
5,001 to 7,000	450	0
7,001 to 10,000	455	0
10,001 to 20,000	460	0
20,001 to 50,000	775	1
50,001 to 100,000	780	1

b. Lot Tolerance Percent Defective 1.0 percent:

Lot size	Sample Size	Acceptance No.
1 to 120	All	0
121 to 150	120	0
151 to 200	140	0
201 to 300	165	0
300 to 400	175	0
401 to 500	180	0
501 to 600	190	0
601 to 800	200	0
801 to 1,000	205	0
1,000 to 3,000	220	0
3,001 to 5,000	225	0
5,001 to 10,000	230	0
10,001 to 100,000	390	1

c. Lot Tolerance Percent Defective 2.0 percent:

Lot size	Sample Size	Acceptance No.
1 to 75	All	0
76 to 100	70	0
101 to 200	85	0
201 to 300	95	0
301 to 400	100	0
401 to 600	105	0
601 to 800	110	0

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801 to 4,000	115	0
4,001 to 10,000	195	1
10,001 to 100,000	200	1

d. Lot Tolerance Percent Defective 3.0 percent:

Lot size	Sample Size	Acceptance No.
1 to 40	All	0
41 to 55	40	0
56 to 100	55	0
101 to 200	65	0
201 to 500	70	0
501 to 3,000	75	0
3,001 to 100,000	130	1

e. Lot Tolerance Percent Defective 4.0 percent:

Lot size	Sample Size	Acceptance No.
1 to 35	All	0
36 to 50	34	0
51 to 100	44	0
101 to 200	50	0
201 to 2,000	55	0
2,001 to 100,000	95	1

f. Lot Tolerance Percent Defective 5.0 percent:

Lot size	Sample Size	Acceptance No.
1 to 30	All	0
31 to 50	30	0
51 to 100	37	0
101 to 200	40	0
201 to 300	43	0
301 to 400	44	0
401 to 2,000	45	0
2,001 to 100,000	75	1

g. Lot Tolerance Percent Defective 7.0 percent:

Lot size	Sample Size	Acceptance No.
1 to 25	All	0
26 to 50	24	0
51 to 100	28	0
101 to 200	30	0
201 to 300	31	0
301 to 800	32	0
801 to 1,000	33	0
1,001 to 100,000	55	1

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h. Lot Tolerance Percent Defective 10.0 percent:

Lot size	Sample Size	Acceptance No.
1 to 20	All	0
21 to 50	17	0
51 to 100	20	0
101 to 200	22	0
201 to 800	23	0
801 to 100,000	39	0

3-015 SPECIAL REQUIREMENTS FOR ISSUANCE OF SPECIFIC LICENSES FOR SOURCE MATERIAL MILLING: In addition to the requirements set forth in 180 NAC 3-011, a specific license for source material milling will be issued if the applicant submits to the Department a satisfactory application as described herein and meets the other conditions specified below:

3-015.01 An Application for a License to Receive Title to, Receive, Possess, and Use Source Material for Milling or Byproduct Material as Defined in 180 NAC 1-002 must address the following:

1. Description of the proposed project or action;
2. Area/site characteristics including geology, topography, hydrology, and
3. Radiological and nonradiological impacts of the proposed project or action, including waterway and groundwater impacts;
4. Environmental effects of accidents;
5. Long-term impacts including decommissioning, decontamination, and reclamation; and meteorology;
6. Site and project alternatives.

3-015.02 Pursuant to 180 NAC 3-011.01, the applicant must not commence construction of the project until the Department has weighed the environmental, economic, technical, and other benefits against the environmental costs and has concluded that the issuance of the license is appropriate.

3-015.03 At least 1 full year prior to any major site construction, a pre-operational monitoring program must be conducted to provide complete baseline data on a milling site and its environs. Throughout the construction and operating phases of the mill, an operational monitoring program must be conducted to measure or evaluate compliance with applicable standards and regulations; to evaluate performance of control systems and procedures; to evaluate environmental impacts of operation; and to detect potential long-term effects.

3-015.04 Prior to issuance of the license, the applicant must establish financial surety arrangements consistent with the requirements of 180 NAC 3-011.02.

1. The amount of funds to be ensured by financial surety arrangements will be based on Department-approved cost estimates in an approved plan for decontamination and decommissioning of mill buildings and the milling site to levels which would allow unrestricted use of these areas upon decommissioning, and the reclamation of tailings and/or waste disposal areas. The licensee must submit this plan in conjunction with an environmental report that addresses the

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expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and that evaluates alternatives for mitigating these impacts. In establishing specific surety arrangements, the licensee's cost estimates will take into account total costs that would be incurred if an independent contractor were hired to perform the decommissioning and reclamation work. In order to avoid unnecessary duplication and expense, the Department may accept financial sureties that have been consolidated with financial surety arrangements established to meet requirements of other Federal or State agencies and/or local governing bodies for such decommissioning, decontamination, reclamation, and long-term site surveillance, provided such arrangements are considered adequate to satisfy these requirements and that portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge are clearly identified. The licensee's surety mechanism will be reviewed annually by the Department to assure that sufficient funds will be available for completion of the reclamation plan if the work had to be performed by an independent contractor. The amount of surety liability should be adjusted to recognize any increases or decreases resulting from inflation, changes in engineering plans, activities performed, and any other conditions affecting costs. Regardless of whether reclamation is phased through the life of the operation or takes place at the end of operations, an appropriate portion of surety liability will be retained until final compliance with the reclamation plan is determined. This will yield a surety that is at least sufficient at all times to cover the costs of decommissioning, decontamination, and reclamation of the areas that are expected to be disturbed before the next license renewal. The term of the surety mechanism must be open ended, unless it can be demonstrated that another arrangement would provide an equivalent level of assurance. This assurance could be provided with a surety instrument which is written for a specified period of time (e.g., 5 years) which must be automatically renewed unless the surety agent notifies the beneficiary (the State regulatory agency) and the principal (the licensee) some reasonable time (e.g., 90 days) prior to the renewal date of their intention not to renew. In such a situation, the surety requirement still exists and the licensee would be required to submit an acceptable replacement surety within a brief period of time to allow at least 60 days for the regulatory agency to collect.

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2. The total amount of funds for reclamation or long term surveillance and control will be transferred to the United States if title and custody of such material and its disposal site is transferred to the United States upon termination of a license. Such funds include, but are not limited to, sums collected for long term surveillance and control. Such funds do not, however, include monies held as surety where no default has occurred, and the reclamation or other bonded activity has been performed.

3-015.05 The applicant must provide procedures describing the means employed to meet the following requirements during the operational phase of any project;

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1. Milling operations must be conducted so that all effluent releases are below the limits of 180 NAC 4 and are as low as is reasonably achievable.

2. The mill operator must conduct daily inspections of any tailings or waste retention systems. Such inspections must be conducted by a qualified engineer or scientist. Records of such inspections must be maintained for review by the Department.
3. The mill operator must immediately notify the Department of the following:

   a. Any failure in a tailings or waste retention system which results in a release of tailings or waste into unrestricted areas, and
   b. Any unusual conditions or conditions not contemplated in the design of the retention system which, if not corrected, could lead to failure of the system and result in a release of tailings or waste into unrestricted areas.

3-015.06 Continued Surveillance Requirements for Source Material Millings Having Reclaimed Residues.

1. The final disposition of tailings or wastes at source material milling sites should be such that the need for ongoing active maintenance is not necessary to preserve isolation. As a minimum, annual site inspections must be conducted by the government agency retaining ultimate custody of the site where tailings or wastes are stored to confirm the integrity of the stabilized tailings or waste systems and to determine the need, if any, for maintenance and/or monitoring. Results of the inspection must be reported to the Department within 60 days following each inspection. The Department may require more frequent site inspections, if, on the basis of a site-specific evaluation, such a need appears necessary due to the features of a particular tailings or waste disposal system.

2. If site surveillance or control requirements at a particular site are determined, on the basis of a site-specific evaluation, to be significantly greater than those specified in, 180 NAC 3-015.06, item 1 additional funding requirements may be specified by the Department. The charge will be reviewed annually to recognize or adjust for inflation.

3-016 ISSUANCE OF SPECIFIC LICENSES

3-016.01 Upon a determination that an application meets the requirements of the Act and the regulations of the Department, the Department will issue a specific license authorizing the proposed activity in such form and containing such conditions and limitations as it deems appropriate or necessary, based on quantities and types of radioactive materials, proposed use and upon the training and experience of the user(s).

3-016.02 The Department may incorporate in any license at the time of issuance, or thereafter by appropriate rule, regulation, or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use and transfer of radioactive material including the requirement of reports, keeping of records and to provide for inspections as it deems appropriate or necessary in order to:

1. Minimize danger to public health and safety or property; and
2. Prevent loss or theft of material subject to 180 NAC 3-016.02.

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3-017 SPECIFIC TERMS AND CONDITIONS OF LICENSE

3-017.01 Each license issued pursuant to 180 NAC 3, 5, 7, 12, 14 and 19 will be subject to all the provisions of the Act, now or hereafter in effect, and to all rules, regulations, and orders of the Department.

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3-017.02 No license issued or granted under 180 NAC 3, 5, 7, 12, 14, and 19 and no right to possess or utilize radioactive material granted by any license issued pursuant to 180 NAC 3, 5, 7, 12, 14, and 19 may be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person unless the Department, after securing full information find that the transfer is in accordance with the provisions of the Act, and gives its consent in writing.

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3-017.03 Each person licensed by the Department pursuant to,180 NAC 3, 5, 7, 12, 14 and 19 must confine use and possession of the material licensed to the locations and purposes authorized in the license.

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3-017.04 Each licensee must notify the Department in writing when the licensee decides to permanently discontinue all activities involving materials under the license. This notification requirement applies to all specific licenses issued under,180 NAC 3, 5, 7, 12, 14, and 19.

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3-017.05 Each general licensee that is required to register by 180 NAC 3-005 and each specific licensee must notify the Department, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapter of Title 11 (Bankruptcy) of the United States Code by or against:

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1. The licensee;
2. An entity (as that term is defined in 11 U.S.C. 101(15)) (attached hereto as Attachment Number 3-1 and incorporated herein by this reference) controlling the licensee or listing the license or licensee as property of the estate; or
3. An affiliate (as that term is defined in 11 U.S.C. 101(2)) (attached hereto as Attachment Number 3-1 and incorporated herein by this reference) of the licensee.
4. This notification must indicate:

    a. The bankruptcy court in which the petition for bankruptcy was filed; and
    b. The date of the filing of the petition.

3-017.06 Security requirements for portable gauges. Each portable gauge licensee must use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal, whenever portable gauges are not under the control and constant surveillance of the licensee.

3-018 FINANCIAL ASSURANCE AND RECORDKEEPING FOR DECOMMISSIONING

3-018.01 Each:

1. Applicant for a specific license authorizing the possession and use of unsealed byproduct material of half-life greater than 120 days and in quantities exceeding 10^5 times the applicable quantities set forth in 180 NAC 4, Appendix 4-F must submit a decommissioning funding plan as described in 180 NAC 3-018.05. The decommissioning funding plan must also be submitted when a combination of isotopes is involved if R divided by 10^5 is greater than 1 (unity rule), where R is defined here as the sum of the ratios of the quantity of each isotope to the applicable value in Appendix 4-F of 180 NAC 4.
2. Holder of, or applicant for, any specific license authorizing the possession and use of sealed sources or plated foils of half-life greater than 120 days and in quantities exceeding 10^{12} times the applicable quantities set forth in 180 NAC 4, Appendix 4-F (or when a combination of isotopes is involved if R, as defined in 180 NAC 3-018.01, item 1, divided by 10^{12} is greater than 1), must submit a decommissioning funding plan as described in 180 NAC 3-018.05. The decommissioning funding plan must be submitted to the Department by (two years from effective date of these regulations).

3-018.02 Each applicant for a specific license authorizing possession and use of byproduct material of half-life greater than 120 days and in quantities specified in 180 NAC 3-018.04 must either:

1. Submit a decommissioning funding plan as described in 180 NAC 3-018.05 or
2. Submit a certification that financial assurance for decommissioning has been provided in the amount prescribed by 180 NAC 3-018.04 using one of the methods described in 180 NAC 3-018.06. For an applicant, this certification may state that the appropriate assurance will be obtained after the application has been approved and the license issued but prior to the receipt of radioactive material. If the applicant defers execution of the financial instrument until after the license has been issued, a signed original of the financial instrument obtained to satisfy 180 NAC 3-018.06 must be submitted to the Department before receipt of radioactive material. If the applicant does not defer execution of the financial instrument, the applicant must submit to the Department as part of the certification, a signed original of the financial instrument obtained to satisfy the requirements of 180 NAC 3-018.06.

3-018.03 Each:

1. Holder of a specific license issued on or after May 30, 1994 and of a type described in 180 NAC 3-018.01 or 3-018.02, must provide financial assurance for decommissioning in accordance with the criteria set for 180 NAC 3-018.03.
2. Holder of a specific license issued before May 30, 1994, and of a type described in 180 NAC 3-018.01 must submit, on or before May 30, 1994, and of type described in 180 NAC 3-018.01 must submit a decommissioning funding plan as described in 180 NAC 3-018.05 or a certification of financial assurance for decommissioning in an amount at least equal to $1,125,000 in accordance with the criteria set forth in 180 NAC 3-018.03, item 2. If the licensee submits the certification of financial assurance rather than a decommissioning funding plan,

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the licensee must include a decommissioning funding plan in any application for license renewal.

3. Holder of a specific license issued before May 30, 1994, and of a type described in 180 NAC 3-018.02 must submit, on or before May 30, 1994, a certification of financial assurance for decommissioning in accordance with the criteria set forth in 180 NAC 3-018.03.

4. Waste collectors and waste processors, as defined in 180 NAC 4, Appendix 4-D, must provide financial assurance in an amount based on a decommissioning funding plan as described in 180 NAC 3-018.05. The decomissioning funding plan must include the cost of disposal of the maximum amount (curies) of radioactive material permitted by license, and the cost of disposal of the maximum quantity, by volume, of radioactive material which could be present at the licensee's facility at any time, in addition to the cost to remediate the licensee's site to meet the license termination criteria of 180 NAC 3. The decommissioning funding plan must be submitted by (two years from effective date of these regulations).

3-018.04 Table of required amounts of financial assurance for decommissioning by quantity of material. Licensees required to submit the $1,125,000 amount must do so by (one year from effective date of these regulations). Licensees required to submit the $113,000 or $225,000 amount must do so by (one and a half years from effective date of these regulations). Licensees having possession limits exceeding the upper bound of this table must base financial assurance on a decommission funding plan.

Greater than 10^4 but less than or equal to 10^5 times the applicable quantities of 180 NAC 4, Appendix 4-F in unsealed form. (For a combination of isotopes, if R, as defined in 180 NAC 3-018.01, item 1 divided by 10^4 is greater than 1 but R divided by 10^5 is less than or equal to 1.)	$1,125,000
Greater than 10^3 but less than or equal to 10^4 times the applicable quantities of 180 NAC 4, Appendix 4-F in unsealed form. (For a combination of isotopes, if R, as defined in 180 NAC 3-018.01, item 1, divided by 10^3 is greater than 1 but R divided by 10^4 is less than or equal to 1.)	$225,000
Greater than 10^{10} but less than or equal to 10^{12} times the applicable quantities of 180 NAC 4, Appendix 4-F in sealed sources or plated foils. (For a combination of isotopes, if R, as defined in 180 NAC 3-018.01, item 1 divided by 10^{10} is greater than 1, but R divided by 10^{12} is less than or equal to 1)	$113,000

3-018.05 Each decommissioning funding plan must contain a cost estimate for decommissioning and a description of the method of assuring funds for decommissioning from 180 NAC 3-018.06, including means of adjusting cost estimates and associated

funding levels periodically over the life of the facility. Cost estimates must be adjusted at intervals not to exceed three years. The decommissioning funding plan must also contain a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning and a signed original of the financial statement obtained to satisfy the requirements of 180 NAC 3-018.06.

3-018.06 Financial assurance for decommissioning must be provided by one or more of the following methods:

1. Prepayment. Prepayment is the deposit prior to the start of operation into an account segregated from licensee assets and outside the licensee's administrative control of cash or liquid assets such that the amount of funds would be sufficient to pay decommissioning costs. Prepayment may be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities.

2. A surety method, insurance, or other guarantee method. These methods guarantee that decommissioning costs will be paid. A surety method may be in the form of a surety bond, letter of credit, or line of credit. A parent company guarantee of funds for decommissioning costs based on a financial test may be used if the guarantee and test are as contained in 180 NAC 3, Appendix 3-E. A parent company guarantee may not be used in combination with other financial methods to satisfy the requirements of 180 NAC 3-018.06, item 2. A guarantee of funds by the applicant or licensee for decommissioning based on a financial test may be used if the guarantee and test are as contained in 180 NAC 3, Appendix 3-D. A guarantee by the applicant or licensee may not be used in combination with any other financial methods to satisfy the requirements of 180 NAC 3-018.06, item 2 or in any situation where the applicant or licensee has a parent company holding majority control of the voting stock of the company. Any surety method or insurance used to provide financial assurance for decommissioning must contain the following conditions:

   a. The surety method or insurance must be open-ended or, if written for a specified term, such as five years, must be renewed automatically unless 90 days or more prior to the renewal date, the issuer notifies the Department, the beneficiary, and the licensee of its intention not to renew. The surety method or insurance must also provide that the full face amount be paid to the beneficiary automatically prior to the expiration without proof of forfeiture if the licensee fails to provide a replacement acceptable to the Department within 30 days after receipt of notification of cancellation.

   b. The surety method or insurance must be payable to a trust established for decommissioning costs. The trustee and trust must be acceptable to the Department. An acceptable trustee includes an appropriate State or Federal government agency or an entity which has the authority to act as a trustee and whose trust operations are regulated and examined by a Federal or State agency.

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c. The surety method or insurance must remain in effect until the Department has terminated the license. Deleted: Agency

3. An external sinking fund in which deposits are made at least annually, coupled with a surety method or insurance, the value of which may decrease by the amount being accumulated in the sinking fund. An external sinking fund is a fund established and maintained by setting aside funds periodically in an account segregated from licensee assets and outside the licensee's administrative control in which the total amount of funds would be sufficient to pay decommissioning costs at the time termination of operation is expected. An external sinking fund may be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities. The surety or insurance provisions must be as stated in 180 NAC 3-018.06, item 2.

4. In the case of Federal, State, or local government licensees, a statement of intent containing a cost estimate for decommissioning or an amount based on the Table in 180 NAC 3-018.04, and indicating that funds for decommissioning will be obtained when necessary.

3-018.07 Each person licensed under 180 NAC 3, 5, 7, 12, 14 and 19 must keep records of information important to the decommissioning of the facility in an identified location until the site is released for unrestricted use. Before licensed activities are transferred or assigned in accordance with 180 NAC 3-017.02, licensees must transfer all records described in 180 NAC 3-018.07 to the new licensee. In this case, the new licensee will be responsible for maintaining these records until the license is terminated. If records important to the decommissioning of a facility are kept for other purposes, reference to these records and their locations may be used. Information the Department considers important to decommissioning consists of: Deleted: Agency

1. Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations.

2. As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or stored and of locations of possible inaccessible contamination such as buried pipes which may be subject to contamination. If required drawings are referenced, each relevant document need not be indexed individually. If drawings are not available, the licensee must substitute appropriate records of available information concerning these areas and locations.

3. Except for areas containing only sealed sources (provided the sources have not leaked or no contamination remains after any leak) or byproduct materials having

only half-lives of less than 65 days, a list contained in a single document and updated every 2 years, of the following:

a. All areas designated and formerly designated as restricted areas as defined under 180 NAC 1-002 ;
b. All areas outside of restricted areas that require documentation under 180 NAC 3-018.07, item 1.;
c. All areas outside of restricted areas where current and previous wastes have been buried as documented under 180 NAC 4-054; and
d. All areas outside of restricted areas which contain material such that, if the license expired, the licensee would be required to either decontaminate the area to unrestricted release levels or apply for approval for disposal under 180 NAC 4-040.

4. Records of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and records of the funding method used for assuring funds if either a funding plan or certification is used.

3-019 EXPIRATION AND TERMINATION OF LICENSES AND DECOMMISSIONING OF SITES AND SEPARATE BUILDINGS OR OUTDOOR AREAS

3-019.01 Each specific license expires at the end of the day on the expiration date stated in the license unless the licensee has filed an application for renewal under 180 NAC 3-020 not less than 30 days before the expiration date stated in the existing license. If an application for renewal has been filed at least 30 days prior to the expiration date stated in the existing license, the existing license expires at the end of the day on which the Department makes a final determination to deny the renewal application or if the determination states an expiration date, the expiration date stated in the determination. Deleted: Agency

3-019.02 Each specific license revoked by the Department expires at the end of the day on the date of the Department's final determination to revoke the license, or on the expiration date stated in the determination, or as otherwise provided by Department Order. Deleted: Agency Deleted: Agency Deleted: Agency

3-019.03 Each specific license continues in effect, beyond the expiration date if necessary, with respect to possession of radioactive material until the Department notifies the licensee in writing that the license is terminated. During this time, the licensee must- Deleted: Agency

1. Limit actions involving radioactive material to those related to decommissioning; and
2. Continue to control entry to restricted area until they are suitable for release in accordance with Department requirements. Deleted: Agency

3-019.04 Within 60 days of the occurrence of any of the following, consistent with the administrative directions in 180 NAC 1-012, each licensee must provide notification to the Department in writing of such occurrence, and either begin decommissioning its site, or any separate building or outdoor area that contains residual radioactivity so that the building or outdoor area is suitable for release in accordance with Department requirements, or submit Deleted: Agency Deleted: Agency

within 12 months of notification a decommissioning plan, if required by 180 NAC 3-019.07 and begin decommissioning upon approval of that plan if -

1. The license has expired pursuant to180 NAC 3-019.01 and 3-019.02; or
2. The licensee has decided to permanently cease principal activities, as defined in 180 NAC 3-002, at the entire site or in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance withDepartment requirements; or
3. No principal activities under the license have been conducted for a period of 24 months; or
4. No principal activities have been conducted for a period of 24 months in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with Department requirements.

3-019.05 Coincident with the notification required by 180 NAC 3-019.04, the licensee must maintain in effect all decommissioning financial assurances established by the licensee pursuant to 180 NAC 3-018 in conjunction with a license issuance or renewal or as required by 180 NAC 3-019.05. The amount of the financial assurance must be increased, or may be decreased, as appropriate, to cover the detailed cost estimate for decommissioning established pursuant to 180 NAC 3-019.07, item 4.e.

1. Any licensee who has not provided financial assurance to cover the detailed cost estimate submitted with the decommissioning plan must do so;
2. Following approval of the decommissioning plan, a licensee may reduce the amount of the financial assurance as decommissioning proceeds and radiological contamination is reduced at the site with the approval of the Department.

3-019.06 The Department may grant a request to extend the time periods established in 180 NAC 3-019.04 if the Department determines that this relief is not detrimental to the public health and safety and is otherwise in the public interest. The request must be submitted no later than 30 days before notification pursuant to 180 NAC 3-019.04. The schedule for decommissioning set forth in 180 NAC 3-019.04 may not commence until the Department has made a determination on the request.

3-019.07 Decommissioning Plans

1. A decommissioning plan must be submitted if required by license condition or if the procedures and activities necessary to carry out decommissioning of the site or separate building or outdoor area have not been previously approved by the Department and these procedures could increase potential health and safety impacts to workers or to the public; such as in the following cases;

   a. Procedures would involve techniques not applied routinely during cleanup or maintenance operations;
   b. Workers could be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation;

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c. Procedures could result in significantly greater airborne concentrations of radioactive materials than are present during operation; or
d. Procedures could result in significantly greater releases of radioactive materials to the environment than those associated with operation.

2. The Department may approve an alternate schedule for submittal of a decommissioning plan required pursuant to 180 NAC 3-019.04 if the Department determines that the alternative schedule is necessary to the effective conduct of decommissioning operations and presents no undue risk from radiation to the public health and safety and is otherwise in the public interest.

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3. Procedures such as those listed in 180 NAC 3-019.07, item 1 with potential health and safety impacts may not be carried out prior to the approval of the decommissioning plan.

4. The proposed decommissioning plan for the site or separate building or outdoor area must include:

a. A description of the conditions of the site or separate building or outdoor area sufficient to evaluate the acceptability of the plan;
b. A description of planned decommissioning activities;
c. A description of methods used to ensure the protection of workers and the environment against radiation hazards during decommissioning;
d. A description of the planned final radiation survey; and
e. An updated detailed cost estimate for decommissioning, comparison of that estimate with present funds set aside for decommissioning, and a plan for assuring the availability of adequate funds for completion of decommissioning.
f. For decommissioning plans calling for completion of decommissioning later than 24 months after plan approval, the plan must include a justification for the delay based on the criteria in 180 NAC 3-019.09.

5. The proposed decommissioning plan will be approved by the Department if the information therein demonstrates that the decommissioning will be completed as soon as practicable and that the health and safety of workers and the public will be adequately protected.

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3-019.08 Decommissioning

1. Except as provided in 180 NAC 3-019.09, licensees must complete decommissioning of the site or separate building or outdoor area as soon as is practicable but no later than 24 months following the initiation of decommissioning.

2. Except as provided in 180 NAC 3-019.09, when decommissioning involves the entire site, the licensee must request license termination as soon as practicable but no later than 24 months following the initiation of decommissioning.

3-019.09 The Department may approve a request for an alternative schedule for completion of decommissioning of the site or separate building or outdoor area, and license termination if appropriate, if the Department determines that the alternative is warranted by consideration of the following: Deleted: Agency Deleted: Agency

1. Whether it is technically feasible to complete decommissioning within the allotted 24 month period;
2. Whether sufficient waste disposal capacity is available to allow completion of decommissioning within the allotted 24 month period;
3. Whether a significant volume reduction in wastes requiring disposal will be achieved by allowing short-lived radionuclides to decay;
4. Whether a significant reduction in radiation exposure to workers can be achieved by allowing short-lived radionuclides to decay; and
5. Other site-specific factors which the Department may consider appropriate on a case-by-case basis, such as the regulatory requirements of other government agencies, lawsuits, ground-water treatment activities, monitored natural ground-water restoration, actions that could result in more environmental harm than deferred cleanup, and other factors beyond the control of the licensee. Deleted: Agency

3-019.10 As the final step in decommissioning, the licensee must: Deleted: -¶

1. Certify the disposition of all licensed material, including accumulated wastes, by submitting a completed Department Form NRH-60 or equivalent information; and Deleted: Agency

2. Conduct a radiation survey of the premises where the licensed activities were carried out and submit a report of the results of this survey unless the licensee demonstrates that the premises are suitable for release in some other manner. The licensee must, as appropriate: Deleted: -

   a. Report levels of gamma radiation in units of millisieverts (microroentgen) per hour at one meter from surfaces, and report levels of radioactivity, including alpha and beta, in units of megabecquerels (disintegrations per minute or microcuries) per 100 square centimeters - removable and fixed - for surfaces, megabecquerels (microcuries) per milliliter for water, becquerels (picocuries) per gram for solids such as soil or concrete; and

   b. Specify the survey instrument(s) used and certify that each instrument is properly calibrated and tested.

3-019.11 Specific licenses, including expired licenses, will be terminated by written notice to the licensee when the Department determines: Deleted: Agency

1. Radioactive material has been properly disposed;

2. Reasonable effort has been made to eliminate residual radioactive contamination, if present; and

3. Demonstration of suitability for release.

a. A radiation survey has been performed which demonstrates that the premises are suitable for release in accordance with Department requirements; or

b. Other information submitted by the licensee is sufficient to demonstrate that the premises are suitable for release in accordance with Department requirements.

4. Records required by 180 NAC 3-030.06 and 3-030.08 have been received.

3-020 RENEWAL OF LICENSES

3-020.01 Applications for renewal of specific licenses must be filed in accordance with 180 NAC 3-010.

3-020.02 In any case in which a licensee, not less than 30 days prior to expiration of the existing license, has filed an application in proper form for renewal or for a new license authorizing the same activities, such existing license will not expire until the application has been finally determined by the Department.

3-021 AMENDMENT OF LICENSES AT REQUEST OF LICENSEE: Applications for amendment of a license must be filed in accordance with 180 NAC 3-010 and must specify the respects in which the licensee desires his/her license to be amended and the grounds for such amendment.

3-022 DEPARTMENT ACTION ON APPLICATIONS TO RENEW AND AMEND: In considering an application by a licensee to renew or amend his/her license, the Department will apply the criteria set forth in 180 NAC 3-011, 3-013 or 3-014, and 3-015 and in 180 NAC 5, 7, 12, 14 or 19 as applicable.

3-023 RESERVED

3-024 RESERVED

3-025 TRANSFER OF MATERIAL

3-025.01 No licensee will transfer radioactive material except as authorized pursuant to 180 NAC 3-025.

3-025.02 Except as otherwise provided in his/her license and subject to the provisions of 180 NAC 3-025.03 and 3-025.04, any licensee may transfer radioactive material:

1. To the Department;[11]
2. To the U.S. Department of Energy;
3. To any person exempt from the regulations to the extent permitted under such exemption;

[11] A licensee may transfer material to the Department only after receiving prior approval from the Department.

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4. To any person authorized to receive such material under terms of a general license or its equivalent, or a specific license or equivalent licensing document, issued by the Department, the U.S. Nuclear Regulatory Commission, or any Agreement State, or to any person otherwise authorized to receive such material by the Federal Government or any agency thereof, the Department, or any Agreement State, or
5. As otherwise authorized by the Department in writing.
6. To the agency in any Agreement State which regulates radioactive material pursuant to an agreement under § 274 of the Atomic Energy Act of 1954[12]

3-025.03 Before transferring radioactive material to a specific licensee of the Department, the U.S. Nuclear Regulatory Commission, or an Agreement State, or to a general licensee who is required to register with the Department, the U.S. Nuclear Regulatory Commission, or an Agreement State prior to receipt of the radioactive material, the licensee transferring the material must verify that the transferee's license authorizes the receipt of the type, form, and quantity of radioactive material to be transferred.

3-025.04 The following methods for the verification required by 180 NAC 3-025.03 are acceptable:

1. The transferor may have in his/her possession, and read, a current copy of the transferee's specific license or registration certificate;
2. The transferor may have in his/her possession a written certification by the transferee that he/she is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date;
3. For emergency shipments the transferor may accept oral certification by the transferee that he/she is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date; provided, that the oral certification is confirmed in writing within ten days;
4. The transferor may obtain other sources of information compiled by a reporting service from official records of the Department, the U.S. Nuclear Regulatory Commission, the licensing agency of an Agreement State as to the identity of licensees and the scope and expiration dates of licenses and registration; or
5. When none of the methods of verification described in 180 NAC 3-025.04, items 1. through 4. are readily available or when a transferor desires to verify that information received by one of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the Department, the U.S. Nuclear Regulatory Commission, or the licensing agency of an Agreement State that the transferee is licensed to receive the radioactive material.

3-025.05 Preparation for shipment and transport of radioactive material must be in accordance with the provisions of 180 NAC 13.

[12]Ibid. p. 3-52

3-026 REPORTING REQUIREMENTS

3-026.01 Immediate Report: Each licensee must notify the Department as soon as possible but not later than four hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of radioactive material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases, etc.).

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3-026.02 Twenty-Four Hour Report: Each licensee must notify the Department within 24 hours after the discovery of any of the following events involving radioactive material:

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1. An unplanned contamination event that:

   a. Requires access to the contaminated area, by workers or the public, to be restricted for more than 24 hours by imposing additional radiological controls or by prohibiting entry into the area;
   b. Involves a quantity of material greater than five times the lowest annual limit on intake specified in 180 NAC 4, Appendix 4-B for the material; and
   c. Has access to the area restricted for a reason other than to allow isotopes with a half-life of less than 24 hours to decay prior to decontamination.

2. An event in which equipment is disabled or fails to function as designed when:

   a. The equipment is required by regulation or license condition to prevent releases exceeding regulatory limits, to prevent exposures to radiation and radioactive materials exceeding regulatory limits, or to mitigate the consequences of an accident;
   b. The equipment is required to be available and operable when it is disabled or fails to function; and
   c. No redundant equipment is available and operable to perform the required safety function.

3. An event that requires unplanned medical treatment at a medical facility of an individual with spreadable radioactive contamination on the individual's clothing or body.
4. An unplanned fire or explosion damaging any radioactive material or any device, container, or equipment containing radioactive material when:

   a. The quantity of radioactive material involved is greater than five times the lowest annual limit on intake specified in 180 NAC 4, Appendix 4-B for the material; and
   b. The damage affects the integrity of the radioactive material or its container.

3-026.03 Preparation and submission of reports: Reports made by licensees in response to the requirements of 180 NAC 3-026.03 must be made as follows:

1. Licensees must make reports required by 180 NAC 3-026.01 and 3-026.02 by telephone to the Department.[13] To the extent that the information is available at the time of notification, the information provided in these reports must include:

   a. The caller's name and call back telephone number;
   b. A description of the event, including date and time;
   c. The exact location of the event;
   d. The isotopes, quantities, and chemical and physical form of the radioactive material involved; and
   e. Any personnel radiation exposure data available.

2. Written report. Each licensee who makes a report required by 180 NAC 3-026.01 or 180 NAC 3-026.02 must submit a written follow-up report within 30 days of the initial report. Written reports prepared pursuant to other regulations may be submitted to fulfill this requirement if the reports contain all of the necessary information and the appropriate distribution is made. These written reports must be sent to:

   Department of Health and Human Services,
   Division of Public Health,
   301 Centennial Mall South
   P.O. Box 95026
   Lincoln, NE 68509-5026

   The reports must include the following:

   a. A description of the event, including the probable cause and the manufacturer and model number, if applicable, of any equipment that failed or malfunctioned;
   b. The exact location of the event;
   c. The isotopes, quantities, and chemical and physical form of the radioactive material involved;
   d. Date and time of the event;
   e. Corrective actions taken or planned and the results of any evaluations or assessments; and
   f. The extent of exposure of individuals to radiation or to radioactive materials without identification of individuals by name.

3-027 MODIFICATION AND REVOCATION OF LICENSES: The terms and conditions of all licenses will be subject to amendment, revision, modification, limitation, suspension or revocation upon:

3-027.01 Amendments to the Radiation Control Act or the rules and regulations adopted pursuant thereto;

[13]The telephone number for the Department is (402) 471-2168.

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3-027.02 Voluntary application for license amendment, revision, modification, limitation, suspension or surrender made by the licensee;

3-027.03 Disciplinary action pursuant to 180 NAC 17 ;or

3-027.04 Pursuant to emergency order as provided by § 71-3513(6) of the Act.

RECIPROCITY

3-028 RECIPROCAL RECOGNITION OF LICENSES

3-028.01 Licenses of Radioactive Material Except Special Nuclear Material in Quantities Sufficient to Form a Critical Mass

1. Subject to Title 180, any person who holds a specific license from the U.S. Nuclear Regulatory Commission or any Agreement State, and issued by the Department having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, is hereby granted a general license to conduct the activities authorized in such licensing document within this State for a period not in excess of 180 days in any calendar year provided that:

   a. The licensing document does not limit the activity authorized by such document to specified installations or locations;
   b. The out-of-state licensee notifies the Department in writing at least three (3) days prior to engaging in such activity. Such notification must include:

      (1) Name of company for whom services will be performed, an individual to be contacted representing the company and telephone number.
      (2) The exact location, start date, duration, and type of activity to be conducted.
      (3) The name(s), documentation of training, and in-state address(es) of the individual(s) performing the activity,
      (4) The identification of the sources of radiation to be used,
      (5) A copy of the pertinent license,
      (6) A copy of the licensee's operating and emergency procedures, and
      (7) An annual fee as specified in 180 NAC 18 .
      (8) The out-of-state licensee notifies the Department of changes in work locations, radioactive material, or work activities different from the information contained on the initial notification.

      If, for a specific case, the three day period would impose an undue hardship on the out-of-state licensee, the licensee may, upon application to the Department, obtain permission to proceed sooner. The Department may waive the requirement for filing additional written notifications during the remainder of the calendar year following the receipt of the initial notification from a person engaging in activities under the general license provided in 180 NAC 3-028.01.

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c. The out-of-state licensee complies with all applicable regulations of the Department and with all the terms and conditions of the licensing document, except any such terms and conditions which may be inconsistent with applicable regulations of the Department;

d. The out-of-state licensee maintains a current copy of the appropriate license, and all amendments thereto, issued by the Department;

e. The out-of-state licensee supplies such other information as the Department may request;

f. The out-of-state licensee must not transfer or dispose of radioactive material possessed or used under the general license provided in 180 NAC 3-028.01, item 1 except by transfer to a person:

(1) Specifically licensed by the Department or by the U.S. Nuclear Regulatory Commission to receive such material, or

(2) Exempt from the requirements for a license for such material under 180 NAC 3-004.01.

2. Notwithstanding the provisions of 180 NAC 3-028.01, item 1 any person who holds a specific license issued by the U.S. Nuclear Regulatory Commission or an Agreement State authorizing the holder to manufacture, transfer, install, or service a device described in 180 NAC 3-008.04, item 1 within areas subject to the jurisdiction of the licensing body is hereby granted a general license to install, transfer, demonstrate or service such a device in this State provided that:

a. Such person must file a report with the Department within 30 days after the end of each calendar quarter in which any device is transferred to or installed in this State. Each such report must identify each general licensee to whom such device is transferred by name and address, the type and model of device transferred, and the quantity and type of radioactive material contained in the device;

b. The device has been manufactured, labeled, installed, and serviced in accordance with applicable provisions of the specific license issued to such person by the U.S. Nuclear Regulatory Commission or an Agreement State;

c. Such person must assure that any labels required to be affixed to the device under regulations of the authority which licensed manufacture of the device bear a statement that "Removal of this label is prohibited"; and

d. The holder of the specific license must furnish to each general licensee to whom he/she transfers such device or on whose premises he/she installs such device a copy of the general license contained in 180 NAC 3-008.04.

3. The Department may withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by another agency, or any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to achieve compliance with Title 180 or to prevent undue hazard to public health and safety or property.

3-028.02 Recognition of Agreement State Licensees

1. Before radioactive materials can be used at a temporary job site within the State at any Federal facility, the jurisdictional status of the job site must be determined. If the jurisdictional status is unknown, the Federal agency should be contacted to determine if the job site is under exclusive Federal jurisdiction.

   a. In areas of exclusive Federal jurisdiction, the general license is subject to all the applicable rules, regulations, orders and fees of the U.S. Nuclear Regulatory Commission, and
   b. Authorizations for use of radioactive materials at job sites under exclusive Federal jurisdiction must be obtained from the U.S. Nuclear Regulatory Commission by either (1) filing a NRC Form-241 in accordance with 10 CFR 150.20(b); or (2) by applying for a specific U.S. Nuclear Regulatory Commission license.

2. Before radioactive material can be used at a temporary job site in another State, authorization must be obtained for the State if it is an Agreement State, or from the U.S. Nuclear Regulatory Commission for any non-Agreement State, either by filing for reciprocity or applying for a specific license.

3-029 RESERVED

3-030 RECORDS

3-030.01 Each person who receives radioactive material pursuant to a license issued pursuant to 180 NAC 3, 5, 7, 12, 14, and 19 must keep records showing the receipt, use, transfer, and disposal of such radioactive material.

3-030.02 Records which are required pursuant to 180 NAC 3-030.01 must be maintained for the period specified by the appropriate regulation. If a retention period is not otherwise specified by regulation such records must be maintained for a period of one year after the records of the licensee have been inspected by the Department unless any litigation, claim, negotiation, audit, licensure action, or other action involving the records has been initiated before the expiration of the one-year period, in which case the records must be retained until the completion of the action and resolution of all issues, or until the end of the regular one-year period, whichever is later.

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3-030.03 Records of receipt of radioactive material which must be maintained pursuant to 180 NAC 3-030.01 will be maintained as long as the licensee retains possession of the radioactive material and for five years following transfer, or disposition of the radioactive material and;

1. Records of transfer of radioactive material must be maintained by the licensee who transferred the material until the Department authorizes their disposition and;
2. Records of disposal of radioactive material must be maintained in accordance with 180 NAC 4-054.
3. If radioactive material is combined or mixed with other licensed material and subsequently treated in a manner which makes direct correlation of a receipt

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record with a transfer, export, or disposition record impossible, evaluative techniques such as first-in-first-out may be used for purposes of the records retention requirements of 180 NAC 3-030.

3-030.04 Records which must be maintained pursuant to 180 NAC 3-030.01 may be the original or reproduced copy of microform if such reproduced copy or microform is duly authenticated by authorized personnel and the microform is capable of producing a clear and legible copy after storage for the period specified by Department regulations. The record may also be stored in electronic media with the capability for producing legible, accurate and complete record during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures. The licensee must maintain adequate safeguards against tampering with and loss of records.

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3-030.05 If there is a conflict between the Department's regulations in 180 NAC 3, license condition, or other written Department approval or authorization pertaining to the retention period for the same type of record, the retention period specified in 180 NAC 3-030 for such records will apply unless the Department pursuant to 180 NAC 1-003.01 has granted a specific exemption from the record retention requirements specified in 180 NAC 3-030.05.

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3-030.06 Prior to license termination, each licensee authorized to possess radioactive material with a half-life greater than 120 days, in an unsealed form, must forward the following records to the Department:

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1. Records of disposal of licensed material made under 180 NAC 4-040, 4-041, 4-042 and 4-043; and
2. Records required by 180 NAC 4-048.02, item 4.

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3-030.07 If licensed activities are transferred or assigned in accordance with 180 NAC 3-017.02, each licensee authorized to possess radioactive material with a half-life greater than 120 days, in an unsealed form, must transfer the following records to the new licensee and the new licensee will be responsible for maintaining these records until the license is terminated:

1. Records of disposal of licensed material made under, 180 NAC 3-038, 3-039, 3-040, 3-041 and
2. Records required by 180 NAC 4-048.02, item 4.

3-030.08 Prior to license termination, each licensee must forward the records required by 180 NAC 3-018.07 to the Department.

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EXEMPT CONCENTRATIONS:

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml*	Column II Liquid and Solid Concentration µCi/ml**
Antimony (51)	Sb-122		3E-4
	Sb-124		2E-4
	Sb-125		1E-3
Argon (18)	Ar-37	1E-3	
	Ar-41	4E-7	
Arsenic (33)	As-73		5E-3
	As-74		5E-4
	As-76		2E-4
	As-77		8E-4
Barium (56)	Ba-131		2E-3
	Ba-140		3E-4
Beryllium (4)	Be-7		2E-2
Bismuth (83)	Bi-206		4E-4
Bromine (35)	Br-82	4E-7	3E-3
Cadmium (48)	Cd-109		2E-3
	Cd-115m		3E-4
	Cd-115		3E-4
Calcium (20)	Ca-45		9E-5
	Ca-47		5E-4
Carbon (6)	C-14	1E-6	8E-3
Cerium (58)	Ce-141		9E-4
	Ce-143		4E-4
	Ce-144		1E-4
Cesium (55)	Cs-131		2E-2
	Cs-134m		6E-2
	Cs-134		9E-5
Chlorine (17)	Cl-38	9E-7	4E-3
Chromium (24)	Cr-51		2E-2
Cobalt (27)	Co-57		5E-3
	Co-58		1E-3

Appendix 3-A

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml*	Column II Liquid and Solid Concentration µCi/ml**
	Co-60		5E-4
Copper (29)	Cu-64		3E-3
Dysprosium (66)	Dy-165		4E-3
	Dy-166		4E-4
Erbium (68)	Er-169		9E-4
	Er-171		1E-3
Europium (63)	Eu-152 (T/2=9.2hrs)		6E-4
	Eu-155		2E-3
Fluorine (9)	F-18	2E-6	8E-3
Gadolinium (64)	Gd-153		2E-3
	Gd-159		8E-4
Gallium (31)	Ga-72		4E-4
Germanium (32)	Ge-71		2E-2
Gold (79)	Au-196		2E-3
	Au-198		5E-4
	Au-199		2E-3
Hafnium (72)	Hf-181		7E-4
Hydrogen (1)	H-3	5E-6	3E-2
Indium (49)	In-113m		1E-2
	In-114m		2E-4
Iodine (53)	I-126	3E-9	2E-5
	I-131	3E-9	2E-5
	I-132	8E-8	6E-4
	I-133	1E-8	7E-5
	I-134	2E-7	1E-3
Iridium (77)	Ir-190		2E-3
	Ir-192		4E-4
	Ir-194		3E-4
Iron (26)	Fe-55		8E-3
	Fe-59		6E-4
Krypton (36)	Kr-85m	1E-6	
	Kr-85	3E-6	
Lanthanum (57)	La-140		2E-4

Appendix 3-A

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml*	Column II Liquid and Solid Concentration µCi/ml**
Lead (82)	Pb-203		4E-3
Lutetium (71)	Lu-177		1E-3
Manganese (25)	Mn-52		3E-4
	Mn-54		1E-3
	Mn-56		1E-3
Mercury (80)	Hg-197m		2E-3
	Hg-197		3E-3
	Hg-203		2E-4
Molybdenum (42)	Mo-99		2E-3
Neodymium (60)	Nd-147		6E-4
	Nd-149		3E-3
Nickel (28)	Ni-65		1E-3
Niobium (Columbium)(41)	Nb-95		1E-3
	Nb-97		9E-3
Osmium (76)	Os-185		7E-4
	Os-191m		3E-2
	Os-191		2E-3
	Os-193		6E-4
Palladium (46)	Pd-103		3E-3
	Pd-109		9E-4
Phosphorus (15)	P-32		2E-4
Platinum (78)	Pt-191		1E-3
	Pt-193m		1E-2
	Pt-197m		1E-2
	Pt-197		1E-3
Potassium (19)	K-42		3E-3
Praseodymium (59)	Pr-142		3E-4
	Pr-143		5E-4
Promethium (61)	Pm-147		2E-3
	Pm-149		4E-4
Rhenium (75)	Re-183		6E-3
	Re-186		9E-4
	Re-188		6E-4

Appendix 3-A

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml*	Column II Liquid and Solid Concentration µCi/ml**
Rhodium (45)	Rh-103m		1E-1
	Rh-105		1E-3
Rubidium (37)	Rb-86		7E-4
Ruthenium (44)	Ru-97		4E-3
	Ru-103		8E-4
	Ru-105		1E-3
	Ru-106		1E-4
Samarium (62)	Sm-153		8E-4
Scandium (21)	Sc-46		4E-4
	Sc-47		9E-4
	Sc-48		3E-4
Selenium (34)	Se-75		3E-3
Silicon (14)	Si-31		9E-3
Silver (47)	Ag-105		1E-3
	Ag-110m		3E-4
	Ag-111		4E-4
Sodium (11)	Na-24		2E-3
Strontium (38)	Sr-85		1E-3
	Sr-89		1E-4
	Sr-91		7E-4
	Sr-92		7E-4
Sulfur (16)	S-35	9E-8	6E-4
Tantalum (73)	Ta-182		4E-4
Technetium (43)	Tc-96m		1E-1
	Tc-96		1E-3
Tellurium (52)	Te-125m		2E-3
	Te-127m		6E-4
	Te-127		3E-3
	Te-129m		3E-4
	Te-131m		6E-4
	Te-132		3E-4
Terbium (65)	Tb-160		4E-4
Thallium (81)	Tl-200		4E-3

Appendix 3-A

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml*	Column II Liquid and Solid Concentration µCi/ml**
	Tl-201		3E-3
	Tl-202		1E-3
	Tl-204		1E-3
Thulium (69)	Tm-170		5E-4
	Tm-171		5E-3
Tin (50)	Sn-113		9E-4
	Sn-125		2E-4
Tungsten (Wolfram)(74)	W-181		4E-3
	W-187		7E-4
Vanadium (23)	V-48		3E-4
Xenon (54)	Xe-131m	4E-6	
	Xe-133	3E-6	
	Xe-135	1E-6	
Ytterbium (70)	Yb-175		1E-3
Yttrium (39)	Y-90		2E-4
	Y-91m		3E-2
	Y-91		3E-4
	Y-92		6E-4
	Y-93		3E-4
Zinc (30)	Zn-65		1E-3
	Zn-69m		7E-4
	Zn-69		2E-2
Zirconium (40)	Zr-95		6E-4
	Zr-97		2E-4
Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years		1E-10	1E-6

*Values are given in Column I only for those materials normally used as gases.

**µCi/gm for solids.

NOTE 1: Many radioisotopes disintegrate into isotopes which are also radioactive. In expressing the concentrations in 180 NAC 3, Appendix 003-A the activity stated is that of the parent isotope and takes into account the daughters.

NOTE 2: For purposes of 180 NAC 3-004 where there is involved a combination of isotopes, the limit for the combination should be derived as follows: Determine for each isotope in the product the ratio between the concentration present in the product and the exempt concentration established in Appendix 003-A for the specific isotope when not in combination. The sum of such ratios may not exceed "1" (i.e., unity).

EXAMPLE:

$$\frac{\text{Concentration of Isotope A in Product}}{\text{Exempt concentration of Isotope A}} + \frac{\text{Concentration of Isotope B in Product}}{\text{Exempt concentration of Isotope B}} = \leq 1$$

NOTE 3: *To convert μCi/ml to SI units of megabecquerels per liter multiply the above value by 37.*

EXAMPLE: Zirconium (40) Zr-97 2E-4 μCi/ml multiplied by 37 is equivalent to 74E+4 MBq /l)

APPENDIX 3-B

Radioactive Material	Microcuries

EXEMPT QUANTITIES

Antimony-122 (Sb 122)	100
Antimony-124 (Sb 124)	10
Antimony-125 (Sb 125)	10
Arsenic-73 (As 73)	100
Arsenic-74 (As 74)	10
Arsenic-76 (As 76)	10
Arsenic-77 (As 77)	100
Barium-131 (Ba 131)	10
Barium-133 (Ba 133)	10
Barium-140 (Ba 140)	10
Bismuth-210 (Bi 210)	1
Bromine-82 (Br 82)	10
Cadmium-109 (Cd 109)	10
Cadmium-115m (Cd 115m)	10
Cadmium-115 (Cd 115)	100
Calcium-45 (Ca 45)	10
Calcium-47 (Ca 47)	10
Carbon-14 (C 14)	100
Cerium-141 (Ce 141)	100
Cerium-143 (Ce 143)	100
Cerium-144 (Ce 144)	1
Cesium-129 (Cs 129)	100
Cesium-131 (Cs 131)	1,000
Cesium-134m (Cs 134m)	100
Cesium-134 (Cs 134)	1
Cesium-135 (Cs 135)	10
Cesium-136 (Cs 136)	10
Cesium-137 (Cs 137)	10
Chlorine-36 (Cl 36)	10
Chlorine-38 (Cl 38)	10
Chromium-51 (Cr 51)	1,000
Cobalt-57 (Co 57)	100
Cobalt-58m (Co 58m)	10
Cobalt-58 (Co 58)	10
Cobalt-60 (Co 60)	1
Copper-64 (Cu 64)	100
Dysprosium-165 (Dy 165)	10
Dysprosium-166 (Dy 166)	100
Erbium-169 (Er 169)	100
Erbium-171 (Er 171)	100

APPENDIX 3-B

Radioactive Material	Microcuries
Europium-152 (Eu 152) 9.2h	100
Europium-152 (Eu 152) 13 yr	1
Europium-154 (Eu 154)	1
Europium-155 (Eu 155)	10
Fluorine-18 (F 18)	1,000
Gadolinium-153 (Gd 153)	10
Gadolinium-159 (Gd 159)	100
Gallium-67 (Ga 67)	100
Gallium-72 (Ga 72)	10
Germanium-71 (Ge 71)	100
Gold-198 (Au 198)	100
Gold-199 (Au 199)	100
Hafnium-181 (Hf 181)	10
Holmium-166 (Ho 166)	100
Hydrogen-3 (H 3)	1,000
Indium-111 (In 111)	100
Indium-113m (In 113m)	100
Indium-114m (In 114m)	10
Indium-115m (In 115m)	100
Indium-115 (In 115)	10
Iodine-123 (I 123)	100
Iodine-125 (I 125)	1
Iodine-126 (I 126)	1
Iodine-129 (I 129)	0.1
Iodine-131 (I 131)	1
Iodine-132 (I 132)	10
Iodine-133 (I 133)	1
Iodine-134 (I 134)	10
Iodine-135 (I 135)	10
Iridium-192 (Ir 192)	10
Iridium-194 (Ir 194)	100
Iron-52 (Fe 52)	10
Iron-55 (Fe 55)	100
Iron-59 (Fe 59)	10
Krypton-85 (Kr 85)	100
Krypton-87 (Kr 87)	10
Lanthanum-140 (La 140)	10
Lutetium-177 (Lu 177)	100
Manganese-52 (Mn 52)	10
Manganese-54 (Mn 54)	10
Manganese-56 (Mn 56)	10
Mercury-197m (Hg 197m)	100
Mercury-197 (Hg 197)	100
Mercury-203 (Hg 203)	10

APPENDIX 3-B

Radioactive Material	Microcuries
Molybdenum-99 (Mo 99)	100
Neodymium-147 (Nd 147)	100
Neodymium-149 (Nd 149)	100
Nickel-59 (Ni 59)	100
Nickel-63 (Ni 63)	10
Nickel-65 (Ni 65)	100
Niobium-93m (Nb 93m)	10
Niobium-95 (Nb 95)	10
Niobium-97 (Nb 97)	10
Osmium-185 (Os 185)	10
Osmium-191m (Os 191m)	100
Osmium-191 (Os 191)	100
Osmium-193 (Os 193)	100
Palladium-103 (Pd 103)	100
Palladium-109 (Pd 109)	100
Phosphorus-32 (P 32)	10
Platinum-191 (Pt 191)	100
Platinum-193m (Pt 193m)	100
Platinum-193 (Pt 193)	100
Platinum-197m (Pt 197m)	100
Platinum-197 (Pt 197)	100
Polonium-210 (Po 210)	0.1
Potassium-42 (K 42)	10
Potassium-43 (K 43)	10
Praseodymium-142 (Pr 142)	100
Praseodymium-143 (Pr 143)	100
Promethium-147 (Pm 147)	10
Promethium-149 (Pm 149)	10
Rhenium-186 (Re 186)	100
Rhenium-188 (Re 188)	100
Rhodium-103m (Rh 103m)	100
Rhodium-105 (Rh 105)	100
Rubidium-81 (Rb 81)	10
Rubidium-86 (Rb 86)	10
Rubidium-87 (Rb 87)	10
Ruthenium-97 (Ru 97)	100
Ruthenium-103 (Ru 103)	10
Ruthenium-105 (Ru 105)	10
Ruthenium-106 (Ru 106)	1
Samarium-151 (Sm 151)	10
Samarium-153 (Sm 153)	100
Scandium-46 (Sc 46)	10
Scandium-47 (Sc 47)	100
Scandium-48 (Sc 48)	10

APPENDIX 3-B

Radioactive Material	Microcuries
Selenium-75 (Se 75)	10
Silicon-31 (Si 31)	100
Silver-105 (Ag 105)	10
Silver-110m (Ag 110m)	1
Silver-111 (Ag 111)	100
Sodium-22 (Na 22)	10
Sodium-24 (Na 24)	10
Strontium-85 (Sr 85)	10
Strontium-89 (Sr 89)	1
Strontium-90 (Sr 90)	0.1
Strontium-91 (Sr 91)	10
Strontium-92 (Sr 92)	10
Sulphur-35 (S 35)	100
Tantalum-182 (Ta 182)	10
Technetium-96 (Tc 96)	10
Technetium-97m (Tc 97m)	100
Technetium-97 (Tc 97)	100
Technetium-99m (Tc 99m)	100
Technetium-99 (Tc 99)	10
Tellurium-125m (Te 125m)	10
Tellurium-127m (Te 127m)	10
Tellurium-127 (Te 127)	100
Tellurium-129m (Te 129m)	10
Tellurium-129 (Te 129)	100
Tellurium-131m (Te 131m)	10
Tellurium-132 (Te 132)	10
Terbium-160 (Tb 160)	10
Thallium-200 (Tl 200)	100
Thallium-201 (Tl 201)	100
Thallium-202 (Tl 202)	100
Thallium-204 (Tl 204)	10
Thulium-170 (Tm 170)	10
Thulium-171 (Tm 171)	10
Tin-113 (Sn 113)	10
Tin-125 (Sn 125)	10
Tungsten-181 (W 181)	10
Tungsten-185 (W 185)	10
Tungsten-187 (W 187)	100
Vanadium-48 (V 48)	10
Xenon-131m (Xe 131m)	1,000
Xenon-133 (Xe 133)	100
Xenon-135 (Xe 135)	100
Ytterbium-175 (Yb 175)	100
Yttrium-87 (Y 87)	10

APPENDIX 3-B

Radioactive Material	Microcuries
Yttrium-90 (Y 90)	10
Yttrium-91 (Y 91)	10
Yttrium-92 (Y 92)	100
Yttrium-93 (Y 93)	100
Zinc-65 (Zn 65)	10
Zinc-69m (Zn 69m)	100
Zinc-69 (Zn 69)	1,000
Zirconium-93 (Zr 93)	10
Zirconium-95 (Zr 95)	10
Zirconium-97 (Zr 97)	10
Any radioactive material not listed above other than alpha emitting radioactive material	0.1

NOTE: To convert microcuries (μCi) to SI units of kilobecquerels (kBq), multiply the above values by 37.

EXAMPLE: Zirconium-97 (10 μCi multiplied by 37 is equivalent to 370 kBq).

APPENDIX 3-C

LIMITS FOR BROAD LICENSES 180 NAC 3-013:

Radioactive Material	Col. I curies	Col. II curies
Antimony-122	1	0.01
Antimony-124	1	0.01
Antimony-125	1	0.01
Arsenic-73	10	0.1
Arsenic-74	1	0.01
Arsenic-76	1	0.01
Arsenic-77	10	0.1
Barium-131	10	0.1
Barium-140	1	0.01
Beryllium-7	10	0.1
Bismuth-210	0.1	0.001
Bromine-82	10	0.1
Cadmium-109	1	0.01
Cadmium-115m	1	0.01
Cadmium-115	10	0.1
Calcium-45	1	0.01
Calcium-47	10	0.1
Carbon-14	100	1.0
Cerium-141	10	0.1
Cerium-143	10	0.1
Cerium-144	0.1	0.001
Cesium-131	100	1.0
Cesium-134m	100	1.0
Cesium-134	0.1	0.001
Cesium-135	1	0.01
Cesium-136	10	0.1
Cesium-137	0.1	0.001
Chlorine-36	1	0.01
Chlorine-38	100	1.0
Chromium-51	100	1.0
Cobalt-57	10	0.1
Cobalt-58m	100	1.0
Cobalt-58	1	0.01
Cobalt-60	0.1	0.001
Copper-64	10	0.1
Dysprosium-165	100	1.0
Dysprosium-166	10	0.1
Erbium-169	10	0.1
Erbium-171	10	0.1
Europium-152 (9.2h)	10	0.1
Europium-152 (13 y)	0.1	0.001
Europium-154	0.1	0.001
Europium-155	1	0.01

APPENDIX 3-C

Radioactive Material	Col. I curies	Col. II curies
Fluorine-18	100	1.0
Gadolinium-153	1	0.01
Gadolinium-159	10	0.1
Gallium-72	10	0.1
Germanium-71	100	1.0
Gold-198	10	0.1
Gold-199	10	0.1
Hafnium-181	1	0.01
Holmium-166	10	0.1
Hydrogen-3	100	1.0
Indium-113m	100	1.0
Indium-114m	1	0.01
Indium-115m	100	1.0
Indium-115	1	0.01
Iodine-125	0.1	0.001
Iodine-126	0.1	0.001
Iodine-129	0.1	0.001
Iodine-131	0.1	0.001
Iodine-132	10	0.1
Iodine-133	1	0.01
Iodine-134	10	0.1
Iodine-135	1	0.01
Iridium-192	1	0.01
Iridium-194	10	0.1
Iron-55	10	0.1
Iron-59	1	0.01
Krypton-85	100	1.0
Krypton-87	10	0.1
Lanthanum-140	1	0.01
Lutetium-177	10	0.1
Manganese-52	1	0.01
Manganese-54	1	0.01
Manganese-56	10	0.1
Mercury-197m	10	0.1
Mercury-197	10	0.1
Mercury-203	1	0.01
Molybdenum-99	10	0.1
Neodymium-147	10	0.1
Neodymium-149	10	0.1
Nickel-59	10	0.1
Nickel-63	1	0.01
Nickel-65	10	0.1
Niobium-93m	1	0.01
Niobium-95	1	0.01
Niobium-97	100	1.0
Osmium-185	1	0.01

APPENDIX 3-C

Radioactive Material	Col. I curies	Col. II curies
Osmium-191m	100	1.0
Osmium-191	10	0.1
Osmium-193	10	0.1
Palladium-103	10	0.1
Palladium-109	10	0.1
Phosphorus-32	1	0.01
Platinum-191	10	0.1
Platinum-193m	100	1.0
Platinum-193	10	0.1
Platinum-197m	100	1.0
Platinum-197	10	0.1
Polonium-210	0.01	0.0001
Potassium-42	1	0.01
Praseodymium-142	10	0.1
Praseodymium-143	10	0.1
Promethium-147	1	0.01
Promethium-149	10	0.1
Radium-226	0.01	0.0001
Rhenium-186	10	0.1
Rhenium-188	10	0.1
Rhodium-103m	1,000	10.0
Rhodium-105	10	0.1
Rubidium-86	1	0.01
Rubidium-87	1	0.01
Ruthenium-97	100	1.0
Ruthenium-103	1	0.01
Ruthenium-105	10	0.1
Ruthenium-106	0.1	0.001
Samarium-151	1	0.01
Samarium-153	10	0.1
Scandium-46	1	0.01
Scandium-47	10	0.1
Scandium-48	1	0.01
Selenium-75	1	0.01
Silicon-31	10	0.1
Silver-105	1	0.01
Silver-110m	0.1	0.001
Silver-111	10	0.1
Sodium-22	0.1	0.001
Sodium-24	1	0.01
Strontium-85m	1,000	10.0
Strontium-85	1	0.01
Strontium-89	1	0.01
Strontium-90	0.01	0.0001
Strontium-91	10	0.1
Strontium-92	10	0.1

APPENDIX 3-C

Radioactive Material	Col. I curies	Col. II curies
Sulphur-35	10	0.1
Tantalum-182	1	0.01
Technetium-96	10	0.1
Technetium-97m	10	0.1
Technetium-97	10	0.1
Technetium-99m	100	1.0
Technetium-99	1	0.01
Tellurium-125m	1	0.01
Tellurium-127m	1	0.01
Tellurium-127	10	0.1
Tellurium-129m	1	0.01
Tellurium-129	100	1.0
Tellurium-131m	10	0.1
Tellurium-132	1	0.01
Terbium-160	1	0.01
Thallium-200	10	0.1
Thallium-201	10	0.1
Thallium-202	10	0.1
Thallium-204	1	0.01
Thulium-170	1	0.01
Thulium-171	1	0.01
Tin-113	1	0.01
Tin-125	1	0.01
Tungsten-181	1	0.01
Tungsten-185	1	0.01
Tungsten-187	10	0.1
Vanadium-48	1	0.01
Xenon-131m	1,000	10.0
Xenon-133	100	1.0
Xenon-135	100	1.0
Ytterbium-175	10	0.1
Yttrium-90	1	0.01
Yttrium-91	1	0.01
Yttrium-92	10	0.1
Yttrium-93	1	0.01
Zinc-65	1	0.01
Zinc-69m	10	0.1
Zinc-69	100	1.0
Zirconium-93	1	0.01
Zirconium-95	1	0.01
Zirconium-97	1	0.01
Any radioactive material other than source material, special nuclear material, or alpha emitting radioactive material not listed above	0.1	0.001

NOTE: To convert curies (Ci) to SI units of gigabecquerels (GBq) multiply the above values by 37

EXAMPLE: Zirconium-97 (Col. II) (0.01 Ci multiplied by 37 is equivalent to 0.37 GBq)

APPENDIX 3-D

Criteria Relating to Use of Financial Tests and Self-Guarantees for Providing Reasonable Assurance of Funds for Decommissioning

1. Introduction

An applicant or licensee may provide reasonable assurance of the availability of funds for decommissioning based on furnishing its own guarantee that funds will be available for decommissioning costs and on a demonstration that the company passes the financial test of Section 2 of this Appendix. The terms of this self-guarantee are in Section 3 of this Appendix. This appendix establishes criteria for passing the financial test for the self-guarantee and establishes the terms for obtaining a self-guarantee.

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2. Financial Test

A. To pass the financial test, a company must meet all of the following criteria:

(1) Tangible net worth of at least 10 times the total current decommissioning cost estimate (or the current amount if certification is used) for all decommissioning activities for which the company is responsible as self-guaranteeing licensee and a parent-guarantor.

(2) Assets located in the United States amounting to at least 90% of total assets or at least 10 times the total current decommissioning cost estimate (or the current amount if certification is used) for all decommissioning activities for which the company is responsible as self-guaranteeing licensee and a parent-guarantor.

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(3) A current rating for its most recent bond issuance of AAA, AA, or A as issued by Standard and Poor's (S&P) or Aaa, Aa, or A as issued by Moody's.

B. To pass the financial test, a company must meet all of the following additional requirements:

(1) The company must have at least one class of equity securities registered under the Securities Exchange Act of 1934.

(2) The company's independent certified public accountant must have compared the data used by the company in the financial test, which is derived from the independently audited, year end financial statements for the latest fiscal year, with the amounts in such financial statement. In connection with that procedure, the licensee must inform the Department within 90 days of any matters coming to the attention of the auditor that cause the auditor to believe that the data specified in the financial test should be adjusted and that the company no longer passes the test.

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(3) After the initial financial test, the company must repeat the passage of the test within 90 days after the close of each succeeding fiscal year.

C. If the company no longer meets the requirements of Section 2.A. of this Appendix, the licensee must send immediate notice to the Department of its intent to establish alternate financial assurance as specified in the Department's regulations within 120 days of such notice.

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APPENDIX 3-D

3. Company Self-Guarantee
The terms of a self-guarantee which an applicant or licensee furnishes must provide that:

A. The guarantee will remain in force unless the licensee sends notice of cancellation by certified mail to the Department. Cancellation may not occur, however during the 120 days beginning on the date of receipt of the notice of cancellation by the Department, as evidenced by the return receipt.

B. The licensee must provide alternative financial assurance as specified in the Department's regulations within 90 days following receipt by the Department of a notice of cancellation of the guarantee.

C. The guarantee and financial test provisions must remain in effect until the Department has terminated the license or until another financial assurance method acceptable to the Department has been put in effect by the licensee.

D. The licensee will promptly forward to the Department and the licensee's independent auditor all reports covering the latest fiscal year filed by the licensee with the Securities and Exchange Commission pursuant to the requirements of Section 13 of the Securities and Exchange Act of 1934.

E. If, at any time, the licensee's most recent bond issuance ceases to be rated in any category of "A" or above by either Standard and Poors or Moody's, the licensee will provide notice in writing of such fact to the Department within 20 days after publication of the change by the rating service. If the licensee's most recent bond issuance ceases to be rated in any category of "A" or above by both Standard and Poors or Moody's, the licensee no longer meets the requirements of Section 2.A. of this Appendix.

F. The applicant or licensee must provide to the Department a written guarantee (a written commitment by a corporate officer) which states that the licensee will fund and carry out the required decommissioning activities or, upon issuance of an order by the Department, the licensee will set up and fund a trust in the amount of the current cost estimate for decommissioning.

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APPENDIX 3-D

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Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release.

Radioactive material[1]	Release fraction	Quantity (curies)
Actinium-228	0.001	4,000
Americium-241	0.001	2
Americium-242	0.001	2
Americium-243	0.001	2
Antimony-124	0.01	4,000
Antimony-126	0.01	6,000
Barium-133	0.01	10,000
Barium-140	0.01	30,000
Bismuth-207	0.01	5,000
Bismuth-210	0.01	600
Cadmium-109	0.01	1,000
Cadmium-113	0.01	80
Calcium-45	0.01	20,000
Californium-252	0.00	19 (20 mg)
Carbon-14 (Non CO)	0.01	50,000
Cerium-141	0.01	10,000
Cerium-144	0.01	300
Cesium-134	0.01	2,000
Cesium-137	0.01	3,000
Chlorine-36	0.5	100
Chromium-51	0.01	300,000
Cobalt-60	0.001	5,000
Copper-64	0.01	200,000
Curium-242	0.001	60
Curium-243	0.001	3
Curium-244	0.001	4
Curium-245	0.001	2
Europium-152	0.01	500
Europium-154	0.01	400
Europium-155	0.01	3,000
Germanium-68	0.01	2,000
Gadolinium-153	0.01	5,000
Gold-198	0.01	30,000
Hafnium-172	0.01	400
Hafnium-181	0.01	7,000
Holmium-166m	0.01	100
Hydrogen-3	0.5	20,000
Iodine-125	0.5	10
Iodine-131	0.5	10

APPENDIX 3-D

Radioactive material[1]	Release fraction	Quantity (curies)
Indium-114m	0.01	1,000
Iridium-192	0.001	40,000
Iron-55	0.01	40,000
Iron-59	0.01	7,000
Krypton-85	1.0	6,000,000
Lead-210	0.01	8
Manganese-56	0.01	60,000
Mercury-203	0.01	10,000
Molybdenum-99	0.01	30,000
Neptunium-237	0.001	2
Nickel-63	0.01	20,000
Niobium-94	0.01	300
Phosphorus-32	0.5	100
Phosphorus-33	0.5	1,000
Polonium-210	0.01	10
Potassium-42	0.01	9,000
Promethium-145	0.01	4,000
Promethium-147	0.01	4,000
Ruthenium-106	0.01	200
Samarium-151	0.01	4,000
Scandium-46	0.01	3,000
Selenium-75	0.01	10,000
Silver-110m	0.01	1,000
Sodium-22	0.01	9,000
Sodium-24	0.01	10,000
Strontium-89	0.01	3,000
Strontium-90	0.01	90
Sulfur-35	0.5	900
Technetium-99	0.01	10,000
Technetium-99m	0.01	400,000
Tellurium-127m	0.01	5,000
Tellurium-129m	0.01	5,000
Terbium-160	0.01	4,000
Thulium-170	0.01	4,000
Tin-113	0.01	10,000
Tin-123	0.01	3,000
Tin-126	0.01	1,000
Titanium-44	0.01	100
Vanadium-48	0.01	7,000
Xenon-133	1.0	900,000
Yttrium-91	0.01	2,000
Zinc-65	0.01	5,000
Zirconium-93	0.01	400
Zirconium-95	0.01	5,000
Any other beta-gamma emitter	0.01	10,000

APPENDIX 3-D

Radioactive material[1]	Release fraction	Quantity (curies)
Mixed fission products	0.01	1,000
Mixed Corrosion products	0.01	10,000
Contaminated equipment beta-gamma	0.001	10,000
Irradiated material, any form other than solid noncombustible	0.01	1,000
Irradiated material, solid noncombustible	0.001	10,000
Mixed radioactive waste, beta-gamma	0.01	1,000
Packaged mixed waste, beta-gamma[2]	0.001	10,000
Any other alpha emitter	0.001	2
Contaminated equipment, alpha	0.0001	20
Packaged waste, alpha[2]	0.0001	20
Combinations of radio-active materials listed above[1]	----	----

[1]For combinations of radioactive materials, consideration of the need for an emergency plan is required if the sum of the ratios of the quantity of each radioactive material authorized to the quantity listed for that material in 180 NAC 3, Appendix 003-E exceeds one.

[2]Waste packaged in Type B containers does not require an emergency plan.

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Criteria Relating to Use of Financial Tests and Parent Company Guarantees for Providing Reasonable Assurance of Funds for Decommissioning

I. Introduction

An applicant or licensee may provide reasonable assurance of the availability of funds for decommissioning based on obtaining a parent company guarantee that funds will be available for decommissioning costs and on a demonstration that the parent company passes a financial test. This appendix establishes criteria for passing the financial test and for obtaining the parent company guarantee.

II. Financial Test

A. To pass the financial test, the parent company must meet the criteria of either paragraph A.1 or A.2 of this section:

1. The parent company must have:

(i) Two of the following three ratios: A ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; and a ratio of current assets to current liabilities greater than 1.5; and

(ii) Net working capital and tangible net worth each at least six times the current decommissioning cost estimates for the total of all facilities or parts thereof (or prescribed amount if a certification is used); and

(iii) Tangible net worth of at least $10 million; and

(iv) Assets located in the United States amounting to at least 90 percent of the total assets or at least six times the current decommissioning cost estimates for the total of all facilities or parts thereof (or prescribed amount if a certification is used).

2. The parent company must have:

(i) A current rating for its most recent bond issuance of AAA, AA, A, or BBB as issued by Standard and Poor's or AAA, AA, A, or BAA as issued by Moody's; and

(ii) Tangible net worth each at least six times the current decommissioning cost estimates for the total of all facilities or parts thereof (or prescribed amount if a certification is used); and

(iii) Tangible net worth of at least $10 million; and

(iv) Assets located in the United States amounting to at least 90 percent of the total assets or at least six times the current decommissioning cost estimates for the total of all facilities or parts thereof (or prescribed amount if a certification is used)

B. The parent company's independent certified public accountant must have compared the data used by the parent company in the financial test, which is derived from the independently audited, year end financial statements for the latest fiscal year, with the amounts in such financial statement. In connection with that procedure the licensee shall inform Agency within 90 days of any matters coming to the auditor's attention which cause the auditor to believe that the data specified in the financial test should be adjusted and that the company no longer passes the test.

C. 1. After the initial financial test, the parent company must repeat the passage of the test within 90 days after the close of each succeeding fiscal year.

2. If the parent company no longer meets the requirements of paragraph A of this section, the licensee must send notice to the Department of intent to establish alternate financial assurance as specified in the Department's regulations. The notice must be sent by certified mail within 90 days after the end of the fiscal year for which the year end financial data show that the parent company no longer meets the financial test requirements. The licensee must provide alternate financial assurance within 120 days after the end of such fiscal year.

III. Parent Company Guarantee

The terms of a parent company guarantee which an applicant or licensee obtains must provide that:

A. The parent company guarantee will remain in force unless the guarantor sends notice of cancellation by certified mail to the licensee and the Department. Cancellation may not occur, however, during the 120 days beginning on the date of receipt of the notice of cancellation by both the licensee and the Department, as evidenced by the return receipts.

B. If the licensee fails to provide alternate financial assurance as specified in the Department's regulations within 90 days after receipt by the licensee and Department of a notice of cancellation of the parent company guarantee from the guarantor, the guarantor will provide such alternative financial assurance in the name of the licensee.

C. The parent company guarantee and financial test provisions must remain in effect until the Department has terminated the license.

D. If a trust is established for decommissioning costs, the trustee and trust must be acceptable to the Department. An acceptable trustee includes an appropriate State or federal government agency or an entity which has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency.

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH - RADIOACTIVE MATERIALS PROGRAM

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APPLICATION FOR RADIOACTIVE MATERIAL LICENSE

INSTRUCTIONS - (Use additional sheets where necessary.)
New or Renewal Application - Complete Items 1. through 15.
Amendment to License - Complete Items1.a, 3., and 15. And indicate other changes as appropriate.
Retain one copy for your files and submit original application to: Department of Health and Human Services, Division of Public Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, NE 68509-5026.
Upon approval of this application, the applicant will receive a Radioactive Material License, issued in accordance with the requirements contained in Title 180, Regulations for the Control of Radiation and the Nebraska Radiation Control Act.

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1.a Legal Name and Street address of Applicant (Institution, Firm, Person, etc.)

Applicant Name:
Address:
City, State Zip +4:
Telephone #:
FAX #:
E-Mail Address:

1.b Street address(es) at which Radioactive Material will be used. (If different than 1.a)

1.a Legal Name and Street address of Applicant (Institution, Firm, Person, etc.)

(1) Permanent Address: _____

_____

City, State Zip+4: _____

(2) Temporary Job Sites Throughout Nebraska? ☐ Yes ☐ No

2. Department to Use Radioactive Material

_____

Person to Contact: _____

Telephone #: _____

3. This is an application for:

☐ New License

☐ Amendment to License No. _____

☐ Renewal of License No. _____

4. Individual User(s)

☐ Individual users approved by the Licensee's radiation safety committee.

☐ Individual users approved by the Licensee's radiation safety officer.

☐ Individual users satisfy the requirements of 180 NAC 3-013

OR

☐ Name and Title of individual(s) who will use or directly supervise use of, Radioactive Materials. Give training and experience in Items 7. And 8.

First Name + Middle Initial | Last Name | Title

5. Radiation Safety Officer (RSO)
(Name and Title of Individual designated as Radiation Safety Officer.

_____

Telephone #: _____

Attach documentation of his/her training and experience as in Items 7. and 8.

"Department Use Only"

Date Received Stamp

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6. Radioactive Material Data

☐ Type B Broad Scope, 180 NAC 3-013.01, item 2

☐ Type C Broad Scope, 180 NAC 3-013.01, item 3

☐ Specific License, Radioactive Material Listed below:

6.a. Element and Mass Number	6.b. Chemical or Physical Form (Make and Model if sealed source)	6.c. Maximum Activity Requested (Expressed as Curies, Millicuries or Microcuries)	6.d. Use of Each Form (If sealed source, also give Make and Model Number of the storage and/or device in which sealed source will be stored and/or used)

7. Training of Individuals in Items 4. and 5.

Name of Individual:

	Formal Course Title	Location and Date(s) of Training	Clock Hours in Lecture or Laboratory
7.a. Radiation Physics and Instrumentation			
7.b. Radiation Protection			
7.c. Mathematics Pertaining to the Use and Measurement of Radioactivity			
7.d. Biological Effects of Radiation			

8. Experience with Radiation of Individuals in Items 4. and 5.

(Actual use of Radioisotopes or Equivalent Experience)

Name of Individual:

Isotope	Maximum Activity	Where Experience Was Gained	Months/Years	Type of Use

9. Radiation Detection Instruments

Type of Instrument	Manufacturer's Name	Model Number	Number Available	Radiation Detected	Sensitivity Range

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10. Calibration of Instruments Listed in Item 9.

☐ a. Calibrated by Service Company	☐ b. Calibrated by Applicant
Name and Address of Service Company and Frequency of Calibration	

11. Personnel Monitoring Devices
(Check and/or complete as appropriate)

Type	Supplier (Service Company)	Exchange Frequency
☐ Film Badge		☐ Monthly
☐ TLD		☐ Quarterly
☐ DOSL		☐ Other (Specify):
☐ Other (Specify):		

Information to be Submitted on Additional Sheets

12. Facilities and Equipment

Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Attach an explanatory sketch of the facility.

13. Radiation Protection Program

Describe the radiation protection program as appropriate for the material to be used, including: the duties and responsibilities of the Radiation Safety Officer (RSO); control measures; bioassay procedures (if needed); day-to-day general safety instructions to be followed; etc. If the application is for sealed sources also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

14. Waste Disposal

If a commercial waste disposal service is employed, specify the name and address of the company. Otherwise, submit a detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. If the application is for sealed sources and devices and they will be returned to the manufacturer, so state.

15. CERTIFICATION
(This item must be completed by applicant.)

The applicant and any official executing this document on behalf of the applicant named in Item 1.a., certify that this application is prepared in conformity with the Nebraska Department of Health and Human Services, Title 180, Regulations for the Control of Radiation and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

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_____

Applicant Name From Item 1.a.

By: _____ *Date:* _____

Signature

_____

Print Name and Title of certifying official authorized to act on behalf of the applicant

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. DIVISION OF PUBLIC HEALTH ASSURANCE¶
. RADIOACTIVE MATERIALS PROGRAM¶
¶
. APPLICATION FOR RADIOACTIVE MATERIAL LICENSE - Medical or Teletherapy¶
¶
INSTRUCTIONS - (Use additional sheets where necessary.)¶
Medical Application - Complete Items 1. through 26.¶
Teletherapy Application - Complete Items 1. through 26, as applicable and Supplement C.¶
Retain one copy for your files and submit original application to: Department of Health and Human Services Regulation and Licensure, Division of Public Health Assurance, 301 Centennial Mall South, P.O. Box 95007, Lincoln, NE 68509-5007.¶
Upon approval of this application, the applicant will receive a Radioactive Material License, issued in accordance with the requirements contained in Title 180, Regulations for Control of Radiation and the Nebraska Radiation Control Act.¶
¶
¶
1.a . Legal Name and Street address of Applicant (Institution, Firm, Hospital, Person, etc.) ... [61]

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH

CERTIFICATE - USE OF DEPLETED URANIUM
UNDER GENERAL LICENSE

180 NAC 3-007.04 establishes a general license authorizing a person to receive, acquire, possess, use, or transfer in accordance with the provisions of 180 NAC 3-007.04, items 2, 3, 4 and 5, depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of the product or device.

Possession of depleted uranium is not authorized under 180 NAC 3-007.04 until a licensee has filed Form NRH-11 and received from the Department a validated copy of NRH-11 with a certification number.

CONDITIONS AND LIMITATIONS OF GENERAL LICENSE 3-007.04

3-007.04 Depleted Uranium In Industrial Products and Devices.

1. A general license is hereby issued to receive, acquire, possess, use, or transfer, in accordance with the provisions of 180 NAC 3-007.04 items 2. through 5., depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of the product or device.

2. The general license in 180 NAC 3-007.04, item 1 applies only to industrial products or devices which have been manufactured either in accordance with a specific license issued to the manufacturer of the products or devices pursuant to 180 NAC 3-014.13 or in accordance with a specific license issued to the manufacturer by the U.S. Nuclear Regulatory Commission or an Agreement State which authorizes manufacture of the products or devices for distribution to persons generally licensed by the U.S. Nuclear Regulatory Commission or an Agreement State.

3. Persons who receive, acquire, possess, or use depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1 must:

   a. File Department Form NRH-11 "Certificate - Use of Depleted Uranium Under General License," with the Department. The form must be submitted within 30 days after the

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Medical or Teletherapy¶
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SUPPLEMENT A¶
¶
Training and Experience¶
Authorized User or Radiation Safety Officer (RSO)¶
¶
¶
¶
1. Name of Individual ... [62]

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first receipt or acquisition of such depleted uranium. The registrant must furnish on Department Form NRH-11 the following information and such other information as may be required by that form:

(1) Name and address of the general licensee;
(2) A statement that the general licensee has developed and will maintain procedures designed to establish physical control over the depleted uranium described in 180 NAC 3-007.04, item 1 and designed to prevent transfer of such depleted uranium in any form, including metal scrap, to persons not authorized to receive the depleted uranium; and
(3) Name and/or title, address, and telephone number of the individual duly authorized to act for and on behalf of the general licensee in supervising the procedures identified in 180 NAC 3-007.04, item 3.a.(2).

b. Report in writing to the Department any changes in information furnished by him in Department Form NRH-11 "Certificate - Use of Depleted Uranium Under General License." The report must be submitted within 30 days after the effective date of such change.

4. A person who receives, acquires, possesses, or uses depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1 must:

a. Not introduce such depleted uranium, in any form, into a chemical, physical, or metallurgical treatment or process, except a treatment or process for repair or restoration of any plating or other covering of the depleted uranium.

b. Not abandon such depleted uranium.

c. Transfer or dispose of such depleted uranium only by transfer in accordance with the provisions of 180 NAC 3-025. In the case where the transferee receives the depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1., the transferor must furnish the transferee a copy of this regulation and a copy of Department Form NRH-11. In the case where the transferee receives the depleted uranium pursuant to a general license contained in the U.S. Nuclear Regulatory Commission or Agreement State's regulation equivalent to 180 NAC 3-007.04, item 1., the transferor must furnish the transferee a copy of Title 180 and a copy of Department Form NRH-11 accompanied by a note explaining that use of the product or device is regulated by the U.S. Nuclear Regulatory Commission or Agreement State under requirements substantially the same as those in Title 180.

d. Within 30 days of any transfer, report in writing to the Department the name and address of the person receiving the depleted uranium pursuant to such transfer.

5. Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by 180 NAC 3-007.04, item 1 is exempt from the requirements of 180 NAC 4 and 180 NAC 10 with respect to the depleted uranium covered by that general license.

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INSTRUCTIONS

Submit this form in duplicate to the Department of Health and Human Services, Division of Public Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

A certification number will be assigned and a validated copy of NRH-11 will be returned.

(Print or Type)

1. Licensee Information

Legal Name: _____

Address: _____

_____

City, State and Zip+4 _____

Person Authorized to sign binding documents for the Licensee _____

2. I hereby apply for a Certificate number pursuant to 180 NAC 3-007.04 on behalf of the above Licensee.

3. Certification:

I certify that:

a. All information in this certificate is true and complete.

b. I understand the Department's regulations require that any change in the information furnished on this certificate be reported to the Department within 30 days from the date of such change.

c. I have read and understand the provisions of 180 NAC 3-007.04 of the Department's regulations, and I understand that I am required to comply with those provisions as to the depleted uranium which I receive, possess, use, or transfer under the general license.

_____
(Signature of Person listed in Item 1.) (Date)

4. To be completed by the Department:

***Certification Number*_____*Date*_____**

Radioactive Materials Program Manager_____

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NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH

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CERTIFICATE - IN VITRO TESTING WITH RADIOACTIVE MATERIAL UNDER GENERAL LICENSE

180 NAC 3-008.09 establishes a general license authorizing physicians, veterinarians, clinical laboratories, and hospitals to possess certain small quantities of radioactive material for In Vitro clinical or laboratory tests not involving the internal or external administration of the radioactive material or the radiation therefrom to human beings or animals. Possession of radioactive material under 180 NAC 3-008.09 is not authorized until the physician, veterinarian, clinical laboratory, or hospital has filed Form NRH-17 and received from the Department a validated copy of Form NRH-17 with a certification number.

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CONDITIONS AND LIMITATIONS OF GENERAL LICENSE 180 NAC 3-008.09

3-008.09 General License for Use of Radioactive Material for Certain In Vitro Clinical or Laboratory Testing

1. A general license is hereby issued to any physician, veterinarian in the practice of veterinary medicine, clinical laboratory or hospital to receive, acquire, possess, transfer or use, for any of the following stated tests, in accordance with the provisions of 180 NAC 3-008.09, items 2. through 6., the following radioactive materials in prepackaged units for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals:

    a. Iodine-125, iodine-131, selenium-75, cobalt-57, and carbon-14 in units not exceeding 370 kBq (10 microcuries) each.
    b. Hydrogen-3 (tritium), in units not exceeding 1.85 MBq (50 microcuries) each.
    c. Iron-59, in units not exceeding 740 kBq (20 microcuries) each.
    d. Mock Iodine-125 reference or calibration sources, in units not exceeding 1.85 kBq (0.05 microcurie) of iodine-129 and 1.85 Bq (0.005 microcurie) of americium-241 each.

2. No person receives, acquires, possesses, uses or transfers radioactive material pursuant to the general license established by 180 NAC 3-008.09, item 1. until s/he has filed Department Form NRH-17, "Certificate - In Vitro Testing with Radioactive Material Under General License", with the Department and received from the Department a validated copy of Department Form NRH-17 with certification number assigned. The physician, veterinarian, clinical laboratory or hospital must furnish on Department Form NRH-17 the following information and such other information as may be required by that form:

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    a. Name and address of the physician, veterinarian, clinical laboratory or hospital;
    b. The location of use; and
    c. A statement that the physician, veterinarian in the practice of veterinary medicine, clinical laboratory or hospital has appropriate radiation measuring instruments to carry out in vitro clinical or laboratory tests with radioactive material as authorized under the general license in 180 NAC 3-008.09, item 1. and that such tests will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive material.

3. A person who receives, acquires, possesses or uses radioactive material pursuant to the general license established by 180 NAC 3-008.09, item 1. must comply with the following:

   a. The general licensee must not possess at any one time, pursuant to the general license in 180 NAC 3-008.09, item 1. at any one location of storage or use a total amount of iodine-125, iodine-131, iron-59, cobalt-57 and/or selenium-75 in excess of 7.4 MBq (200 microcuries).

   b. The general licensee must store the radioactive material, until used, in the original shipping container or in a container providing equivalent radiation protection.

   c. The general licensee must use the radioactive material only for the uses authorized by 180 NAC 3-008.09, item 1.

   d. The general licensee must not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the Department, the U.S. Nuclear Regulatory Commission, or any Agreement State, nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the supplier.

   e. The general licensee must dispose of the Mock Iodine-125 reference or calibration sources described in 180 NAC 3-008.09, item 1.d. as required by 180 NAC 4-039 and 4-040.

4. The general licensee must not receive, acquire, possess, or use radioactive material pursuant to 180 NAC 3-008.09, item 1.:

   a. Except as prepackaged units which are labeled in accordance with the provisions of an applicable specific license issued pursuant to 180 NAC 3-014.08 or in accordance with the provisions of a specific license issued by the U.S. Nuclear Regulatory Commission, or any Agreement State which authorizes the manufacture and distribution of iodine-125, iodine-131, carbon-14, hydrogen-3 (tritium), iron-59, selenium-75, cobalt-57, or Mock Iodine-125 to persons generally licensed under 180 NAC 3-008.09 or its' equivalent, and

   b. Unless the following statement, or substantially similar statement which contains the information called for in the following statement, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

This radioactive material must be received, acquired, possessed, and used only by physicians, veterinarians in the practice of veterinary medicine, clinical laboratories or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to the regulations and a general license of the U.S. Nuclear Regulatory commission or of a State in which the Commission has entered into an agreement for the exercise of regulatory authority.

_____
Name of Manufacturer

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5. The physician, veterinarian in the practice of veterinary medicine, clinical laboratory or hospital possessing or using radioactive material under the general license of 180 NAC 3-008.09, item 1. must report in writing to the Department, any changes in the information furnished by him/her in the "Certificate - In Vitro Testing with Radioactive Material Under General License", Department Form NRH-17. The report must be furnished within 30 days after the effective date of such change.

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6. Any person using radioactive material pursuant to the general license of 180 NAC 3-008.09, item 1. is exempt from the requirements of 180 NAC 4 and 180 NAC 10 with respect to radioactive material covered by that general license, except that such persons using the Mock Iodine-125 described in 180 NAC 3-008.09 item 1.d. must comply with the provisions of 180 NAC 4-039, 4-057, and 4-058.

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INSTRUCTIONS

Submit this form in duplicate to the Department of Health and Human Services, Division of Public Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

A certification number will be assigned and a validated copy of NRH-17 will be returned.

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(Print or Type)

1. Licensee Information

Legal Name: (Physician, Veterinarian, Clinical Laboratory or Hospital) _____

Address: _____

_____

City, State and Zip+4 _____

Person Authorized to sign binding documents for the Licensee _____

2. I hereby apply for a Certificate Number pursuant to 180 NAC 3-008.09 for use of radioactive materials for:

   [ ] a. Myself, a duly licensed physician authorized to dispense drugs in the practice of medicine, or a veterinarian licensed to practice veterinary medicine.

   [ ] b. The above named clinical laboratory.

   [ ] c. The above named hospital.

3. If place of use is different from address in Item 1, please give complete address:

4. Certification:

   I certify that:

   a. All information in this certificate is true and complete.

   b. Appropriate radiation measuring instruments are available to carry out the tests for which radioactive material will be used under the general license of 180 NAC 3-008.09. The tests will be performed only by personnel competent in the use of the instruments and in the handling of the radioactive materials.

   c. I understand that Department regulations require that any change in the information furnished on this certificate be reported to the Department within 30 days from the date of such change.

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d. I have read and understand the provisions of 180 NAC 3-008.09 of the Department regulations; and I understand that compliance with those provisions is required as to all radioactive material which is received, acquired, possessed, used, or transferred under the general license for which this certification number is filed with the Department.

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(Signature of Person listed in Item 1.) (Date)

4. To be completed by the Department:

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Certification Number _____ ***Date*** _____

Radioactive Materials Program Manager _____

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NRH-60
DRAFT Date August 16, 2007

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
RADIOACTIVE MATERIALS PROGRAM

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CERTIFICATION OF DISPOSITION OF MATERIALS

INSTRUCTIONS - (Use additional sheets where necessary.)
Type or Print except where indicated.
Retain one copy for your files and submit original application to: Department of Health and Human Services, Division of Public Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, NE 68509-5026.
Upon approval of this Certification of Disposition of Materials the licensee will receive a termination notice of this radioactive material license.

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1. Licensee Information

Licensee Number: _____

License Expiration Date: _____

2. Person to Contact Regarding this Application

_____

Telephone #: _____

Licensee Name and Street Address:

Applicant Name: _____

Address: _____

_____

City, State Zip+4 _____

Telephone #: _____

FAX#: _____

E-mail Address:

3. Materials Data

☐ No Materials have ever been procured or possessed by the Licensee under this License.

☐ All Materials procured and/or possessed by the Licensee under the License Number cited above have been disposed of in the following manner:

☐ Transfer
Specify the date of the transfer, the name of the licensed recipient and the recipient's Department, U.S. Nuclear Regulatory Commission or Agreement State license number.
Describe specific materials transfer actions and if there were radioactive wastes generated in terminating this license, the disposal actions, including the disposition of low-level radioactive waste, mixed waste, Greater-than-Class-C waste, and sealed sources, if applicable.

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☐ Disposed of directly by Licensee
Describe specific disposal procedures (e.g. decay in storage).

4. Other Data

☐ Our License has not yet expired, please terminate it.
A Radiation Survey was conducted to confirm the absence of licensed radioactive materials and to determine whether any contamination remains on the premises covered by the license:

☐ NO (Attach Explanation)

☐ YES, the results:

☐ Are attached

☐ Were forwarded to the Department on (Date) _____

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4. **Other Data** *(Continued)*

Address all future correspondence regarding this license to:

Name:

Address:

City, State Zip+4:

Telephone #:

FAX#:

E-mail Address:

5. CERTIFICATION
(This item must be completed by applicant.)

The applicant and any official executing this document on behalf of the applicant named in Item 1., certify that this application is prepared in conformity with the Nebraska Department of Health and Human Services, Title 180, Regulations for the Control of Radiation and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

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Applicant Name From Item 1.

By: _____ *Date:* _____
Signature

Print Name and Title of certifying official authorized to act on behalf of the applicant

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH – RADIOACTIVE MATERIAL PROGRAM

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TRANSFERS OF INDUSTRIAL DEVICES REPORT

(Continue on Form NRH 653, 653A or 653B, as appropriate)

NAME OF VENDOR	REPORTING PERIOD	
	FROM	TO
LICENSE NUMBER:		

For each "person" to whom a devices(s) has been transferred during the reporting period, supply the following:

INTERMEDIATE PERSON (if any)

NAME OF INTERMEDIATE PERSON	NAME OF RESPONSIBLE INDIVIDUAL	TITLE OF RESPONSIBLE INDIVIDUAL	TELEPHONE

GENERAL LICENSEE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	
NAME OF RESPONSIBLE INDIVIDUAL / TELEPHONE	
TITLE OF RESPONSIBLE INDIVIDUAL	

INFORMATION ON DEVICE(S) TRANSFERRED

DATE OF TRANSFER	TYPE OF DEVICE	MODEL NUMBER	SERIAL NUMBER	ISOTOPE	ACTIVITY & UNITS

INTERMEDIATE PERSON (if any)

NAME OF INTERMEDIATE PERSON	NAME OF RESPONSIBLE INDIVIDUAL	INDIVIDUAL TITLE OF RESPONSIBLE	TELEPHONE

GENERAL LICENSE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	
NAME OF RESPONSIBLE INDIVIDUAL / TELEPHONE	
TITLE OF RESPONSIBLE INDIVIDUAL	

INFORMATION ON DEVICE(S) TRANSFERRED

DATE OF TRANSFER	TYPE OF DEVICE	MODEL NUMBER	SERIAL NUMBER	ISOTOPE	ACTIVITY & UNITS

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH – RADIOACTIVE MATERIAL PROGRAM

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TRANSFERS OF INDUSTRIAL DEVICES REPORT (TO GENERAL LICENSEES)

INTERMEDIATE PERSON (if any)

NAME OF INTERMEDIATE PERSON	NAME OF RESPONSIBLE INDIVIDUAL	TITLE OF RESPONSIBLE INDIVIDUAL	TELEPHONE
NAME OF INTERMEDIATE PERSON	NAME OF RESPONSIBLE INDIVIDUAL	TITLE OF RESPONSIBLE INDIVIDUAL	TELEPHONE

GENERAL LICENSEE USER INFORMATION

NAME OF GENERAL LICENSEE USER		MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, include Zip Code)
DEPARTMENT		
NAME OF RESPONSIBLE INDIVIDUAL	TELEPHONE	
TITLE OF RESPONSIBLE INDIVIDUAL		

INFORMATION ON DEVICE(S) TRANSFERRED

DATE OF TRANSFER	TYPE OF DEVICE	MODEL NUMBER	SERIAL NUMBER	ISOTOPE	ACTIVITY & UNITS

INTERMEDIATE PERSON (if any)

NAME OF INTERMEDIATE PERSON	NAME OF RESPONSIBLE INDIVIDUAL	INDIVIDUAL TITLE OF RESPONSIBLE	TELEPHONE

GENERAL LICENSE USER INFORMATION

NAME OF GENERAL LICENSEE USER		MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, include Zip Code)
DEPARTMENT		
NAME OF RESPONSIBLE INDIVIDUAL	TELEPHONE	
TITLE OF RESPONSIBLE INDIVIDUAL		

INFORMATION ON DEVICE(S) TRANSFERRED

DATE OF TRANSFER	TYPE OF DEVICE	MODEL NUMBER	SERIAL NUMBER	ISOTOPE	ACTIVITY & UNITS

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DIVISION OF PUBLIC HEALTH – RADIOACTIVE MATERIAL PROGRAM

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TRANSFERS OF INDUSTRIAL DEVICES REPORT (FROM GENERAL LICENSEE)

For each "person" to whom a devices(s) has been transferred during the reporting period, supply the following:

GENERAL LICENSEE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	

INFORMATION ON DEVICE(S) TRANSFERRED

DATE OF TRANSFER	TYPE OF DEVICE	MODEL NUMBER	SERIAL NUMBER	ISOTOPE	ACTIVITY & UNITS

GENERAL LICENSE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	

INFORMATION ON DEVICE(S) TRANSFERRED

DATE OF TRANSFER	TYPE OF DEVICE	MODEL NUMBER	SERIAL NUMBER	ISOTOPE	ACTIVITY & UNITS

GENERAL LICENSE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	

INFORMATION ON DEVICE(S) TRANSFERRED

DATE OF TRANSFER	TYPE OF DEVICE	MODEL NUMBER	SERIAL NUMBER	ISOTOPE	ACTIVITY & UNITS

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH – RADIOACTIVE MATERIAL PROGRAM

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TRANSFERS OF INDUSTRIAL DEVICES REPORT (LABEL CHANGES)

For each device for which required label information has been changed, supply the following::

GENERAL LICENSEE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	

INFORMATION ON DEVICE(S) RECEIVED

TYPE OF DEVICE	MODEL NUMBER	PREVIOUS SERAL NUMBER	NEW SERIAL NUMBER	PREVIOUS ISOTOPE	NEW ISOTOPE	PREVIOUS LABEL ACTIVITY AND UNITS	LABEL ACTIVITYAND UNITS

GENERAL LICENSEE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	

INFORMATION ON DEVICE(S) RECEIVED

TYPE OF DEVICE	MODEL NUMBER	PREVIOUS SERAL NUMBER	NEW SERIAL NUMBER	PREVIOUS ISOTOPE	NEW ISOTOPE	PREVIOUS LABEL ACTIVITY AND UNITS	LABEL ACTIVITYAND UNITS

GENERAL LICENSEE USER INFORMATION

NAME OF GENERAL LICENSEE USER	MAILING ADDRESS AT THE LOCATION OF USE (No. P.O. Boxes, Include Zip Code)
DEPARTMENT	

INFORMATION ON DEVICE(S) RECEIVED

TYPE OF DEVICE	MODEL NUMBER	PREVIOUS SERAL NUMBER	NEW SERIAL NUMBER	PREVIOUS ISOTOPE	NEW ISOTOPE	PREVIOUS LABEL ACTIVITY AND UNITS	LABEL ACTIVITYAND UNITS

Attachment 3-1

11 U.S.C. 101(2) AND (15)

CITE-
11 USC CHAPTER 1 - GENERAL PROVISIONS 01/03/05

TITLE 11 - BANKRUPTCY
CHAPTER 1 - GENERAL PROVISIONS

-HEAD-
Sec. 101. Definitions

-STATUTE-
In this title -
(2) **"affiliate"** means -
(A) entity that directly or indirectly owns, controls, or holds with power to vote, 20 percent or more of the outstanding voting securities of the debtor, other than an entity that holds such securities -
(i) in a fiduciary or agency capacity without sole discretionary power to vote such securities; or
(ii) solely to secure a debt, if such entity has not in fact exercised such power to vote;

(B) corporation 20 percent or more of whose outstanding voting securities are directly or indirectly owned, controlled, or held with power to vote, by the debtor, or by an entity that directly or indirectly owns, controls, or holds with power to vote, 20 percent or more of the outstanding voting securities of the debtor, other than an entity that holds such securities -
(i) in a fiduciary or agency capacity without sole discretionary power to vote such securities; or
(ii) solely to secure a debt, if such entity has not in fact exercised such power to vote;

(C) person whose business is operated under a lease or operating agreement by a debtor, or person substantially all of whose property is operated under an operating agreement with the debtor; or
(D) entity that operates the business or substantially all of the property of the debtor under a lease or operating agreement;

(15) **"entity"** includes person, estate, trust, governmental unit, and United States trustee;

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ATTACHMENT

Attachment 4-1 29 CFR 1910.134(l)(1)(ii) (A-E)

Copies of the Code of Federal Regulations (CFR) cited in this Chapter are available for inspection at the Department of Health and Human Services Regulation and Licensure, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska.

40 CFR 190 through 259 (July 1, 2005)
49 CFR 100 through 185 (October 1, 2005)

Or at http://www.access.gpo.gov/nara/cfr/index.html

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TITLE 180 CONTROL OF RADIATION

CHAPTER 4 STANDARDS FOR PROTECTION AGAINST RADIATION

4-001 SCOPE AND AUTHORITY

4-001.01 180 NAC 4 establishes standards for protection against ionizing radiation resulting from activities conducted pursuant to licenses or registrations issued by the Department. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

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4-001.02 The requirements of 180 NAC 4 are designed to control the receipt, possession, use, transfer, and disposal of sources of radiation by any licensee or registrant so the total dose to an individual, including doses resulting from all sources of radiation other than background radiation, does not exceed the standards for protection against radiation prescribed in 180 NAC 4. However, nothing in 180 NAC 4 will be construed as limiting actions that may be necessary to protect health and safety.

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4-001.03 Except as specifically provided in other Chapters of Title 180, 180 NAC 4 applies to persons licensed or registered by the Department to receive, possess, use, transfer, or dispose of sources of radiation. The limits in 180 NAC 4 do not apply to doses due to background radiation, to exposure of patients to radiation for the purpose of medical diagnosis or therapy, to exposure from individuals administered radioactive material and released in accordance with 180 NAC 7-037 or to voluntary participation in medical research programs.

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4-001.04 40 CFR as published on July 1, 2006 and 49 CFR as published October 1, 2006 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Office of Radiological Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

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4-001.05 National Council on Radiation Protection and Measurement (NRCP) 91, International Commission on Radiological Protection (ICRP) 23 and Compressed Gas Association Publication G7.1 as referred to in this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Office or Radiological Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

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4-002 DEFINITIONS

Air-purifying respirator means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Annual limit on intake (ALI) means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 0.05 Sv (5 rem) or a committed dose equivalent of 0.5 Sv (50 rem) to any individual organ or tissue. ALI values for intake by ingestion and by inhalation of selected radionuclides are given in Table I, Columns 1 and 2, of Appendix 180 NAC 4-B.

Assigned protection factor (APF) means the expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users. Operationally, the inhaled concentration can be estimated by dividing the ambient airborne concentration by the APF.

Atmosphere-supplying respirator means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

Class means a classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which applies to a range of clearance half-times: for Class D (Days) of less than 10 days, for Class W (Weeks) from 10 to 100 days, and for Class Y (Years) of greater than 100 days. For purposes of these regulations, "lung class" and "inhalation class" are equivalent terms.

Declared pregnant woman means a woman who has voluntarily informed the licensee, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant woman withdraws the declaration in writing or is no longer pregnant.

Demand respirator means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

Derived air concentration (DAC) means the concentration of a given radionuclide in air which, if breathed by the reference man for working year of 2,000 hours under conditions of light work, (inhalation rate 1.2 cubic meters of air per hour), results in an intake of one ALI. DAC values are given in Table I, Column 3, of Appendix 180 NAC 4-B.

Derived air concentration-hour (DAC-hour) means the product of the concentration of radioactive material in air, expressed as a fraction or multiple of the derived air concentration for each radionuclide, and the time of exposure to that radionuclide, in hours. A licensee or registrant may take 2,000 DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 0.05 Sv (5 rem).

Disposable respirator means a respirator for which maintenance is not intended and that is designed to be discarded after excessive breathing resistance, sorbent exhaustion, physical damage, or end-of-service-life renders it unsuitable for use. Examples of this type of respirator are a disposable half-mask respirator or a disposable escape-only self-contained breathing apparatus (SCBA).

Dose *or* radiation dose is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as defined in other paragraphs of this section.

Dosimetry processor means an individual or an organization that processes and evaluates individual monitoring devices in order to determine the radiation dose delivered to the monitoring devices.

Filtering facepiece (dust mask) means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium, not equipped with elastomeric sealing surfaces and adjustable straps.

Fit factor means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

Helmet means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

Hood means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

Inhalation class [See "Class"].

Loose-fitting facepiece means a respiratory inlet covering that is designed to form a partial seal with the face.

Lung class [See "Class"].

Negative pressure respirator (tight fitting) means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

Nonstochastic effect means a health effect, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect. For purposes of these regulations, a "deterministic effect" is an equivalent term.

Planned special exposure means an infrequent exposure to radiation, separate from and in addition to the annual occupational dose limits.

Positive pressure respirator means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

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

Pressure demand respirator means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

Qualitative fit test (QLFT) means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

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

Quarter means a period of time equal to one-fourth of the year observed by the licensee or registrant, approximately 13 consecutive weeks, providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

Reference man means a hypothetical aggregation of human physical and physiological characteristics determined by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base. A description of the Reference Man is contained in the International Commission on Radiological Protection Report, ICRP Publication 23, "Report of the Task Group on Reference Man."

Respiratory protective equipment means an apparatus, such as a respirator, used to reduce an individual's intake of airborne radioactive materials.

Sanitary sewerage means a system of public sewers for carrying off waste water and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the licensee.

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

Shallow-dose equivalent (Hs) which applies to the external exposure of the skin of the whole body or the skin of an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm^2).

Stochastic effect means a health effect that occurs randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects.

Supplied-air respirator (SAR) *or* airline respirator means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Tight-fitting facepiece means a respiratory inlet covering that forms a complete seal with the face.

User seal check (fit check) means an action conducted by the respirator user to determine if the respirator is properly seated to the face. Examples include negative pressure check, positive pressure check, irritant smoke check, or isoamyl acetate check.

Very high radiation area means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of 5 Gy (500 rad) in 1 hour at 1 meter from a radiation source or 1 meter from any surface that the radiation penetrates.[1]

Weighting factor w_T for an organ or tissue (T) means the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. For calculating the effective dose equivalent, the values of w_T are:

ORGAN DOSE WEIGHTING FACTORS	
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[a]
Whole Body	1.00[b]

[a] 0.30 results from 0.06 for each of 5 "remainder" organs, excluding the skin and the lens of the eye, that receive the highest doses.

[b] For the purpose of weighting the external whole body dose, for adding it to the internal dose, a single weighting factor, $w_T = 1.0$, has been specified. The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued.

4-003 IMPLEMENTATION

4-003.01 Any existing license condition that is more restrictive than 180 NAC 4 remains in force until there is an amendment or renewal of the license.

4-003.02 If a license condition exempts a licensee from a provision of 180 NAC 4 in effect on or before May 30, 1994, it also exempts the licensee from the corresponding provision of 180 NAC 4.

[1]At very high doses received at high dose rates, units of absorbed dose, gray and rad, are appropriate, rather than units of dose equivalent, sievert and rem.

4-003.03 If a license condition cites provisions of 180 NAC 4 in effect prior to May 30, 1994, which do not correspond to any provisions of 180 NAC 4, the license condition remains in force until there is an amendment or renewal of the license that modifies or removes this condition.

RADIATION PROTECTION PROGRAMS

4-004 RADIATION PROTECTION PROGRAMS

4-004.01 Each licensee or registrant must develop, document, and implement a radiation protection program sufficient to ensure compliance with the provisions of 180 NAC 4. See 180 NAC 4-047 for recordkeeping requirements relating to these programs. Deleted: 5

4-004.02 The licensee or registrant must use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and public doses that are as low as is reasonably achievable (ALARA).

4-004.03 The licensee or registrant must, at intervals not to exceed 12 months, review the radiation protection program content and implementation.

4-004.04 To implement the ALARA requirements of 180 NAC 4-004.02 and notwithstanding the requirements in 180 NAC 4-013, a constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its daughters must be established by licensees, such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 mSv) per year from these emissions. If a licensee subject to this requirement exceeds this dose constraint, the licensee must report the exceedance as provided in 180 NAC 4-059 and promptly take appropriate corrective action to ensure against a recurrence.

OCCUPATIONAL DOSE LIMITS

4-005 OCCUPATIONAL DOSE LIMITS FOR ADULTS

4-005.01 The licensee or registrant must control the occupational dose to individual adults, except for planned special exposures pursuant to 180 NAC 4-010, to the following dose limits:

1. An annual limit, which is the more limiting of:

   a. The total effective dose equivalent being equal to 0.05 Sv (5 rem); or
   b. The sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 0.5 Sv (50 rem).

2. The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities, which are: Deleted: or

   a. A lens dose equivalent of 0.15 Sv (15 rem), and Deleted: n

b. A shallow dose equivalent of 0.5 Sv (50 rem) to the skin of the whole body or to the skin of any extremity.

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4-005.02 Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, must be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime. See 4-010 item 5.a. and 5.b.

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4-005.03 The assigned deep dose equivalent must be for the part of the body receiving the highest exposure.

1. The assigned shallow-dose equivalent must be the dose averaged over the contiguous ten square centimeters of skin receiving the highest exposure. The deep-dose equivalent, lens-dose equivalent, and the shallow-dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable.

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2. When a protective apron is worn while working with medical fluoroscopic equipment and monitoring is conducted as specified in 180 NAC 4-022.01, item 5, the effective dose equivalent for external radiation must be determined as follows:

   a. When only one individual monitoring device is used and it is located at the neck (collar) outside the protective apron, the reported deep dose equivalent must be the effective dose equivalent for external radiation; or
   b. When only one individual monitoring device is used and it is located at the neck (collar) outside the protective apron, and the reported dose exceeds 25% of the limit specified in 180 NAC 4-005.01, the reported deep dose equivalent value multiplied by 0.3 must be the effective dose equivalent for external radiation; or
   c. When individual monitoring devices are worn, both under the protective apron at the waist and outside the protective apron at the neck, the effective dose equivalent for external radiation must be assigned the value of the sum of the deep dose equivalent reported for the individual monitoring device located at the waist under the protective apron multiplied by 1.5 and the deep dose equivalent reported for the individual monitoring device located at the neck outside the protective apron multiplied by 0.04

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4-005.04 Derived air concentration (DAC) and annual limit on intake (ALI) values are presented in Table I of Appendix 180 NAC 4-B and may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits. See180 NAC 4-052.

4-005.05 Notwithstanding the annual dose limits, the licensee must limit the soluble uranium intake by an individual to 10 milligrams in a week in consideration of chemical toxicity. See footnote 3 of Appendix 180 NAC 4-B.

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4-005.06 The licensee or registrant must reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person. See180 NAC 4-009.05. Deleted: 7

4-006 COMPLIANCE WITH REQUIREMENTS FOR SUMMATION OF EXTERNAL AND INTERNAL DOSES

4-006.01 If the licensee is required to monitor pursuant to both 180 NAC 4-022.01 and 4-022.02, the licensee must demonstrate compliance with the dose limits by summing external and internal doses. If the licensee or registrant is required to monitor only pursuant to 180 NAC 4-022.01 or only pursuant to 180 NAC 4-022.02 then summation is not required to demonstrate compliance with the dose limits. The licensee may demonstrate compliance with the requirements for summation of external and internal doses pursuant to 180 NAC 4-006.02 through 4-006.04. The dose equivalents for the lens of the eye, the skin, and the extremities are not included in the summation, but are subject to separate limits.

4-006.02 Intake by Inhalation. If the only intake of radionuclides is by inhalation, the total effective dose equivalent limit is not exceeded if the sum of the deep dose equivalent divided by the total effective dose equivalent limit, and one of the following, does not exceed unity:

1. The sum of the fractions of the inhalation ALI for each radionuclide, or
2. The total number of derived air concentration-hours (DAC-hours) for all radionuclides divided by 2,000, or
3. The sum of the calculated committed effective dose equivalents to all significantly irradiated organs or tissues (T) calculated from bioassay data using appropriate biological models and expressed as a fraction of the annual limit. For purposes of this requirement, an organ or tissue is deemed to be significantly irradiated if, for that organ or tissue, the product of the weighting factors, w_T, and the committed dose equivalent, $H_{T,50}$, per unit intake is greater than 10% of the maximum weighted value of $H_{T,50}$, (i.e., $w_T H_{T,50}$,) per unit intake for any organ or tissue.

4-006.03 Intake by Oral Ingestion. If the occupationally exposed individual also receives an intake of radionuclides by oral ingestion greater than 10% of the applicable oral ALI, the licensee or registrant must account for this intake and include it in demonstrating compliance with the limits.

4-006.04 Intake through Wounds or Absorption through Skin. The licensee or registrant must evaluate and, to the extent practical, account for intakes through wounds or skin absorption. The intake through intact skin has been included in the calculation of DAC for hydrogen-3 and does not need to be evaluated or accounted for pursuant to 180 NAC 4-006.04.

4-007 DETERMINATION OF EXTERNAL DOSE FROM AIRBORNE RADIOACTIVE MATERIAL

4-007.01 Licensees must, when determining the dose from airborne radioactive material, include the contribution to the deep dose equivalent, lens dose equivalent, and shallow dose equivalent from external exposure to the radioactive cloud. See Appendix 180 NAC 4-B, footnotes 1 and 2. Deleted: eye

4-007.02 Airborne radioactivity measurements and DAC values must not be used as the primary means to assess the deep dose equivalent when the airborne radioactive material includes radionuclides other than noble gases or if the cloud of airborne radioactive material is not relatively uniform. The determination of the deep dose equivalent to an individual must be based upon measurements using instruments or individual monitoring devices.

4-008 DETERMINATION OF INTERNAL EXPOSURE

4-008.01 For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee must, when required under 180 NAC 4-022 take suitable and timely measurements of:

1. Concentrations of radioactive materials in air in work areas; or
2. Quantities of radionuclides in the body; or
3. Quantities of radionuclides excreted from the body; or
4. Combinations of these measurements.

4-008.02 Unless respiratory protective equipment is used, as provided in 180 NAC 4-028 or the assessment of intake is based on bioassays, the licensee must assume that an individual inhales radioactive material at the airborne concentration in which the individual is present.

4-008.03 When specific information on the physical and biochemical properties of the radionuclides taken into the body or the behavior or the material in an individual is known, the licensee may:

1. Use that information to calculate the committed effective dose equivalent, and, if used, the licensee must document that information in the individual's record; and
2. Upon prior approval of the Department, adjust the DAC or ALI values to reflect the actual physical and chemical characteristics of airborne radioactive material, for example, aerosol size distribution or density; and
3. Separately assess the contribution of fractional intakes of Class D, W, or Y compounds of a given radionuclide to the committed effective dose equivalent. See Appendix 180 NAC 4-B.

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4-008.04 If the licensee chooses to assess intakes of Class Y material using the measurements given in 180 NAC 4-008.01, item 2 or 3, the licensee may delay the recording and reporting of the assessments for periods up to seven months, unless otherwise required by 180 NAC 4-058 or 4-059. This delay permits the licensee to make additional measurements basic to the assessments.

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4-008.05 If the identity and concentration of each radionuclide in a mixture are known, the fraction of the DAC applicable to the mixture for use in calculating DAC-hours must be either:

1. The sum of the ratios of the concentration to the appropriate DAC value, (for example, D, W, or Y) from Appendix 180 NAC 4-B for each radionuclide in the mixture; or

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2. The ratio of the total concentration for all radionuclides in the mixture to the most restrictive DAC value for any radionuclide in the mixture.

4-008.06 If the identity of each radionuclide in a mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture must be the most restrictive DAC of any radionuclide in the mixture.

4-008.07 When a mixture of radionuclides in air exists, a licensee may disregard certain radionuclides in the mixture if:

1. The licensee uses the total activity of the mixture in demonstrating compliance with the dose limits in 180 NAC 4-005 and in complying with the monitoring requirements in 180 NAC 4-022, and
2. The concentration of any radionuclide disregarded is less than 10% of its DAC, and
3. The sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 30%.

4-008.08 When determining the committed effective dose equivalent, the following information may be considered:

1. In order to calculate the committed effective dose equivalent, the licensee may assume that the inhalation of one ALI, or an exposure of 2,000 DAC-hours, results in a committed effective dose equivalent of 0.05 Sv (5 rem) for radionuclides that have their ALIs or DACs based on the committed effective dose equivalent.

2. For an ALI (and the associated DAC) determined by the nonstochastic organ dose limit of 0.5 Sv (50 rem), the intake of radionuclides that would result in a committed effective dose equivalent of 0.05 Sv (5 rem), (the stochastic ALI) is listed in parentheses in Table I of Appendix 180 NAC 4-B. The licensee may, as a simplifying assumption, use the stochastic ALI to determine committed effective dose equivalent. However, if the licensee uses the stochastic ALI, the licensee must also demonstrate that the limit in 180 NAC 4-005.01, item 1.b. is met.

4-009 DETERMINATION OF PRIOR OCCUPATIONAL DOSE

4-009.01 For each individual who may enter the licensee's or registrant's restricted area and is likely to receive, in a year, an occupational dose requiring monitoring pursuant to 180 NAC 4-022, the licensee or registrant must:

1. Determine the occupational radiation dose received during the current year; and
2. Attempt to obtain the records of cumulative occupational radiation dose.

4-009.02 Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant must determine:

1. The internal and external doses from all previous planned special exposures; and

2. All doses in excess of the limits (including doses received during accidents and emergencies) received during the lifetime of the individual.

4-009.03 In complying with the requirements of 180 NAC 4-009.01, a licensee or registrant may:

1. Accept, as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's most recent employer for work involving radiation exposure, that discloses the nature and the amount of any occupational dose that the individual received during the current year; and
2. Accept, as the record of cumulative radiation dose, an up-to-date Department Form NRH-1, or equivalent, signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant; and
3. Obtain reports of the individual's dose equivalent from the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant, by telephone, telegram, electronic media, or letter. The licensee or registrant must request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

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4-009.04 The licensee or registrant must record the exposure history, as required by 180 NAC 4-009.01, on Department Form NRH-1, or other clear and legible record, including all of the information required on that form.

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1. The form or record must show each period in which the individual received occupational exposure to radiation or radioactive material and must be signed by the individual who received the exposure. For each period for which the licensee or registrant obtains reports, the licensee or registrant must use the dose shown in the report in preparing Department Form NRH-1 or equivalent. For any period in which the licensee or registrant does not obtain a report, the licensee or registrant must place a notation on Department Form NRH-1 indicating the periods of time for which data are not available.

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2. Licensees or registrants are not required to partition historical dose between external dose equivalent(s) and internal committed dose equivalent(s). Further, occupational exposure histories obtained and recorded on Department Form NRH-1 before the May 30, 1994, might not have included effective dose equivalent, but may be used in the absence of specific information on the intake of radionuclides by the individual.

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4-009.05 If the licensee or registrant is unable to obtain a complete record of an individual's current and previously accumulated occupational dose, the licensee or registrant must assume:

1. In establishing administrative controls under 180 NAC 4-005.07 for the current year, that the allowable dose limit for the individual is reduced by 12.5 mSv (1.25 rem) for each quarter for which records were unavailable and the individual was

engaged in activities that could have resulted in occupational radiation exposure; and

2. That the individual is not available for planned special exposures.

4-009.06 The licensee or registrant must retain the records on Department Form NRH-1 or equivalent until the Department terminates each pertinent license or registration requiring this record. The licensee or registrant must retain records used in preparing Department Form NRH-1 or equivalent for three years after the record is made. This includes records required under the standards for protection against radiation in effect prior to May 30, 1994.

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4-010 PLANNED SPECIAL EXPOSURES: A licensee or registrant may authorize an adult worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in 180 NAC 4-005 provided that each of the following conditions is satisfied:

1. The licensee or registrant authorizes a planned special exposure only in an exceptional situation when alternatives that might avoid the dose estimated to result from the planned special exposure are unavailable or impractical.
2. The licensee or registrant, and employer if the employer is not the licensee or registrant, specifically authorizes the planned special exposure, in writing, before the exposure occurs.
3. Before a planned special exposure, the licensee or registrant ensures that each individual involved is:

   a. Informed of the purpose of the planned operation; and
   b. Informed of the estimated doses and associated potential risks and specific radiation levels or other conditions that might be involved in performing the task; and
   c. Instructed in the measures to be taken to keep the dose ALARA considering other risks that may be present.

4. Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant ascertains prior doses as required by 180 NAC 4-009.02 during the lifetime of the individual for each individual involved.

5. Subject to 180 NAC 4-005.02, the licensee or registrant must not authorize a planned special exposure that would cause an individual to receive a dose from all planned special exposures and all doses in excess of the limits to exceed:

   a. The numerical values of any of the dose limits in 180 NAC 4-005.01 in any year; and
   b. Five times the annual dose limits in 180 NAC 4-005.01 during the individual's lifetime.

6. The licensee or registrant maintains records of the conduct of a planned special exposure in accordance with 180 NAC 4-051 and submits a written report in accordance with 180 NAC 4-060.

7. The licensee or registrant records the best estimate of the dose resulting from the planned special exposure in the individual's record and informs the individual, in writing,

of the dose within 30 days from the date of the planned special exposure. The dose from planned special exposures must not be considered in controlling future occupational dose of the individual pursuant to 180 NAC 4-005.01 but must be included in evaluations required by 180 NAC 4-010.04 and 4-010.05.

4-011 OCCUPATIONAL DOSE LIMITS FOR MINORS: The annual occupational dose limits for minors are 10% of the annual occupational dose limits specified for adult workers in 180 NAC 4-005.

4-012 DOSE EQUIVALENT TO AN EMBRYO/FETUS

4-012.01 The licensee or registrant must ensure that the dose equivalent to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 5 mSv (0.5 rem). See 180 NAC 4-052 for record keeping requirements.

4-012.02 The licensee or registrant must make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in 180 NAC 4-012.01.[2]

4-012.03 The dose equivalent to an embryo/fetus is the sum of:

1. The deep dose equivalent to the declared pregnant woman; and
2. The equivalent dose to the embryo/fetus resulting from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman.

4-012.04 If the dose equivalent to the embryo/fetus is found to have exceeded 5 mSv (.5 rem), or is within 0.5 mSv (0.05 rem) of this dose, by the time the woman declares the pregnancy to the licensee, the licensee or registrant must be deemed to be in compliance with 180 NAC 4-012.01 if the additional dose to the embryo/fetus does not exceed 0.5 mSv (0.05 rem) during the remainder of the pregnancy.

RADIATION DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC

4-013 DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC

4-013.01 Each licensee or registrant must conduct operations so that:

1. The total effective dose equivalent to individual members of the public from the licensed or registered operation does not exceed 1 mSv (0.1 rem) in a year, exclusive of the dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 180 NAC 7-037, from voluntary participation in medical research programs, and from the

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[2]The National Council on Radiation Protection and Measurements recommended in NCRP Report No. 91 "Recommendations on Limits for Exposure to Ionizing Radiation" (June 1, 1987) that no more than 0.5 mSv (0.05 rem) to the embryo\fetus be received in any one month.

licensee's or registrant's disposal of radioactive material into sanitary sewerage in accordance with 180 NAC 4-041, and

2. The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with 180 NAC 7-037, does not exceed 0.02 mSv (0.002 rem) in any one hour.

4-013.02 If the licensee or registrant permits members of the public to have access to restricted areas, the limits for members of the public continue to apply to those individuals.

4-013.03 Notwithstanding 180 NAC 4-013.01, item 1 a licensee may permit visitors to an individual who cannot be released, under 180 NAC 7-037, to receive a radiation dose greater than 1 mSv (0.1 rem) if:

1. The radiation dose received does not exceed 5 mSv (0.5 rem); and
2. The authorized user, as defined in 180 NAC 7, has determined before the visit that it is appropriate.

4-013.04 A licensee, registrant, or an applicant for a license or registration may apply for prior Department authorization to operate up to an annual dose limit for an individual member of the public of 5 mSv (0.5 rem). This application must include the following information:

1. Demonstration of the need for and the expected duration of operations in excess of the limit in 180 NAC 4-013.01; and
2. The licensee's or registrant's program to assess and control dose within the 5 mSv (0.5 rem) annual limit; and
3. The procedures to be followed to maintain the dose ALARA.

4-013.04 In addition to the requirements of 180 NAC 4, a licensee or registrant subject to the provisions of the U.S. Environmental Protection Agency's generally applicable environmental radiation standards in 40 CFR 190 must comply with those standards.

4-013.05 The Department may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that a licensee or registrant may release in effluents in order to restrict the collective dose.

4-014 COMPLIANCE WITH DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC

4-014.01 The licensee or registrant must make or cause to be made surveys of radiation levels in unrestricted areas and radioactive materials in effluents released to unrestricted areas to demonstrate compliance with the dose limits for individual members of the public in 180 NAC 4-013.

4-014.02 A licensee or registrant must show compliance with the annual dose limit in 180 NAC 4-013 by:

1. Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed or registered operation does not exceed the annual dose limit; or

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2. Demonstrating that:

   a. The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in Table II of Appendix 180 NAC 4-B; and
   b. If an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.02 mSv (0.002 rem) in an hour and 0.5 mSv (0.05 rem) in a year.

4-014.03 Upon approval from the Department, the licensee or registrant may adjust the effluent concentration values in Appendix 180 NAC 4-B, Table II, for members of the public, to take into account the actual physical and chemical characteristics of the effluents, such as, aerosol size distribution, solubility, density, radioactive decay equilibrium, and chemical form. Deleted: Agency

RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION

4-015 GENERAL PROVISIONS AND SCOPE

4-015.01 The criteria in 180 NAC 4 apply to the decommissioning of facilities licensed under 180 NAC 3 and 12, as well as other facilities subject to the Department's jurisdiction under the Act for low-level waste disposal facilities (180 NAC 12), the criteria apply only to ancillary surface facilities that support radioactive waste disposal activities. The criteria do not apply to uranium and thorium recovery facilities or to uranium solution extraction facilities. Deleted: Agency

4-015.02 The criteria in 180 NAC 4 do not apply to sites which:

1. Have been decommissioned prior to May 27, 2000 in accordance criteria identified in the Site Decommissioning Management Plan Action Plan of April 16, 1992 (57 FR 13389); Deleted: the effective date of the rule
2. Have previously submitted and received Department approval on a decommissioning plan that is compatible with the Site Decommissioning Management Plan Action Plan criteria; or Deleted: Agency
3. Submit a sufficient decommissioning plan within 1 year after May 27, 2000 and such decommissioning plan is approved by the Department within 2 years after May 27, 2000 and in accordance with the criteria identified in the Site Decommissioning Management Plan, except that if an Environmental Impact Statement is required in the submittal, there will be a provision for day-for-day extension. Deleted: the effective date of these regulations Deleted: Agency Deleted: the effective date of these regulations

4-015.03 After a site has been decommissioned and the license terminated in accordance with the criteria in 180 NAC 4, the Department will require additional cleanup only if, based on new information, it determines that the criteria of 180 NAC 4 were not met and residual radioactivity remaining at the site could result in significant threat to public health and safety. Deleted: Agency

4-015.04 When calculating TEDE to the average member of the critical group the licensee must determine the peak annual TEDE dose expected within the first 1000 years after decommissioning. Formatted: Bullets and Numbering

4-016 RADIOLOGICAL CRITERIA FOR UNRESTRICTED USE: A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

4-017 CRITERIA FOR LICENSE TERMINATION UNDER RESTRICTED CONDITIONS

4-017.01 A site will be considered acceptable for license termination under restricted conditions if:

1. The licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of 180 NAC 4-016 would result in net public or environmental harm or were not being made because the residual levels associated with restricted conditions are ALARA. Determination of the levels which are ALARA must take into account consideration of any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal;
2. The licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) per year;
3. The licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site. Acceptable financial assurance mechanisms are;

    a. Funds placed into an account segregated from the licensee's assets and outside the licensee's administrative control as described in 180 NAC 3-018.06, item 1;
    b. Surety method, insurance, or other guarantee method as described in 180 NAC 3-018.06, item 2;
    c. A statement of intent in the case of Federal, State or local Government licensees, as described in 180 NAC 3-018.06, item 4; or
    d. When a governmental entity is assuming custody and ownership of a site, an arrangement that is deemed acceptable by such governmental entity.

4. The licensee has submitted a decommissioning plan to the Department indicating the licensee's intent to decommission in accordance with 180 NAC 3-018.01, and specifying that the licensee intends to decommission by restricting use of the site. The licensee must document in the decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, following analysis of that advice.

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a. Licensees proposing to decommission by restricting use of the site must seek advice from such affected parties regarding the following matters concerning the proposed decommissioning;

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(1) Whether provisions for institutional controls proposed by the licensee;

(a) Will provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) TEDE per year;
(b) Will be enforceable; and
(c) Will not impose undue burdens on the local community or other affected parties.

(2) Whether the licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site.

b. In seeking advice on the issues identified in 180 NAC 4-017.01, item 4.a., the licensee must provide for:

(1) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;
(2) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and
(3) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues; and

5. Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable and would not exceed either;

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a. 100 mrem (1 mSv) per year; or (1 mSv) per year; or
b. 500 mrem (5 mSv) per year provided the licensee;

(1) Demonstrates that further reductions in residual radioactivity necessary to comply with the 100 mrem/y (1 mSv/y) value of 180 NAC 4-017.01, item 5.a. are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm;
(2) Makes provisions for durable institutional controls;
(3) Provides sufficient financial assurance to enable a responsible government entity or independent third party, including a governmental custodian of a site both to carry out periodic rechecks

of the site, no less frequently than every five years to assure that the institutional controls necessary to meet the criteria of 180 NAC 4-017.01, item 2 and to assume and carry out responsibilities for any necessary control and, maintenance of those controls. Acceptable financial assurance mechanisms are those in 180 NAC 4-017.01, item 3.

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4-018 ALTERNATE CRITERIA FOR LICENSE TERMINATION

4-018.01 The Department may terminate a license using alternate criteria greater than the dose criterion of 180 NAC 4-016, 4-017.01, item 2 and 4-017.01, item 4.a.(1)(a), if the licensee:

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1. Provides assurance that public health and safety would continue to be protected, and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the 1 mSv/y (100 mrem/y) limit of 180 NAC 4-013.01, item 1, by submitting an analysis of possible sources of exposure;
2. Has employed to the extent practical restrictions on site use according to the provisions of 180 NAC 4-017 in minimizing exposures at the site; and
3. Reduces doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal.
4. Has submitted a decommissioning plan to the Department indicating the licensee's intent to decommission in accordance with 180 NAC 3-019.04 and specifying that the licensee proposes to decommission by use of alternate criteria. The licensee must document in the decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee must provide for:

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   a. Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning:
   b. An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and
   c. A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues.

4-018.02 The use of alternate criteria to terminate a license requires the approval of the Department after consideration of the Department staff's recommendations that will address any comments provided by the Environmental Protection Agency and any public comments
submitted pursuant to180 NAC 4-019.

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4-019 PUBLIC NOTIFICATION AND PUBLIC PARTICIPATION

4-019.01 Upon the receipt of the decommissioning plan from the licensee, or a proposal by the licensee for release of a site pursuant to 180 NAC 4-017 and 4-018, or whenever the Department deems such notice to be in the public interest, the Department must:

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1. Notify and solicit comments from:

   a. Local and State governments in the vicinity of the site and any Indian Nation or other indigenous people that have treaty or statutory rights that could be affected by the decommissioning; and
   b. The Environmental Protection Agency for cases where the licensee proposes to release a site pursuant to180 NAC 4-018.

4-019.02 Publish a notice in a forum, such as local newspapers, letters to the State or local organizations, or other appropriate forum, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.

4-020 MINIMIZATION OF CONTAMINATION: Applicants for licenses, other than renewals, must describe in the application how the facility design and the procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

SURVEYS AND MONITORING

4-021 GENERAL

4-021.01 Each licensee or registrant must make, or cause to be made, surveys that:

1. Are necessary for the licensee or registrant to comply with 180 NAC 4; and
2. Are necessary under the circumstances to evaluate:

   a. The magnitude and extent of radiation levels; and
   b. Concentrations or quantities of radioactive material; and
   c. The potential radiological hazards that could be present.

4-021.02 The licensee or registrant must ensure that instruments and equipment used for quantitative radiation measurements for example, dose rate and effluent monitoring, are calibrated at intervals not to exceed 12 months for the radiation measured, except when a more frequent interval is specified in another applicable chapter or a license condition.

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4-021.03 All personnel dosimeters (except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to any extremity) that require processing to determine the radiation dose and that are used by licensees and registrants to comply with 180 NAC 4-005, with other applicable provisions of these regulations, or with conditions specified in a license or registration must be processed and evaluated by a dosimetry processor:

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

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

4-021.04 The licensee or registrant must ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.

4-022 CONDITIONS REQUIRING INDIVIDUAL MONITORING OF EXTERNAL AND INTERNAL OCCUPATIONAL DOSE: Each licensee or registrant must monitor exposures to radiation and radioactive material at levels sufficient to demonstrate compliance with the occupational dose limits of 180 NAC 4. As a minimum:

4-022.01 Each licensee or registrant must monitor occupational exposures to radiation from registered, licensed and unlicensed radiation sources under the control of the licensee or registrant and must supply and require the use of individual monitoring devices by:

1. Adults likely to receive, in 1 year from sources external to the body, a dose in excess of 10% of the limits in 180 NAC 4-005.01; and
2. Minors likely to receive, in 1 year, from sources external to the body, a deep dose equivalent in excess of 0.1 rem (1 mSv), a lens dose equivalent in excess of 0.15 rem (1.5 mSv), or a shallow dose equivalent to the skin or to the extremities in excess of 0.5 rem (5 mSv);
3. Declared pregnant women likely to receive during the entire pregnancy, from radiation sources external to the body, a deep dose equivalent in excess of 0.1 rem (1 mSv);[3] and
4. Individuals entering a high or very high radiation area.
5. Individuals working with medical fluoroscopic equipment.

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a. An individual monitoring device used for the dose to an embryo/fetus of a declared pregnant woman, pursuant to 180 NAC 4-012.01, must be located under the protective apron at the waist.
b. An individual monitoring device used for lense dose equivalent must be located at the neck (collar), or an unshielded location closer to the eye, outside the protective apron.
c. When only one individual monitoring device is used to determine the effective dose equivalent for external radiation pursuant to 180 NAC 4-005.03, it must be located at the neck (collar) outside the protective apron. When a second individual monitoring device is used for the same purpose, it must be located under the protective apron at the waist. The second individual monitoring device is required for a declared pregnant woman.

4-022.02 Each licensee or registrant must monitor, to determine compliance with 180 NAC 4-008, the occupational intake of radioactive material by and assess the committed effective dose equivalent to:

[3] All of the occupational doses in 180 NAC 4-005 continue to be applicable to the declared pregnant worker as long as the embryo/fetus dose limit is not exceeded.

1. Adults likely to receive, in 1 year, an intake in excess of 10% of the applicable ALI in Table I, Columns 1 and 2, of Appendix 180 NAC 4-B; and
2. Minors likely to receive, in 1 year, a committed effective dose equivalent in excess of 0.1 rem (1 mSv);.
3. Declared pregnant women likely to receive, during the entire pregnancy, a committed effective dose equivalent in excess of 0.1 rem (1 mSv).

CONTROL OF EXPOSURE FROM EXTERNAL SOURCES IN RESTRICTED AREAS

4-023 CONTROL OF ACCESS TO HIGH RADIATION AREAS

4-023.01 The licensee or registrant must ensure that each entrance or access point to a high radiation area has one or more of the following features:

1. A control device that, upon entry into the area, causes the level of radiation to be reduced below that level at which an individual might receive a deep dose equivalent of 1 mSv (0.1 rem) in 1 hour at 30 centimeters from the source of radiation from any surface that the radiation penetrates; or
2. A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry; or
3. Entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.

4-023.02 In place of the controls required by 180 NAC 4-023.01 for a high radiation area, the licensee or registrant may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

4-023.03 The licensee or registrant may apply to the Department for approval of alternative methods for controlling access to high radiation areas.

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4-023.04 The licensee or registrant must establish the controls required by 180 NAC 4-023.01 and 4-023.03 in a way that does not prevent individuals from leaving a high radiation area.

4-023.05 The licensee or registrant is not required to control each entrance or access point to a room or other area that is a high radiation area solely because of the presence of radioactive materials prepared for transport and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation provided that:

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

4-023.06 The licensee is not required to control entrance or access to rooms or other areas in hospitals solely because of the presence of patients containing radioactive material, provided that there are personnel in attendance who are taking the necessary precautions to prevent the exposure of individuals to radiation or radioactive material in excess of the

established limits in 180 NAC 4 and to operate within the ALARA provisions of the licensee's or registrant's radiation protection program.

4-023.07 The registrant is not required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a high radiation area as described in 180 NAC 4-023 if the registrant has met all the specific requirements for access and control specified in other applicable 180 NAC Chapters, such as, 180 NAC 5 for industrial radiography, 180 NAC 6 for x-rays in the healing arts, and 180 NAC 9 for particle accelerators.

4-024 CONTROL OF ACCESS TO VERY HIGH RADIATION AREAS

4-024.01 In addition to the requirements in 180 NAC 4-023, the licensee or registrant must institute measures to ensure that an individual is not able to gain unauthorized or inadvertent access to areas in which radiation levels could be encountered at 5 Gy (500 rad) or more in 1 hour at 1 meter from a source of radiation or any surface through which the radiation penetrates. This requirement does not apply to rooms or areas in which diagnostic x-ray systems are the only source of radiation, or to non-self-shielded irradiators.

4-024.02 The registrant is not required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a very high radiation area as described in 180 NAC 4-024.01 if the registrant has met all the specific requirements for access and control specified in other applicable 180 NAC Chapters, such as, 180 NAC 5 for industrial radiography, 180 NAC 6 for x-rays in the healing arts, and 180 NAC 9 for particle accelerators.

4-025 CONTROL OF ACCESS TO VERY HIGH RADIATION AREAS--IRRADIATORS

4-025.01 180 NAC 4-025 applies to licensee or registrants with sources of radiation in non-self-shielded irradiators. 180 NAC 4-025 does not apply to sources of radiation that are used in teletherapy, in industrial radiography, or in completely self-shielded irradiators in which the source of radiation is both stored and operated within the same shielding radiation barrier and, in the designed configuration of the irradiator, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual.

4-025.02 Each area in which there may exist radiation levels in excess of 5 Gy (500 rad) in 1 hour at 1 meter from a source of radiation that is used to irradiate materials must meet the following requirements:

1. Each entrance or access point must be equipped with entry control devices which:

   a. Function automatically to prevent any individual from inadvertently entering a very high radiation area; and
   b. Permit deliberate entry into the area only after a control device is actuated that causes the radiation level within the area, from the source of radiation, to be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour; and

c. Prevent operation of the source of radiation if it would produce radiation levels in the area that could result in a deep dose equivalent to an individual in excess of 1 mSv (0.1 rem) in 1 hour.

2. Additional control devices must be provided so that, upon failure of the entry control devices to function as required by 180 NAC 4-025.02, item 1:

   a. The radiation level within the area, from the source of radiation, is reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour; and
   b. Conspicuous visible and audible alarm signals are generated to make an individual attempting to enter the area aware of the hazard and at least one other authorized individual, who is physically present, familiar with the activity, and prepared to render or summon assistance, aware of the failure of the entry control devices.

3. The licensee or registrant must provide control devices so that, upon failure or removal of physical radiation barriers:

   a. The radiation level from the source of radiation is reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour; and
   b. Conspicuous visible and audible alarm signals are generated to make potentially affected individuals aware of the hazard and the licensee or registrant or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of the failure or removal of the physical barrier.

4. Physical radiation barriers that comprise permanent structural components, such as walls, that have no credible probability of failure or removal in ordinary circumstances need not meet the requirements of 180 NAC 4-025.02, item 3.
5. Each area must be equipped with devices that will automatically generate conspicuous visible and audible alarm signals to alert personnel in the area before the source of radiation can be put into operation and in time for any individual in the area to operate a clearly identified control device, which must be installed in the area and which can prevent the source of radiation from being put into operation.
6. Each area must be controlled by use of such administrative procedures and such devices as are necessary to ensure that the area is cleared of personnel prior to each use of the source of radiation.
7. Each area must be checked by a radiation measurement to ensure that, prior to the first individual's entry into the area after any use of the source of radiation, the radiation level from the source of radiation in the area is below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 1 mSv (0.1 rem) in 1 hour.
8. The entry control devices required in 180 NAC 4-025.02, item 1 must have been tested for proper functioning. See 180 NAC 4-055 for record keeping requirements.

a. Testing must be conducted prior to initial operation with the source of radiation on any day, unless operations were continued uninterrupted from the previous day; and
b. Testing must be conducted prior to resumption of operation of the source of radiation after any unintentional interruption; and
c. The licensee or registrant must submit and adhere to a schedule for periodic tests of the entry control and warning systems.

9. The licensee or registrant must not conduct operations, other than those necessary to place the source of radiation in safe condition or to effect repairs on controls, unless control devices are functioning properly.
10. Entry and exit portals that are used in transporting materials to and from the irradiation area, and that are not intended for use by individuals, must be controlled by such devices and administrative procedures as are necessary to physically protect and warn against inadvertent entry by any individual through these portals.

4-025.03 Registrants or applicants for registrations for sources of radiation within the purview of 180 NAC 4-025.02 which will be used in a variety of positions or in locations, such as open fields or forests, that make it impracticable to comply with certain requirements of 180 NAC 4-025.02, such as those for the automatic control of radiation levels, may apply to the Department for approval of alternative safety measures. Alternative safety measures must provide personnel protection at least equivalent to those specified in 180 NAC 4-025.02. At least one of the alternative measures must include an entry-preventing interlock control based on a measurement of the radiation that ensures the absence of high radiation levels before an individual can gain access to the area where such sources of radiation are used.

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4-025.04 The entry control devices required by 180 NAC 4-025.02 and 4-025.03 must be established in such a way that no individual will be prevented from leaving the area.

RESPIRATORY PROTECTION AND CONTROLS TO RESTRICT INTERNAL EXPOSURE IN RESTRICTED AREAS

4-026 USE OF PROCESS OR OTHER ENGINEERING CONTROLS: The licensee or registrant must use, to the extent practical, process or other engineering controls (for example, containment, decontamination, or ventilation) to control the concentrations of radioactive material in air.

4-027 USE OF OTHER CONTROLS

4-027.01 When it is not practical to apply process or other engineering controls to control the concentrations of radioactive material in air to values below those that define an airborne radioactivity area, the licensee or registrant must, consistent with maintaining the total effective dose equivalent ALARA, increase monitoring and limit intakes by one or more of the following means:

1. Control of access; or
2. Limitation of exposure times; or
3. Use of respiratory protection equipment; or

4. Other controls.

4-027.02 If the licensee performs an ALARA analysis to determine whether or not respirators should be used, the licensee may consider safety factors other than radiological factors. The licensee should also consider the impact of respirator use on workers' industrial health and safety.

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4-028 USE OF INDIVIDUAL RESPIRATORY PROTECTION EQUIPMENT

4-028.01 If the licensee assigns or permits the use of respiratory protection equipment to limit the intake of radioactive material, pursuant to 180 NAC 4-027:

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1. Except as provided in 180 NAC 4-028.01, item 2, the licensee must use only respiratory protection equipment that is tested and certified by the National Institute for Occupational Safety and Health (NIOSH) except as otherwise noted in this part.

2. If the licensee wishes to use equipment that has not been tested or certified by the NIOSH, or for which there is no schedule for testing or certification, the licensee or registrant must submit an application for authorized use of this equipment, except as provided in 180 NAC 4-028.01. The application must include evidence that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use. This must be demonstrated either by licensee testing or on the basis of reliable test information.

3. The licensee must implement and maintain a respiratory protection program that includes:

   a. Air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate doses;
   b. Surveys and bioassays, as necessary, to evaluate actual intakes;
   c. Testing of respirators for operability (user seal check for face sealing devices and functional check for each others) immediately prior to each use; and
   d. Written procedures regarding--

      (1) Monitoring, including air sampling and bioassays;
      (2) Supervision and training of respiratory users;
      (3) Fit testing;
      (4) Respiratory selection
      (5) Breathing air quality;
      (6) Inventory and control
      (7) Storage, issuance, maintenance, repair, testing, and quality assurance of respiratory protection equipment;
      (8) Recordkeeping; and
      (9) Limitations on periods of respirator use and relief from respirator use;

e. Determination by a physician that the individual user is medically fit to use the respiratory protection equipment; before

(1) The initial fitting of a face sealing respiratory;
(2) Before the first field use of non-face sealing respirators, and
(3) Either every 12 months thereafter, or periodically at a frequency determined by a physician.

f. Fit testing, with fit factor ≥ 10 times the assigned protection factor (APF) for negative pressure devices, and a fit factor ≥ 500 for any positive pressure, continuous flow, and pressure-demand devices, before the first field use of tight fitting face-sealing respirators and periodically thereafter at a frequency not to exceed 1 year. Fit testing must be performed with the facepeice operating in the negative pressure mode.

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4. The licensee must advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other conditions that might require such relief.

5. The licensee must also consider limitations appropriate to the type and mode of use. When selecting respiratory devices the licensee must provide for vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or radiological protection equipment. The licensee must use equipment in such a way as not to interfere with the proper operation of the respirator.

6. Standby rescue persons are required whenever one-piece atmosphere-supplying suits, or any combination of supplied air respiratory protection device and personnel protective equipment are used from which an unaided individual would have difficulty extricating himself/herself. The standby persons must be equipped with respiratory protection devices or other apparatus appropriate for the potential hazards. The standby rescue persons must observe or otherwise maintain continuous communication with the workers (visual, voice, signal line, telephone, radio, or other suitable means), and be immediately available to assist them in case of a failure of the air supply or for any other reason that requires relief from distress. A sufficient number of standby rescue persons must be immediately available to assist all users of this type of equipment and to provide effective emergency rescue if needed.

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7. Atmosphere-supplying respirators must be supplied with respirable air of grade D quality or better as defined by the Compressed Gas Association in publication G-7.1, "Commodity Specification for Air," 1997 and included in the regulations of the Occupational Safety and Health Administration (29 CFR 1910.134(i)(1)(ii)(A) through (E) attached hereto as Attachment Number 4-1 and incorporated herein by this reference. Grade D quality air criteria include:

(a) Oxygen content (v/v) of 19.5-23.5%;
(b) Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
(c) Carbon monoxide (CO) content of 10 ppm or less;
(d) Carbon dioxide content of 1,000 ppm or less; and
(e) Lack of noticeable odor.

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

9. In estimating the dose to individuals from intake of airborne radioactive materials, the concentration of radioactive material in the air that is inhaled when respirators are worn is initially assumed to be the ambient concentration in air without respiratory protection, divided by the assigned protection factor. If the dose is later found to be greater than the estimated dose, the corrected value must be used. If the dose is later found to be less than the estimated dose, the corrected value may be used.

4-029 FURTHER RESTRICTIONS ON THE USE OF RESPIRATORY PROTECTION EQUIPMENT

The Department may impose restrictions in addition to the provisions of 180 NAC 4-027, 4-028, and Appendix 4-A in order to:

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4-029.01 Ensure that the respiratory protection program of the licensee is adequate to limit doses to individuals from intakes of airborne radioactive materials consistent with maintaining total effective dose equivalent ALARA; and

4-029.02 Limit the extent to which a licensee may use respiratory protection equipment instead of process or other engineering controls.

4-030 APPLICATION FOR USE OF HIGHER ASSIGNED PROTECTION FACTORS

The licensee must obtain authorization from the Department before using assigned protection factors in excess of those specified in Appendix 4-A. The Department may authorize a licensee to use higher assigned protection factors on receipt of an application that:

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4-030.01 Describes the situation for which a need exists for higher protection factors; and

4-030.02 Demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.

STORAGE AND CONTROL OF LICENSED OR REGISTERED SOURCES OF RADIATION

4-031 SECURITY AND CONTROL OF LICENSED OR REGISTERED SOURCES OF RADIATION:

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4-031.01 The licensee or registrant must secure licensed or registered radioactive material from unauthorized removal or access.

4-031.02 The licensee or registrant must maintain constant surveillance, use devices and/or administrative procedures to prevent unauthorized use of licensed or registered radioactive material that is in an unrestricted area and that is not in storage.

4-031.03 The registrant must secure registered radiation machines from unauthorized removal.

4-031.04 The registrant must use devices or administrative procedures to prevent unauthorized use of registered radiation machines.

4-031.05 Security requirements for portable gauges. Each portable gauge licensee must use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal, whenever portable gauges are not under the control and constant surveillance of the licensee.

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4-032 RESERVED:

PRECAUTIONARY PROCEDURES

4-033 CAUTION SIGNS

4-033.01 Standard Radiation Symbol: Unless otherwise authorized by the Department, the symbol prescribed by 180 NAC 4-033 must use the colors magenta, or purple, or black on yellow background. The symbol prescribed is the three-bladed design as follows:

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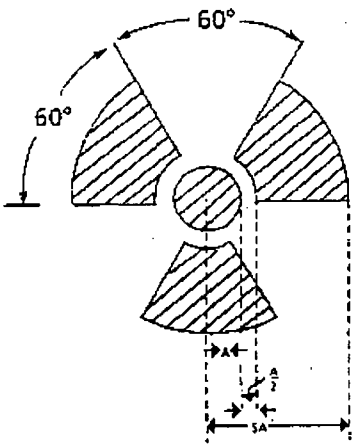
RADIATION SYMBOL

1. Cross-hatched area is to be magenta, or purple, or black, and
2. The background is to be yellow.



4-033.02 Exception to Color Requirements for Standard Radiation Symbol: Notwithstanding the requirements of 180 NAC 4-033.01, licensees or registrants are authorized to label sources, source holders, or device components containing sources of radiation that are subjected to high temperatures, with conspicuously etched or stamped radiation caution symbols and without a color requirement.

4-033.03 Additional Information on Signs and Labels: In addition to the contents of signs and labels prescribed in 180 NAC 4, the licensee or registrant must provide, on or near the required signs and labels, additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures.

4-034 POSTING REQUIREMENTS

4-034.01 Posting of Radiation Areas: The licensee or registrant must post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA."

4-034.02 Posting of High Radiation Areas: The licensee or registrant must post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA."

4-034.03 Posting of Very High Radiation Areas: The licensee or registrant must post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA."

4-034.04 Posting of Airborne Radioactivity Areas: The licensee or registrant must post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA."

4-034.05 Posting of Areas or Rooms in which Licensed or Registered Material is Used or Stored: The licensee or registrant must post each area or room in which there is used or stored an amount of licensed or registered material exceeding ten times the quantity of such material specified in Appendix 180 NAC 4-C with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."

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4-035 EXCEPTIONS TO POSTING REQUIREMENT:

4-035.01 A licensee or registrant is not required to post caution signs in areas or rooms containing sources of radiation for periods of less than eight hours, if each of the following conditions is met:

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1. The sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in 180 NAC 4; and
2. The area or room is subject to the licensee's or registrant's control.

4-035.02 Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs pursuant to 180 NAC 4-034 provided that the patient could be released from licensee control pursuant to 180 NAC 7-037.

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4-035.03 A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level at 30 centimeters from the surface of the sealed source container or housing does not exceed 0.05 mSv (0.005 rem) per hour.

4-035.04 Rooms in hospitals or clinics that are used for teletherapy are exempt from the requirement to post caution signs in accordance with 180 NAC 4-034 if:

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1. Access to the room is controlled in accordance with 180 NAC 7-071; and

2. Personnel in attendance take necessary precautions to prevent the inadvertent exposure of workers, other patients, and members of the public to radiation in excess of the limits established in 180 NAC 4-035.

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4-036 LABELING CONTAINERS AND RADIATION MACHINES

4-036.01 The licensee or registrant must ensure that each container of licensed or registered material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL." The label must also provide information such as the radionuclides present, an estimate of the quantity of radioactivity, the date for which the activity is estimated, radiation levels, kinds of materials, and mass enrichment to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures.

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4-036.02 Each licensee or registrant must, prior to removal or disposal of empty uncontaminated containers to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

4-036.03 Each registrant must ensure that each radiation machine is labeled in a conspicuous manner which cautions individuals that radiation is produced when it is energized.

4-037 EXEMPTIONS TO LABELING REQUIREMENTS: A licensee or registrant is not required to label:

4-037.01 Containers holding licensed or registered material in quantities less than the quantities listed in Appendix 180 NAC 4-C; or

4-037.02 Containers holding licensed or registered material in concentrations less than those specified in Table III of Appendix 180 NAC 4-B; or

4-037.03 Containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by 180 NAC 4; or

4-037.04 Containers when they are in transport and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation[4]; or

4-037.05 Containers that are accessible only to individuals authorized to handle or use them, or to work in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record. Examples of containers of this type are containers in locations such as water-filled canals, storage vaults, or hot cells. The record must be retained as long as the containers are in use for the purpose indicated on the record; or

4-037.06 Installed manufacturing or process equipment, such as piping and tanks.

4-038 PROCEDURES FOR RECEIVING AND OPENING PACKAGES

4-038.01 Each licensee who expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, as defined in 180 NAC 13-002 and Appendix A of 180 NAC 13, must make arrangements to receive:

1. The package when the carrier offers it for delivery; or
2. Notification of the arrival of the package at the carrier's terminal and to take possession of the package expeditiously.

4-038.02 *Each licensee must:*

1. Monitor the external surfaces of a labeled[5] package for radioactive contamination unless the package contains only radioactive material in the form of a gas or in special form as defined in 180 NAC 1-002; and
2. Monitor the external surfaces of a labeled[6] package for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity, as defined in 180 NAC 13-002 and Appendix A to 180 NAC 13; and
3. Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet, or damaged.

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4-038.03 The licensee must perform the monitoring required by 180 NAC 4-038.02 as soon as practical after receipt of the package, but not later than three hours after the package is

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[4]Labeling of packages containing radioactive materials is required by the U.S. Department of Transportation if the amount and type of radioactive material exceeds the limits for an excepted quantity or article as defined and limited by U.S. Department of Transportation regulations 49 CFR 173.403(m) and (w) and 173.421-424.

[5]Labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U.S. Department of Transportation regulations, 49 CFR 172.403 and 172.436-440.

[6]Labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U.S. Department of Transportation regulations, 49 CFR 172.403 and 172.436-440.

received at the licensee's or registrant's facility if it is received during the licensee's or registrant's normal working hours, or not later than three hours from the beginning of the next working day if it is received after working hours.

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4-038.04 The licensee must immediately notify the final delivery carrier and, by telephone and telegram, mailgram, or facsimile, the Department when:

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1. Removable radioactive surface contamination exceeds the limits of 180 NAC 13-015.08; or
2. External radiation levels exceed the limits of 180 NAC 13-015.09 and 13-015.10

4-038.05 Each licensee must:

1. Establish, maintain, and retain written procedures for safely opening packages in which radioactive material is received; and
2. Ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.

4-038.06 Licensees transferring special form sources in vehicles owned or operated by the licensee to and from a work site are exempt from the contamination monitoring requirements of 180 NAC 4-038.02, but are not exempt from the monitoring requirement in 180 NAC 4-038.02 for measuring radiation levels that ensures that the source is still properly lodged in its shield.

WASTE DISPOSAL

4-039 GENERAL REQUIREMENTS

4-039.01 A licensee must dispose of licensed material only:

1. By transfer to an authorized recipient as provided in 180 NAC 4-044 or in 180 NAC 3, 12 or 19, or to the U.S. Department of Energy; or
2. By decay in storage in accordance with 180 NAC 4-039.03; or
3. By release in effluents within the limits in 180 NAC 4-013; or
4. As authorized pursuant to 180 NAC 4-040 through 4-043.

4-039.02 A person must be specifically licensed to receive waste containing licensed material from other persons for:

1. Treatment prior to disposal; or
2. Treatment or disposal by incineration; or
3. Decay in storage; or
4. Management at a facility licensed pursuant to 180 NAC 12; or
5. Storage until transferred to a storage or disposal facility authorized to receive the waste.

4-039.03 A licensee may hold radioactive material with a physical half-life of less than 120 days for decay-in-storage before disposal without regard to its radioactivity if the licensee:

1. Holds radioactive material for decay a minimum of ten half-lives;
2. Monitors radioactive material at the container surface before disposal and determines that its radioactivity cannot be distinguished from the background radiation level with an appropriate radiation detection survey instrument set on its most sensitive scale and with no interposed shielding;
3. Removes or obliterates all radiation labels; except for materials that will be handled as biomedical waste after released; and
4. Separates and monitors each generator column individually with all radiation shielding removed to ensure that its contents have decayed to background radiation level before disposal.

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4-039.04 For radioactive material disposed in accordance with 180 NAC 4-039.03, the licensee must retain a record of each disposal in accordance with 180 NAC 4-054.03.

4-040 METHOD FOR OBTAINING APPROVAL OF PROPOSED DISPOSAL PROCEDURES:
A licensee or applicant for a license may apply to the Department for approval of proposed procedures, not otherwise authorized in these regulations, to dispose of licensed material generated in the licensee's operations. Each application must include:

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1. A description of the waste containing licensed or registered material to be disposed of, including the physical and chemical properties that have an impact on risk evaluation, and the proposed manner and conditions of waste disposal; and

2. An analysis and evaluation of pertinent information on the nature of the environment; and

3. The nature and location of other potentially affected facilities; and

4. Analyses and procedures to ensure that doses are maintained ALARA and within the dose limits in 180 NAC 4.

4-041 DISPOSAL BY RELEASE INTO SANITARY SEWERAGE

4-041.01 A licensee may discharge licensed material into sanitary sewerage if each of the following conditions is satisfied:

1. The material is readily soluble, or is readily dispersible biological material, in water; and
2. The quantity of licensed radioactive material that the licensee releases into the sewer in 1 month divided by the average monthly volume of water released into the sewer by the licensee does not exceed the concentration listed in Table III of Appendix 180 NAC 4-B; and
3. If more than one radionuclide is released, the following conditions must also be satisfied:

    a. The licensee must determine the fraction of the limit in Table III of Appendix 180 NAC 4-B represented by discharges into sanitary sewerage by dividing the actual monthly average concentration of each radionuclide released by

the licensee or registrant into the sewer by the concentration of that radionuclide listed in Table III of Appendix 180 NAC 4-B; and

b. The sum of the fractions for each radionuclide required by 180 NAC 4-041.01, item 3.a. does not exceed unity; and

4. The total quantity of licensed radioactive material that the licensee releases into the sanitary sewerage system in a year does not exceed 185 GBq (5 Ci) of hydrogen-3, 37 GBq (1 Ci) of carbon-14, and 37 GBq (1 Ci) of all other radioactive materials combined.

4-041.02 Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limitations contained in 180 NAC 4-039.01.

4-042 TREATMENT OR DISPOSAL BY INCENERATION: A licensee may treat or dispose of licensed material by incineration only in the amounts and forms specified in 180 NAC 4-043 or as specifically approved by the Department pursuant to 180 NAC 4-040. Deleted: Agency

4-043 DISPOSAL OF SPECIFIC WASTES

4-043.01 A licensee may dispose of the following licensed material as if it were not radioactive:

1. 1.85 kBq (0.05 μCi), or less, of Hydrogen-3, Carbon-14 or Iodine-125 per gram of medium used for liquid scintillation counting; and Deleted: μ
2. 1.85 kBq (0.05 μCi), or less, of Hydrogen-3, or Carbon-14 or Iodine-125 per gram of animal tissue, averaged over the weight of the entire animal.

4-043.02 A licensee must not dispose of tissue pursuant to 180 NAC 4-041.01, item 2 in a manner that would permit its use either as food for humans or as animal feed.

4-043.03 The licensee must maintain records in accordance within 180 NAC 4-052.

4-043.04 Any licensee may, upon Department approval of procedures required in 180 NAC 4-041.06, dispose of radioactive material included in Appendix 180 NAC 4-G, provided that it does not exceed the concentration and total curie limits contained therein. Any radioactive material included in Appendix 180 NAC 4-G may be disposed of at a city or county landfill facility authorized to receive the radioactive material. Deleted: Agency

4-043.05 Each licensee who disposes of radioactive material described in 180 NAC 4-043.01 or 4-043.04 must:

1. Make surveys adequate to assure that the limits of 180 NAC 4-043.01 or 4-043.04 are not exceeded; and
2. Remove or otherwise obliterate all labels, tags, or other markings which would indicate that the material or its contents is radioactive.

4-043.06 Prior to the initiation of disposals authorized by 180 NAC 4-043.04, a licensee must submit procedures to the Department for: Deleted: Agency

1. The physical delivery of the material to the disposal site, the physical placing of the material in the disposal location and that the material is properly covered;
2. Surveys to be performed for compliance with 180 NAC 4-043.05, item 1;
3. Maintaining secure packaging during transportation to the site;
4. Maintaining records of disposals made under 180 NAC 4-043.04; and
5. Written authorization by the landfill operator agreeing to such disposal.

4-043.07 Nothing in 180 NAC 4, however, relieves the licensee of maintaining records showing the receipt, transfer, and disposal of such radioactive material as specified pursuant to 180 NAC 1-004.

4-043.08 Nothing in 180 NAC 4 relieves the licensee from complying with other applicable federal, state or local regulations governing any other toxic or hazardous property of these materials.

4-043.09 Radioactive material disposed of under 180 NAC 4 is not subject to the requirements of 180 NAC 13.

4-044 TRANSFER FOR DISPOSAL AND MANIFESTS

4-044.01 The requirements of 180 NAC 4 and Appendix 180 NAC 4-D are designed to:

1. *Control transfers of low-level radioactive waste by any waste generator,* waste collector, or waste processor license, as defined in 180 NAC 4, who ships low-level waste either directly, or indirectly through a waste collector or waste processor, to a licensed low-level waste disposal facility.
2. Establish a manifest tracking system; and
3. Supplement existing requirements concerning transfers and recordkeeping for those wastes.

4-044.02 All affected licensees must use Appendix 180 NAC 4-D and comply with 180 NAC 4-044.02, item 2.

1. Each shipment of radioactive waste intended for disposal at a licensed low-level radioactive waste disposal facility must be accompanied by a shipment manifest as specified in Section I of Appendix 180 NAC 4-D.
2. Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility must document the information required on the Department's Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee in accordance with Appendix 180 NAC 4-D.

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4-044.03 Each shipment manifest must include a certification by waste generator as specified in Section II of Appendix 180 NAC 4-D.

4-044.04 Each person involved in the transfer for disposal and disposal of waste, including the waste generator, waste collector, waste processor, and disposal facility operator, must comply with the requirements specified in Section III of Appendix 180 NAC 4-D.

4-045 COMPLIANCE WITH ENVIRONMENTAL AND HEALTH PROTECTION REGULATIONS: Nothing in 180 NAC 4-039 through 4-044 relieves the licensee or registrant from complying with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of pursuant to 180 NAC 4-039 through 4-044.

RECORDS

4-046 GENERAL PROVISONS

4-046.01 Each licensee or registrant must use the SI units becquerel, gray, sievert and coulomb per kilogram, or the special units curie, rad, rem, and roentgen, including multiples and subdivisions, and must clearly indicate the units of all quantities on records required by 180 NAC 4.

4-046.02 In the records required by 180 NAC 4-046.01, the licensee or registrant may record quantities in SI units in parentheses following each of the units specified in 180 NAC 4-046.01. However, all quantities must be recorded as stated in 180 NAC 4-046.01.

4-046.03 Not withstanding the requirements of 180 NAC 4-046.01, when recording information on shipment manifests, as required in 180 NAC 4-044.02, item 1, information must be recorded in the International System of Units (SI) or in SI and units as specified in 180 NAC 4-046.01.

4-046.04 The licensee or registrant must make a clear distinction among the quantities entered on the records required by 180 NAC 4, such as, total effective dose equivalent, total organ dose equivalent, shallow dose equivalent, lens dose equivalent, deep dose equivalent, or committed effective dose equivalent. Deleted: 3

4-047 RECORDS OF RADIATION PROTECTION PROGRAMS

4-047.01 Each licensee or registrant must maintain records of the radiation protection program, including:

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

4-047.02 The licensee or registrant must retain the records required by 180 NAC 4-047.01, item 1 until the Department terminates each pertinent license or registration requiring the record. The licensee or registrant must retain the records required by 180 NAC 4-047.01, item 2 for three years after the record is made. Deleted: Agency Deleted: 3

4-048 RECORDS OF SURVEYS

4-048.01 Each licensee or registrant must maintain records showing the results of surveys and calibrations required by 180 NAC 4-021 and 4-038.02. The licensee or registrant must retain these records for three years after the record is made. Deleted: 3

4-048.02 The licensee or registrant must retain each of the following records until the Department terminates each pertinent license or registration requiring the record: Deleted: Agency

1. Records of the results of surveys to determine the dose from external sources of radiation used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents. This includes those records of results of surveys to determine the dose from external sources and used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents required under the standards for protection against radiation in effect prior to May 30, 1994; and
2. Records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose. This includes those records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose required under the standards for protection against radiation in effect prior to May 30, 1994.
3. Records showing the results of air sampling, surveys, and bioassays required pursuant to 180 NAC 4-028.01, item 3.a. This includes those records showing the results of air sampling, surveys and bioassays required under the standards for protection against radiation in effect prior to May 30, 1994; and
4. Records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment. This includes those records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment required under the standards for protection against radiation in effect prior to May 30, 1994.

4-049 RECORDS OF TESTS FOR LEAKAGE OR CONTAMINATION OF SEALED SOURCES: Records of tests for leakage or contamination of sealed sources required by 180 NAC 1-011 must be kept in units of becquerel or microcuries and maintained for inspection by the Department for five years after the records are made.

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4-050 RECORDS OF PRIOR OCCUPATIONAL DOSE: For each individual who is likely to receive in a year, an occupational dose requiring monitoring pursuant to 180 NAC 4-022 the licensee or registrant must: Retain the records of prior occupational dose and exposure history as specified in 180 NAC 4-009 on Department Form NRH-1 or equivalent until the Department terminates each pertinent license or registration requiring this record. The licensee or registrant must retain records used in preparing Department Form NRH-1 for three years after the record is made.

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4-051 RECORDS OF PLANNED SPECIAL EXPOSURES

4-051.01 For each use of the provisions of 180 NAC 4-010 for planned special exposures, the licensee or registrant must maintain records that describe:

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

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

4-051.02 The licensee or registrant must retain the records until the Department terminates each pertinent license or registration requiring these records. Deleted: Agency

4-052 RECORDS OF INDIVIDUAL MONITORING RESULTS

4-052.01 Recordkeeping Requirement. Each licensee or registrant must maintain records of doses received by all individuals for whom monitoring was required pursuant to 180 NAC 4-022 and records of doses received during planned special exposures, accidents, and emergency conditions. Assessments of dose equivalent and records made using units in effect before October 30, 1996 for 180 NAC 4 need not be changed. These records must include, when applicable:

1. The deep dose equivalent to the whole body, lens dose equivalent, shallow dose equivalent to the skin, and shallow dose equivalent to the extremities; and Deleted: eye
2. The estimated intake of radionuclides, see 180 NAC 4-006; and
3. The committed effective dose equivalent assigned to the intake of radionuclides;
4. The specific information used to calculate the committed effective dose equivalent pursuant to 180 NAC 4-008.03; Deleted: and¶ Deleted: and
5. The total effective dose equivalent when required by 180 NAC 4-006; and
6. The total of the deep dose equivalent and the committed dose to the organ receiving the highest total dose.

4-052.02 Recordkeeping Frequency. The licensee or registrant must make entries of the records specified in 180 NAC 4-052.01 at intervals not to exceed one year. Deleted: 5 Deleted: 1

4-052.03 Recordkeeping Format. The licensee or registrant must maintain the records specified in 180 NAC 4-052.01 on Department Form NRH-2, in accordance with the instructions for Department Form NRH-2, or in clear and legible records containing all the information required by Department Form NRH-2. Deleted: Agency Deleted: Agency Deleted: Agency

4-052.04 The licensee or registrant must maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman. The declaration of pregnancy, including the estimated date of conception, must also be kept on file, but may be maintained separately from the dose records.

4-052.05 The licensee or registrant must retain each required form or record until the Department terminates each pertinent license or registration requiring the record. Deleted: Agency

4-053 RECORDS OF DOSE TO INDIVIDUAL MEMBERS OF THE PUBLIC

4-053.01 Each licensee or registrant must maintain records sufficient to demonstrate compliance with the dose limit for individual members of the public. See 180 NAC 4-013.

4-053.02 The licensee or registrant must retain the records required by 180 NAC 4-053 until the Department terminates each pertinent license or registration requiring the record. Deleted: Agency

4-054 RECORDS OF WASTE DISPOSAL

4-054.01 Each licensee must maintain records of the disposal of licensed materials made pursuant to 180 NAC 4-040 through 4-043 and 180 NAC 12, and disposal by burial in soil, including burials authorized before August 22, 1982.[4]

4-054.02 The licensee must retain the records required by 180 NAC 4-054.01 until the Department terminates each pertinent license requiring the record. Requirements for disposition of these records, prior to license termination, are located in 180 NAC 3-030 for activities licensed under 180 NAC 4. This includes records required under the standards for protection against radiation in effect prior to May 30, 1994.

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4-054.03 A licensee must maintain records of the disposal of licensed materials, as required by 180 NAC 4-039.03 for three years. The record must include the date of the disposal, the specific survey instrument used, the background radiation level, the radiation level measured at the surface of each waste container, and the name of the individual who performed the survey.

4-055 RECORDS OF TESTING ENTRY CONTROL DEVICES FOR VERY HIGH RADIATION AREAS

4-055.01 Each licensee or registrant must maintain records of tests made pursuant to 180 NAC 4-025.02, item 8 on entry control devices for very high radiation areas. These records must include the date, time, and results of each such test of function.

4-055.02 The licensee or registrant must retain the records required by 180 NAC 4-055.01 for three years after the record is made.

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4-056 FORM OF RECORDS: Each record required by 180 NAC 4 must be legible throughout the specified retention period. The record must be the original or a reproduced copy or a microform, provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials, and signatures. The licensee or registrant must maintain adequate safeguards against tampering with and loss of records.

REPORTS

4-057 REPORTS OF STOLEN, LOST, OR MISSING LICENSED OR REGISTERED SOURCES OF RADIATION

4-057.01 Telephone Reports. Each licensee or registrant must report to the Department by telephone as follows:

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[4]A previous 180 NAC 1-004.23, (January 1974) permitted burial of small quantities of licensed material in soil before August 22, 1982, without specific Department authorization.

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1. Immediately after its occurrence becomes known to the licensee or registrant, stolen, lost, or missing licensed radioactive material in an aggregate quantity equal to or greater than 1,000 times the quantity specified in Appendix 180 NAC 4-C under such circumstances that it appears to the licensee or registrant that an exposure could result to individuals in unrestricted areas; or
2. Within 30 days after its occurrence becomes known to the licensee or registrant, lost, stolen, or missing licensed radioactive material in an aggregate quantity greater than 10 times the quantity specified in Appendix 180 NAC 4-C that is still missing.
3. Immediately after its occurrence becomes known to the registrant, a stolen, lost, or missing radiation machine.

4-057.02 Written Reports. Each licensee or registrant required to make a report pursuant to 180 NAC 4-057.01 must, within 30 days after making the telephone report, make a written report to the Department setting forth the following information: Deleted: Agency

1. A description of the licensed or registered source of radiation involved, including, for radioactive material, the kind, quantity, and chemical and physical form; and, for radiation machines, the manufacturer, model and serial number, type and maximum energy of radiation emitted;
2. A description of the circumstances under which the loss or theft occurred; and
3. A statement of disposition, or probable disposition, of the licensed or registered source of radiation involved; and
4. Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas; and
5. Actions that have been taken, or will be taken, to recover the source of radiation; and
6. Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed or registered sources of radiation.

4-057.03 Subsequent to filing the written report, the licensee or registrant must also report additional substantive information on the loss or theft within 30 days after the licensee or registrant learns of such information.

4-057.04 The licensee or registrant must prepare any report filed with the Department pursuant to 180 NAC 4-057 so that names of individuals who may have received exposure to radiation are stated in a separate and detachable portion of the report. Deleted: Agency

4-058 NOTIFICATION OF INCIDENTS

4-058.01 Immediate Notification: Notwithstanding other requirements for notification, each licensee or registrant must immediately report each event involving a source of radiation possessed by the licensee or registrant that may have caused or threatens to cause any of the following conditions:

1. An individual to receive:

   a. A total effective dose equivalent of 0.25 Sv (25 rem) or more; or

b. A lens dose equivalent of 0.75 Sv (75 rem) or more; or
c. A shallow dose equivalent to the skin or extremities of 2.5 Gy (250 rad) or more; or

2. The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the occupational ALI. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

4-058.02 Twenty-Four Hour Notification: Each licensee or registrant must, within 24 hours of discovery of the event, report to the Department each event involving loss of control of a licensed or registered source of radiation possessed by the licensee or registrant that may have caused, or threatens to cause, any of the following conditions:

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

   a. A total effective dose equivalent exceeding 0.05 Sv (5 rem); or
   b. A lens dose equivalent exceeding 0.15 Sv (15 rem); or
   c. A shallow dose equivalent to the skin or extremities exceeding 0.5 Sv (50 rem); or

2. The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational ALI. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

4-058.03 The licensee or registrant must prepare each report filed with the Department pursuant to 180 NAC 4-058 so that names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.

4-058.04 Licensees or registrants must make the reports required by 180 NAC 4-058.01 and 4-058.02 by initial contact by telephone to the Department and must confirm the initial contact by telegram, mailgram, or electronic media to the Department.

4-058.05 The provisions of 180 NAC 4-058 do not apply to doses that result from planned special exposures, provided such doses are within the limits for planned special exposures and are reported pursuant to180 NAC 4-060.

4-059 REPORTS OF EXPOSURES, RADIATION LEVELS, AND CONCENTRATIONS OF RADIOACTIVE MATERIAL EXCEEDING THE CONSTRAINTS OR LIMITS

4-059.01 Reportable Events: In addition to the notification required by 180 NAC 4-058, each licensee or registrant must submit a written report within 30 days after learning of any of the following occurrences:

1. Any incident for which notification is required by 180 NAC 4-058; or
2. Doses in excess of any of the following:

a. The occupational dose limits for adults in 180 NAC 4-005; or
b. The occupational dose limits for a minor in 180 NAC 4-011; or
c. The limits for an embryo/fetus of a declared pregnant woman in 180 NAC 4-012; or
d. The limits for an individual member of the public in 180 NAC 4-013; or
e. Any applicable limit in the license or registrant; or
f. The ALARA constraints for air emissions established under 180 NAC 4-004.04; or

3. Levels of radiation or concentrations of radioactive material in:

a. A restricted area in excess of applicable limits in the license; or
b. An unrestricted area in excess of 10 times the applicable limit set forth in 180 NAC 4 or in the license, whether or not involving exposure of any individual in excess of the limits in 180 NAC 4-013; or

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

4-059.02 Contents of Reports

1. Each report required by 180 NAC 4-059 must describe the extent of exposure of individuals to radiation and radioactive material, including, as appropriate:

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

2. Each report filed pursuant to 180 NAC 4-059.01 must include for each individual exposed: the name, the individual's unique identification number, and date of birth. With respect to the limit for the embryo fetus in 180 NAC 4-012, the identifiers should be those of the declared pregnant woman. The report must be prepared so that this information is stated in a separate and detachable portion of the report.

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4-059.03 All licensees or registrants who make reports pursuant to 180 NAC 4-059.01 must submit the report in writing to the Department.

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4-060 REPORTS OF PLANNED SPECIAL EXPOSURES: The licensee or registrant must submit a written report to the Department within 30 days following any planned special exposure conducted in accordance with 180 NAC 4-010, informing the Department that a planned special exposure was

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conducted and indicating the date the planned special exposure occurred and the information required by 180 NAC 4-051.

4-061 [Reserved]

4-062 REPORTS OF INDIVIDUAL MONITORING

4-062.01 180 NAC 4 applies to each person licensed by the Department to:

1. Possess or use sources of radiation for purposes of industrial radiography pursuant to 180 NAC 3 or 180 NAC 5; or
2. Receive radioactive waste from other persons for disposal pursuant to 180 NAC 12; or
3. Possess or use at any time, for processing or manufacturing for distribution pursuant to 180 NAC 3 or 180 NAC 7, radioactive material in quantities exceeding any one of the following quantities:

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

[a]The Department may require as a license condition, or by rule, regulation, or order pursuant to 180 NAC 1-007, reports from licensees who are licensed to use radionuclides not on this list, in quantities sufficient to cause comparable radiation levels.

4-062.02 Each licensee in a category listed in 180 NAC 4-062.01 must submit an annual report of the results of individual monitoring carried out by the licensee for each individual for whom monitoring was required by 180 NAC 4-022 during that year. The licensee may include additional data for individuals for whom monitoring was provided but not required. The licensee must use Department Form NRH-2 or electronic media containing all the information required by Department Form NRH-2.

4-062.03 The licensee must file the report required by 180 NAC 4-060.02, covering the preceding year, on or before April 30 of each year. The licensee must submit the report to the Department.

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4-063 NOTIFICATIONS AND REPORTS TO INDIVIDUALS

4-063.01 Requirements for notification and reports to individuals of exposure to radiation or radioactive material are specified in 180 NAC 10-004.

4-063.02 When a licensee or registrant is required, pursuant to the provisions of 180 NAC 4-059, 4-060, and 4-062, to report to the Department any exposure of identified occupationally exposed individual, or an identified member of the public, to radiation or radioactive material, the licensee or registrant must also provide a copy of the report submitted to the Department to the individual. This report must be transmitted at a time no later than the transmittal to the Department.

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4-064 REPORTS OF LEAKING OR CONTAMINATED SEALED SOURCES: The licensee must file a report within 5 days with the Department if the test for leakage or contamination required pursuant to 180 NAC 1-011 indicates a sealed source is leaking or contaminated. The report must include the equipment involved, the test results and the corrective action taken.

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ADDITIONAL REQUIREMENTS

4-065 VACATING PREMISES: Each specific licensee must, no less than 30 days before vacating or relinquishing possession or control of premises which may have been contaminated with radioactive material as a result of his/her activities, notify the Department in writing of intent to vacate. When deemed necessary by the Department, the licensee must decontaminate the premises in such a manner as the Department may specify.

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4-066 REPORTS OF TRANSACTIONS INVOLVING NATIONALLY TRACKED SOURCES: Each licensee who manufactures, transfers, receives, disassembles, or disposes of a nationally tracked source must complete and submit a National Source Tracking Transaction Report as specified in 180 NAC 4-066.01 through 4-066.05 for each type of transaction.

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4-066.01 Each licensee who manufactures a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

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

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4-066.02 Each licensee that transfers a nationally tracked source to another person must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

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

2. The name of the individual preparing the report;
3. The name and license number of the recipient facility and the shipping address;
4. The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;
5. The radioactive material in the source;
6. The initial or current source strength in becquerels (curies);
7. The date for which the source strength is reported;
8. The shipping date;
9. The estimated arrival date; and
10. For nationally tracked sources transferred as waste under a Uniform Low-Level Radioactive Waste Manifest, the waste manifest number and the container identification of the container with the nationally tracked source.

4-066.03 Each licensee that receives a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

1. The name, address, and license number of the reporting licensee;
2. The name of the individual preparing the report;
3. The name, address, and license number of the person that provided the source;
4. The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;
5. The radioactive material in the source;
6. The initial or current source strength in becquerels (curies);
7. The date for which the source strength is reported;
8. The date of receipt, and
9. For material received under a Uniform Low-Level Radioactive Waste Manifest, the waste manifest number and the container identification with the nationally tracked source.

4-066.04 Each licensee that disassembles a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

1. The name, address, and license number of the reporting licensee;
2. The name of the individual preparing the report;
3. The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;
4. The radioactive material in the source;
5. The initial or current source strength in becquerels (curies);
6. The date for which the source strength is reported;
8. The disassemble date of the source.

4-066.05 Each licensee who disposes of a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

1. The name, address, and license number of the reporting licensee;
2. The name of the individual preparing the report;

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3. The waste manifest number;
4. The container identification with the nationally tracked source;
5. The date of disposal; and
6. The method of disposal.

4-066.06 The reports discussed in 180 NAC 4-066.01 through 4-066.05 must be submitted by the close of the next business day after the transaction. A single report may be submitted for multiple sources and transactions. The reports must be submitted to the National Source Tracking System by using:

1. The on-line National Source Tracking System;
2. Electronically using a computer readable format;
3. By facsimile;
4. By mail to the address on the National Source Tracking Transaction Report Form (NRC Form 748); or
5. By telephone with followup by facsimile or mail.

4-066.07 Each licensee must correct any error in previously filed reports or file a new report for any missed transaction within 5 business days of the discovery of the error or missed transaction. Such errors may be detected by a variety of methods such as administrative reviews or by physical inventories required by regulation. In addition, each licensee must reconcile the inventory of nationally tracked sources possessed by the licensee against that licensee's data in the National Source Tracking System. The reconciliation must be conducted during the month of January in each year. The reconciliation process must include resolving any discrepancies between the National Source Tracking System and the actual inventory by filing the reports identified in 180 NAC 4-066.01 through 4-066.05. By January 31 of each year, each licensee must submit to the National Source Tracking System confirmation that the data in the National Source Tracking System is correct.

4-066.08 Each licensee that possesses Category 1 nationally tracked sources must report its initial inventory of Category 1 nationally tracked sources to the National Source Tracking System by November 15, 2007. Each licensee that possesses Category 2 nationally tracked sources must report its initial inventory of Category 2 nationally tracked sources to the National Source Tracking System by November 30, 2007. The information may be submitted by using any of the methods identified in 180 NAC 4-066.06, items 1 through 4. The initial inventory report must include the following information:

1. The name, address, and license number of the reporting licensee;
2. The name of the individual preparing the report;
3. The manufacturer, model, and serial number of each nationally tracked source or, if not available, other information to uniquely identify the source;
4. The radioactive material in the sealed source;
5. The initial or current source strength in becquerels (curies); and
6. The date for which the source strength is reported.

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APPENDIX 4-A

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PROTECTION FACTORS FOR RESPIRATORS[a]

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	Operating mode	Assigned Protection Factors
I. Air Purifying Respirators [Particulate1A[b] only]1A[c]:		
Filtering facepiece disposable[d]	Negative Pressure	([d])
Facepiece, half [e]	Negative Pressure	10
Facepiece, full	Negative Pressure	100
Facepiece, half	Powered air-purifying respirators	50
Facepiece, full	Powered air-purifying respirators	1000
Helmet/hood	Powered air-purifying respirators	1000
Facepiece, loose-fitting	Powered air-purifying respirators	25
II. Atmosphere supplying respirators [particulate, gases and vapors1A[f]]:		
1. Air-line respirator:		
Facepiece, half	Demand	10
Facepiece, half	Continuous Flow	50
Facepiece, half	Pressure Demand	50
Facepiece, full	Demand	100
Facepiece, full	Continuous Flow	1000
Facepiece, full	Pressure Demand	1000
Helmet/hood	Continuous Flow	1000
Facepiece, loose-fitting	Continuous Flow	25
Suit	Continuous Flow	([g])
2. Self-contained breathing Apparatus (SCBA):		
Facepiece, full	Demand	[h]100
Facepiece, full	Pressure Demand	[i]10,000
Facepiece, full	Demand, Recirculating	[h]100
Facepiece, full	Positive Pressure Recirculating	[i]10,000
III. Combination Respirators:		
Any combination of air-purifying and atmosphere-supplying respirators	Assigned protection factor for type and mode of operation as listed above.	

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[a] These assigned protection factors apply only in a respiratory protection program that meets the requirements of this Chapter. They are applicable only to airborne radiological hazards and may not be appropriate to circumstances when chemical or other respiratory hazards exist instead of, or in addition to, radioactive hazards. Selection and use of respirators for such circumstances must also comply with U.S. Department of Labor regulations.
Radioactive contaminants for which the concentration values in Table 1, Column 3 of Appendix 4-B are based on internal dose due to inhalation may, in addition, present external exposure hazards at higher concentrations. Under these circumstances, limitations on occupancy may have to be governed by external dose limits.
[b] Air purifying respirators with APF <100 must be equipped with particulate filters that are at least 95% efficient. Air purifying respirators with APF = 100 must be equipped with particulate filters that are at least 99% efficient. Air purifying respirators with APFs >100 must be equipped with particulate filters that are at least 99.97% efficient.
[c] The licensee may apply to the Department for the use of an APF greater than 1 for sorbent cartridges as protection against airborne

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radioactive gases and vapors (e.g., radioiodine).

[d] Licensees may permit individuals to use this type of respirator who have not been medically screened or fit tested on the device provided that no credit be taken for their use in estimating intake or dose. It is also recognized that it is difficult to perform an effective positive or negative pressure pre-use user seal check on this type of device. All other respiratory protection program requirements listed in 180 NAC 4-028 apply. An assigned protection factor has not been assigned for these devices. However, an APF equal to 10 may be used if the licensee can demonstrate a fit factor of at least 100 by use of a validated or evaluated, qualitative or quantitative fit test.

[e] Under-chin type only. No distinction is made in this Appendix between elastomeric half-masks with replaceable cartridges and those designed with the filter medium as an integral part of the facepiece, for example disposable or reusable disposable. Both types are acceptable so long as the seal area of the latter contains some substantial type of seal-enhancing material such as rubber or plastic, the two or more suspension straps are adjustable, the filter medium is at least 95% efficient and all other requirements of 180 NAC 4 are met.

[f] The assigned protection factors for gases and vapors are not applicable to radioactive contaminants that present an absorption or submersion hazard. For tritium oxide vapor, approximately one-third of the intake occurs by absorption through the skin so that an overall protection factor of 3 is appropriate when atmosphere-supplying respirators are used to protect against tritium oxide. Exposure to radioactive noble gases is not considered a significant respiratory hazard, and protective actions for these contaminants should be based on external (submersion) dose considerations.

[g] No NIOSH approval schedule is currently available for atmosphere supplying suits. This equipment may be used in an acceptable respiratory protection program as long as all the other minimum program requirements, with the exception of fit testing, are met for example, 180 NAC 4-028.

[h] The licensee should implement institutional controls to assure that these devices are not used in areas immediately dangerous to life or health (IDLH).

[i] This type of respirator may be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure such as skin absorption must be taken into account in these circumstances. This device may not be used by any individual who experiences perceptible outward leakage of breathing gas while wearing the device.

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APPENDIX 4-B

ANNUAL LIMITS ON INTAKE (ALI) AND DERIVED AIR CONCENTRATIONS (DAC) OF RADIONUCLIDES FOR OCCUPATIONAL EXPOSURE; EFFLUENT CONCENTRATIONS; CONCENTRATIONS FOR RELEASE TO SANITARY SEWERAGE

Introduction

For each radionuclide, Table I indicates the chemical form which is to be used for selecting the appropriate ALI or DAC value. The ALIs and DACs for inhalation are given for an aerosol with an activity median aerodynamic diameter (AMAD) of 1 μm, micron, and for three classes (D,W,Y) of radioactive material, which refer to their retention (approximately days, weeks or years) in the pulmonary region of the lung. This classification applies to a range of clearance half-times for D if less than 10 days, for W from 10 to 100 days, and for Y greater than 100 days. The class (D,W, or Y) given in the column headed "Class" applies only to the inhalation ALIs and DACs given in Table I, columns 2 and 3. Table II provides concentration limits for airborne and liquid effluents released to the general environment. Table III provides concentration limits for discharges to sanitary sewerage.

Note: The values in Tables I, II, and III are presented in the computer "E" notation. In this notation a value of 6E-02 represents a value of 6×10^{-2} or 0.06, 6E+2 represents 6×10^{2} or 600, and 6E+0 represents 6×10^{0} or 6.

Table I "Occupational Values"

Note that the columns in Table I of this appendix captioned "Oral Ingestion ALI," "Inhalation ALI," and "DAC," are applicable to occupational exposure to radioactive material.

The ALIs in this appendix are the annual intakes of given radionuclide by "Reference Man" which would result in either (1) a committed effective dose equivalent of 0.05 Sv (5 rem), stochastic ALI, or (2) a committed dose equivalent of 0.5 Sv (50 rem) to an organ or tissue, non-stochastic ALI. The stochastic ALIs were derived to result in a risk, due to irradiation of organs and tissues, comparable to the risk associated with deep dose equivalent to the whole body of 0.05 Sv (5 rem). The derivation includes multiplying the committed dose equivalent to an organ or tissue by a weighting factor, w_T. This weighting factor is the proportion of the risk of stochastic effects resulting from irradiation of the organ or tissue, T, to the total risk of stochastic effects when the whole body is irradiated uniformly. The values of w_T are listed under the definition of weighting factor in 180 NAC 4-02. The non-stochastic ALIs were derived to avoid non-stochastic effects, such as prompt damage to tissue or reduction in organ function.

A value of $w_T = 0.06$ is applicable to each of the five organs or tissues in the "remainder" category receiving the highest dose equivalents, and the dose equivalents of all other remaining tissues may be disregarded. The following portions of the GI tract -- stomach, small intestine, upper large intestine, and lower large intestine -- are to be treated as four separate organs.

Note that the dose equivalents for an extremity, skin, and lens of the eye are not considered in computing the committed effective dose equivalent, but are subject to limits that must be met separately.

When an ALI is defined by the stochastic dose limit, this value alone is given. When an ALI is determined by the non-stochastic dose limit to an organ, the organ or tissue to which the limit applies is shown, and the ALI for the stochastic limit is shown in parentheses. Abbreviated organ or tissue designations are used:

LLI wall = lower large intestine wall;
St. wall = stomach wall;
Blad wall = bladder wall; and
Bone surf = bone surface.

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The use of the ALIs listed first, the more limiting of the stochastic and non-stochastic ALIs, will ensure that non-stochastic effects are avoided and that the risk of stochastic effects is limited to an acceptably low value. If, in a particular situation involving a radionuclide for which the nonstochastic ALI is limiting, use of that non-stochastic ALI is considered unduly conservative, the licensee may use the stochastic ALI to determine the committed effective dose equivalent. However, the licensee shall also ensure that the 0.5 Sv (50 rem) dose equivalent limit for any organ or tissue is not exceeded by the sum of the external deep dose equivalent plus the internal committed dose equivalent to that organ, not the effective dose. For the case where there is no external dose contribution, this would be demonstrated if the sum of the fractions of the nonstochastic ALIs (ALI_{ns}) that contribute to the committed dose equivalent to the organ receiving the highest dose does not exceed unity, that is, $\sum$ (intake (in μCi) of each radionuclide/ALI_{ns}) ≤ 1.0. If there is an external deep dose equivalent contribution of H_d, then this sum must be less than $1 - (H_d/50)$, instead of ≤ 1.0.

The derived air concentration (DAC) values are derived limits intended to control chronic occupational exposures. The relationship between the DAC and the ALI is given by:

DAC = ALI(in μCi)/(2000 hours per working year x 60 minutes/hour x 2×10^4 ml per minute) = [ALI/2.4×10^9] μCi/ml,

where 2×10^4 ml is the volume of air breathed per minute at work by Reference Man under working conditions of light work.

The DAC values relate to one of two modes of exposure: either external submersion or the internal committed dose equivalents resulting from inhalation of radioactive materials. DACs based upon submersion are for immersion in a semi-infinite cloud of uniform concentration and apply to each radionuclide separately.

The ALI and DAC values include contributions to exposure by the single radionuclide named and any in-growth of daughter radionuclides produced in the body by decay of the parent. However, intakes that include both the parent and daughter radionuclides should be treated by the general method appropriate for mixtures.

The values of ALI and DAC do not apply directly when the individual both ingests and inhales a radionuclide, when the individual is exposed to a mixture of radionuclides by either inhalation or ingestion or both, or when the individual is exposed to both internal and external irradiation. See 180 NAC 4-06. When an individual is exposed to radioactive materials which fall under several of the translocation classifications of the same radionuclide, such as, Class D, Class W, or Class Y, the exposure may be evaluated as if it were a mixture of different radionuclides.

It should be noted that the classification of a compound as Class D, W, or Y is based on the chemical form of the compound and does not take into account the radiological half-life of different radionuclides. For this reason, values are given for Class D, W, and Y compounds, even for very short-lived radionuclides.

Table II "Effluent Concentrations"

The columns in Table II of this appendix captioned "Effluents," "Air" and "Water" are applicable to the assessment and control of dose to the public, particularly in the implementation of the provisions of 180 NAC 4-014. The concentration values given in Columns 1 and 2 of Table II are equivalent to the radionuclide concentrations which, if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 0.5 mSv (0.05 rem).

Consideration of non-stochastic limits has not been included in deriving the air and water effluent concentration limits because non-stochastic effects are presumed not to occur at or below the dose levels

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established for individual members of the public. For radionuclides, where the non-stochastic limit was governing in deriving the occupational DAC, the stochastic ALI was used in deriving the corresponding airborne effluent limit in Table II. For this reason, the DAC and airborne effluent limits are not always proportional as was the case in Appendix 1 180 NAC 4.

Deleted: (Nebraska Regulations for Control of Radiation-Ionizing) which went into effect on Novemer 25, 1990.

The air concentration values listed in Table II, Column 1 were derived by one of two methods. For those radionuclides for which the stochastic limit is governing, the occupational stochastic inhalation ALI was divided by 2.4×10^9 ml, relating the inhalation ALI to the DAC, as explained above, and then divided by a factor of 300. The factor of 300 includes the following components: a factor of 50 to relate the 0.05 Sv (5 rem) annual occupational dose limit to the 1 mSv (0.1 rem) limit for members of the public, a factor of 3 to adjust for the difference in exposure time and the inhalation rate for a worker and that for members of the public; and a factor of 2 to adjust the occupational values, derived for adults, so that they are applicable to other age groups.

For those radionuclides for which submersion (external dose) is limiting, the occupational DAC in Table I, Column 3 was divided by 219. The factor of 219 is composed of a factor of 50, as described above, and a factor of 4.38 relating occupational exposure for 2,000 hours per year to full-time exposure (8,760 hours per year). Note that an additional factor of 2 for age considerations is not warranted in the submersion case.

The water concentrations were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by 7.3×10^7. The factor of 7.3×10^7 (ml) includes the following components: the factors of 50 and 2 described above and a factor of 7.3×10^5 (ml) which is the annual water intake of Reference Man.

- Note 2 at the end of this appendix provides groupings of radionuclides which are applicable to unknown mixtures of radionuclides. These groupings, including occupational inhalation ALIs and DACs, air and water effluent concentrations and releases to sewer, require demonstrating that the most limiting radionuclides in successive classes are absent. The limit for the unknown mixture is defined when the presence of one of the listed radionuclides cannot be definitely excluded as being present either from knowledge of the radionuclide composition of the source or from actual measurements.

Table III "Releases to Sewers"

The monthly average concentrations for release to sanitary sewerage are applicable to the provisions in 004.40. The concentration values were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by 7.3×10^6 (ml). The factor of 7.3×10^6 (ml) is composed of a factor of 7.3×10^5 (ml), the annual water intake by Reference Man, and a factor of 10, such that the concentrations, if the sewage released by the licensee were the only source of water ingested by a Reference Man during a year, would result in a committed effective dose equivalent of 0.5 mSv (0.5 rem).

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LIST OF ELEMENTS

Name	Atomic Symbol	Atomic Number	Name	Atomic Symbol	Atomic Number
Actinium	Ac	89	Mercury	Hg	80
Aluminum	Al	13	Molybdenum	Mo	42
Americium	Am	95	Neodymium	Nd	60
Antimony	Sb	51	Neptunium	Np	93
Argon	Ar	18	Nickel	Ni	28
Arsenic	As	33	Niobium	Nb	41
Astatine	At	85	Osmium	Os	76
Barium	Ba	56	Palladium	Pd	46
Berkelium	Bk	97	Phosphorus	P	15
Beryllium	Be	4	Platinum	Pt	78
Bismuth	Bi	83	Plutonium	Pu	94
Bromine	Br	35	Polonium	Po	84
Cadmium	Cd	48	Potassium	K	19
Calcium	Ca	20	Praseodymium	Pr	59
Californium	Cf	98	Promethium	Pm	61
Carbon	C	6	Protactinium	Pa	91
Cerium	Ce	58	Radium	Ra	88
Cesium	Cs	55	Radon	Rn	86
Chlorine	Cl	17	Rhenium	Re	75
Chromium	Cr	24	Rhodium	Rh	45
Cobalt	Co	27	Rubidium	Rb	37
Copper	Cu	29	Ruthenium	Ru	44
Curium	Cm	96	Samarium	Sm	62
Dysprosium	Dy	66	Scandium	Sc	21
Einsteinium	Es	99	Selenium	Se	34
Erbium	Er	68	Silicon	Si	14
Europium	Eu	63	Silver	Ag	47
Fermium	Fm	100	Sodium	Na	11
Fluorine	F	9	Strontium	Sr	38
Francium	Fr	87	Sulfur	S	16
Gadolinium	Gd	64	Tantalum	Ta	73
Gallium	Ga	31	Technetium	Tc	43
Germanium	Ge	32	Tellurium	Te	52
Gold	Au	79	Terbium	Tb	65
Hafnium	Hf	72	Thallium	Tl	81
Holmium	Ho	67	Thorium	Th	90
Hydrogen	H	1	Thulium	Tm	69
Indium	In	49	Tin	Sn	50
Iodine	I	53	Titanium	Ti	22
Iridium	Ir	77	Tungsten	W	74
Iron	Fe	26	Uranium	U	92
Krypton	Kr	36	Vanadium	V	23
Lanthanum	La	57	Xenon	Xe	54
Lead	Pb	82	Ytterbium	Yb	70
Lutetium	Lu	71	Yttrium	Y	39
Magnesium	Mg	12	Zinc	Zn	30
Manganese	Mn	25	Zirconium	Zr	40
Mendelevium	Md	101			

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Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
1	Hydrogen-3	Water, DAC includes skin absorption	8E+4	8E+4	2E-5	1E-7	1E-3	1E-2
		Gas (HT or T_2) Submersion[1]: Use above values as HT and T_2 oxidize in air and in the body to HTO.						
4	Beryllium-7	W, all compounds except those given for Y	4E+4	2E+4	9E-6	3E-8	6E-4	6E-3
		Y, oxides, halides, and nitrates	-	2E+4	8E-6	3E-8	-	-
4	Beryllium-10	W, see ^{7}Be	1E+3 LLI wall (1E+3)	2E+2	6E-8	2E-10	-	-
			-	-	-	-	2E-5	2E-4
		Y, see ^{7}Be	-	1E+1	6E-9	2E-11	-	-
6	Carbon-11[2]	Monoxide	-	1E+6	5E-4	2E-6	-	-
		Dioxide	-	6E+5	3E-4	9E-7	-	-
		Compounds	4E+5	4E+5	2E-4	6E-7	6E-3	6E-2
6	Carbon-14	Monoxide	-	2E+6	7E-4	2E-6	-	-
		Dioxide	-	2E+5	9E-5	3E-7	-	-
		Compounds	2E+3	2E+3	1E-6	3E-9	3E-5	3E-4
9	*Fluorine-18*[2]	D, fluorides of H, Li, Na, K, Rb, Cs, and Fr	5E+4 St wall (5E+4)	7E+4	3E-5	1E-7	-	-
				-	-	-	7E-4	7E-3
		W, fluorides of Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, As, Sb, Bi, Fe, Ru, Os, Co, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, V, Nb, Ta, Mn, Tc, and Re	-	9E+4	4E-5	1E-7	-	-
		Y, lanthanum fluoride	-	8E+4	3E-5	1E-7	-	-
11	*Sodium-22*	D, all compounds	4E+2	6E+2	3E-7	9E-10	6E-6	6E-5
11	Sodium-24	D, all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
12	Magnesium-28	D, all compounds except those given for W	7E+2	2E+3	7E-7	2E-9	9E-6	9E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	1E+3	5E-7	2E-9	-	-
13	Aluminum-26	D, all compounds except those given for W	4E+2	6E+1	3E-8	9E-11	6E-6	6E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	9E+1	4E-8	1E-10	-	-
14	Silicon-31	D, all compounds except those given for W and Y	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, oxides, hydroxides, carbides, and nitrates	-	3E+4	1E-5	5E-8	-	-
		Y, aluminosilicate glass	-	3E+4	1E-5	4E-8	-	-
14	Silicon-32	D, see ^{31}Si	2E+3 LLI wall	2E+2	1E-7	3E-10	-	-

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Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			(3E+3)	-	-	-	4E-5	4E-4
		W, see ^{31}Si	-	1E+2	5E-8	2E-10	-	-
		Y, see ^{31}Si	-	5E+0	2E-9	7E-12	-	-
15	Phosphorus-32	D, all compounds except phosphates given for W	6E+2	9E+2	4E-7	1E-9	9E-6	9E-5
		W, phosphates of Zn^{2+}, S^{3+}, Mg^{2+}, Fe^{3+}, Bi^{3+}, and lanthanides	-	4E+2	2E-7	5E-10	-	-
15	Phosphorus-33	D, see ^{32}P	6E+3	8E+3	4E-6	1E-8	8E-5	8E-4
		W, see ^{32}P	-	3E+3	1E-6	4E-9	-	-
16	Sulfur-35	Vapor	-	1E+4	6E-6	2E-8	-	-
		D, sulfides and sulfates except those given for W	1E+4	2E+4	7E-6	2E-8	-	-
			LLI wall (8E+3)	-	-	-	1E-4	1E-3
		W, elemental sulfur, sulfides of Sr, Ba, Ge, Sn, Pb, As, Sb, Bi, Cu, Ag, Au, Zn, Cd, Hg, W, and Mo. Sulfates of Ca, Sr, Ba, Ra, As, Sb, and Bi	6E+3 -	2E+3	9E-7	3E-9	-	-
17	Chlorine-36	D, chlorides of H, Li, Na, K, Rb, Cs, and Fr	2E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W, chlorides of lanthanides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Tc, and Re	-	2E+2	1E-7	3E-10	-	-
17	Chlorine-38[2]	D, see ^{36}Cl	2E+4	4E+4	2E-5	6E-8	-	-
			St wall (3E+4)	-	-	-	3E-4	3E-3
		W, see ^{36}Cl	-	5E+4	2E-5	6E-8	-	-
17	Chlorine-39[2]	D, see ^{36}Cl	2E+4	5E+4	2E-5	7E-8	-	-
			St wall (4E+4)	-	-	-	5E-4	5E-3
		W, see ^{36}Cl	-	6E+4	2E-5	8E-8	-	-
18	Argon-37	Submersion[1]	-	-	1E+0	6E-3	-	-
18	Argon-39	Submersion[1]	-	-	2E-4	8E-7	-	-
18	Argon-41	Submersion[1]	-	-	3E-6	1E-8	-	-
19	Potassium-40	D, all compounds	3E+2	4E+2	2E-7	6E-10	4E-6	4E-5
19	Potassium-42	D, all compounds	5E+3	5E+3	2E-6	7E-9	6E-5	6E-4
19	Potassium-43	D, all compounds	6E+3	9E+3	4E-6	1E-8	9E-5	9E-4
19	Potassium-44[2]	D, all compounds	2E+4 St wall	7E+4	3E-5	9E-8	-	-

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Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			(4E+4)	-	-	-	5E-4	5E-3
19	Potassium-45[2]	D, all compounds	3E+4 St wall (5E+4)	1E+5 -	5E-5 -	2E-7 -	- 7E-4	- 7E-3
20	Calcium-41	W, all compounds	3E+3 Bone surf (4E+3)	4E+3 Bone surf (4E+3)	2E-6 -	- 5E-9	- 6E-5	- 6E-4
20	Calcium-45	W, all compounds	2E+3	8E+2	4E-7	1E-9	2E-5	2E-4
20	Calcium-47	W, all compounds	8E+2	9E+2	4E-7	1E-9	1E-5	1E-4
21	Scandium-43	Y, all compounds	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
21	Scandium-44m	Y, all compounds	5E+2	7E+2	3E-7	1E-9	7E-6	7E-5
21	Scandium-44	Y, all compounds	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
21	Scandium-46	Y, all compounds	9E+2	2E+2	1E-7	3E-10	1E-5	1E-4
21	Scandium-47	Y, all compounds	2E+3 LLI wall (3E+3)	3E+3 -	1E-6 -	4E-9 -	- 4E-5	- 4E-4
21	Scandium-48	Y, all compounds	8E+2	1E+3	6E-7	2E-9	1E-5	1E-4
21	Scandium-49[2]	Y, all compounds	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
22	Titanium-44	D, all compounds except those given for W and Y	3E+2	1E+1	5E-9	2E-11	4E-6	4E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	3E+1	1E-8	4E-11	-	-
		Y, SrTi0	-	6E+0	2E-9	8E-12	-	-
22	Titanium-45	D, see ^{44}Ti	9E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		W, see ^{44}Ti	-	4E+4	1E-5	5E-8	-	-
		Y, see ^{44}Ti	-	3E+4	1E-5	4E-8	-	-
23	Vanadium-47[2]	D, all compounds except those given for W	3E+4 St wall (3E+4)	8E+4 -	3E-5 -	1E-7 -	- 4E-4	- 4E-3
		W, oxides, hydroxides, carbides, and halides	-	1E+5	4E-5	1E-7	-	-
23	Vanadium-48	D, see ^{47}V	6E+2	1E+3	5E-7	2E-9	9E-6	9E-5
		W, see ^{47}V	-	6E+2	3E-7	9E-10	-	-
23	Vanadium-49	D, see ^{47}V	7E+4 LLI wall (9E+4)	3E+4 Bone surf (3E+4)	1E-5 -	- 5E-8	- 1E-3	- 1E-2
		W, see ^{47}V	-	2E+4	8E-6	2E-8	-	-
24	Chromium-48	D, all compounds except those given for W and Y	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, halides and nitrates	-	7E+3	3E-6	1E-8	-	-
		Y, oxides and hydroxides	-	7E+3	3E-6	1E-8	-	-

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Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
24	Chromium-49[2]	D, see ^{48}Cr	3E+4	8E+4	4E-5	1E-7	4E-4	4E-3
		W, see ^{48}Cr	-	1E+5	4E-5	1E-7	-	-
		Y, see ^{48}Cr	-	9E+4	4E-5	1E-7	-	-
24	Chromium-51	D, see ^{48}Cr	4E+4	5E+4	2E-5	6E-8	5E-4	5E-3
		W, see ^{48}Cr	-	2E+4	1E-5	3E-8	-	-
		Y, see ^{48}Cr	-	2E+4	8E-6	3E-8	-	-
25	Manganese-51[2]	D, all compounds except those given for W	2E+4	5E+4	2E-5	7E-8	3E-4	3E-3
		W, oxides, hydroxides, halides, and nitrates	-	6E+4	3E-5	8E-8	-	-
25	Manganese-52m[2]	D, see ^{51}Mn	3E+4 St wall (4E+4)	9E+4	4E-5	1E-7	-	-
			-	-	-	-	5E-4	5E-3
		W, see ^{51}Mn	-	1E+5	4E-5	1E-7	-	-
25	Manganese-52	D, see ^{51}Mn	7E+2	1E+3	5E-7	2E-9	1E-5	1E-4
		W, see ^{51}Mn	-	9E+2	4E-7	1E-9	-	-
25	Manganese-53	D, see ^{51}Mn	5E+4	1E+4	5E-6	-	7E-4	7E-3
			-	Bone surf (2E+4)	-	3E-8	-	-
		W, see ^{51}Mn	-	1E+4	5E-6	2E-8	-	-
25	Manganese-54	D, see ^{51}Mn	2E+3	9E+2	4E-7	1E-9	3E-5	3E-4
		W, see ^{51}Mn	-	8E+2	3E-7	1E-9	-	-
25	Manganese-56	D, see ^{51}Mn	5E+3	2E+4	6E-6	2E-8	7E-5	7E-4
		W, see ^{51}Mn	-	2E+4	9E-6	3E-8	-	-
26	Iron-52	D, all compounds except those given for W	9E+2	3E+3	1E-6	4E-9	1E-5	1E-4
		W, oxides, hydroxides, and halides	-	2E+3	1E-6	3E-9	-	-
26	Iron-55	D, see ^{52}Fe	9E+3	2E+3	8E-7	3E-9	1E-4	1E-3
		W, see ^{52}Fe	-	4E+3	2E-6	6E-9	-	-
26	Iron-59	D, see ^{52}Fe	8E+2	3E+2	1E-7	5E-10	1E-5	1E-4
		W, see ^{52}Fe	-	5E+2	2E-7	7E-10	-	-
26	Iron-60	D, see ^{52}Fe	3E+1	6E+0	3E-9	9E-12	4E-7	4E-6
		W, see ^{52}Fe	-	2E+1	8E-9	3E-11	-	-
27	Cobalt-55	W, all compounds except those given for Y	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, oxides, hydroxides, halides, and nitrates	-	3E+3	1E-6	4E-9	-	-
27	Cobalt-56	W, see ^{55}Co	5E+2	3E+2	1E-7	4E-10	6E-6	6E-5
		Y, see ^{55}Co	4E+2	2E+2	8E-8	3E-10	-	-
27	Cobalt-57	W, see ^{55}Co	8E+3	3E+3	1E-6	4E-9	6E-5	6E-4
		Y, see ^{55}Co	4E+3	7E+2	3E-7	9E-10	-	-
27	Cobalt-58m	W, see ^{55}Co	6E+4	9E+4	4E-5	1E-7	8E-4	8E-3
		Y, see ^{55}Co	-	6E+4	3E-5	9E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
27	Cobalt-58	W, see ^{56}Co	2E+3	1E+3	5E-7	2E-9	2E-5	2E-4
		Y, see ^{55}Co	1E+3	7E+2	3E-7	1E-9	-	-
27	Cobalt-60m[2]	W, see ^{56}Co	1E+6 St wall (1E+6)	4E+6	2E-3	6E-6	-	-
				-	-	-	2E-2	2E-1
		Y, see ^{55}Co	-	3E+6	1E-3	4E-6	-	-
27	Cobalt-60	W, see ^{56}Co	5E+2	2E+2	7E-8	2E-10	3E-6	3E-5
		Y, see ^{55}Co	2E+2	3E+1	1E-8	5E-11	-	-
27	Cobalt-61[2]	W, see ^{55}Co	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		Y, see ^{55}Co	2E+4	6E+4	2E-5	8E-8	-	-
27	Cobalt-62m[2]	W, see ^{56}Co	4E+4 St wall (5E+4)	2E+5	7E-5	2E-7	-	-
				-	-	-	7E-4	7E-3
		Y, see ^{55}Co	-	2E+5	6E-5	2E-7	-	-
28	Nickel-56	D, all compounds except those given for W	1E+3	2E+3	8E-7	3E-9	2E-5	2E-4
		W, oxides, hydroxides, and carbides	-	1E+3	5E-7	2E-9	-	-
		Vapor	-	1E+3	5E-7	2E-9	-	-
28	Nickel-57	D, see ^{56}Ni	2E+3	5E+3	2E-6	7E-9	2E-5	2E-4
		W, see ^{56}Ni	-	3E+3	1E-6	4E-9	-	-
		Vapor	-	6E+3	3E-6	9E-9	-	-
28	Nickel-59	D, see ^{56}Ni	2E+4	4E+3	2E-6	5E-9	3E-4	3E-3
		W, see ^{56}Ni	-	7E+3	3E-6	1E-8	-	-
		Vapor	-	2E+3	8E-7	3E-9	-	-
28	Nickel-63	D, see ^{56}Ni	9E+3	2E+3	7E-7	2E-9	1E-4	1E-3
		W, see ^{56}Ni	-	3E+3	1E-6	4E-9	-	-
		Vapor	-	8E+2	3E-7	1E-9	-	-
28	Nickel-65	D, see ^{56}Ni	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see ^{56}Ni	-	3E+4	1E-5	4E-8	-	-
		Vapor	-	2E+4	7E-6	2E-8	-	-
28	Nickel-66	D, see ^{56}Ni	4E+2 LLI wall (5E+2)	2E+3	7E-7	2E-9	-	-
				-	-	-	6E-6	6E-5
		W, see ^{56}Ni	-	6E+2	3E-7	9E-10	-	-
		Vapor	-	3E+3	1E-6	4E-9	-	-
29	Copper-60[2]	D, all compounds except those given for W and Y	3E+4 St wall (3E+4)	9E+4	4E-5	1E-7	-	-
				-	-	-	4E-4	4E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	4E-5	1E-7	-	-
29	Copper-61	D, see ^{60}Cu	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see ^{60}Cu	-	4E+4	2E-5	6E-8	-	-
		Y, see ^{60}Cu	-	4E+4	1E-5	5E-8	-	-
29	Copper-64	D, see ^{60}Cu	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see ^{60}Cu	-	2E+4	1E-5	3E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		Y, see ^{60}Cu	-	2E+4	9E-6	3E-8	-	-
29	Copper-67	D, see ^{60}Cu	5E+3	8E+3	3E-6	1E-8	6E-5	6E-4
		W, see ^{60}Cu	-	5E+3	2E-6	7E-9	-	-
		Y, see ^{60}Cu	-	5E+3	2E-6	6E-9	-	-
30	Zinc-62	Y, all compounds	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
30	Zinc-63[2]	Y, all compounds	2E+4	7E+4	3E-5	9E-8	-	-
			St wall (3E+4)	-	-	-	3E-4	3E-3
30	Zinc-65	Y, all compounds	4E+2	3E+2	1E-7	4E-10	5E-6	5E-5
30	Zinc-69m	Y, all compounds	4E+3	7E+3	3E-6	1E-8	6E-5	6E-4
30	Zinc-69[2]	Y, all compounds	6E+4	1E+5	6E-5	2E-7	8E-4	8E-3
30	Zinc-71m	Y, all compounds	6E+3	2E+4	7E-6	2E-8	8E-5	8E-4
30	Zinc-72	Y, all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
31	Gallium-65[2]	D, all compounds except those given for W	5E+4	2E+5	7E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	9E-4	9E-3
		W, oxides, hydroxides, carbides, halides, and nitrates	-	2E+5	8E-5	3E-7	-	-
31	Gallium-66	D, see ^{65}Ga	1E+3	4E+3	1E-6	5E-9	1E-5	1E-4
		W, see ^{65}Ga	-	3E+3	1E-6	4E-9	-	-
31	Gallium-67	D, see ^{65}Ga	7E+3	1E+4	6E-6	2E-8	1E-4	1E-3
		W, see ^{65}Ga	-	1E+4	4E-6	1E-8	-	-
31	Gallium-68[2]	D, see ^{65}Ga	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{65}Ga	-	5E+4	2E-5	7E-8	-	-
31	Gallium-70[2]	D, see ^{65}Ga	5E+4	2E+5	7E-5	2E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
		W, see ^{65}Ga	-	2E+5	8E-5	3E-7	-	-
31	Gallium-72	D, see ^{65}Ga	1E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see ^{65}Ga	-	3E+3	1E-6	4E-9	-	-
31	Gallium-73	D, see ^{65}Ga	5E+3	2E+4	6E-6	2E-8	7E-5	7E-4
		W, see ^{65}Ga	-	2E+4	6E-6	2E-8	-	-
32	Germanium-66	D, all compounds except those given for W	2E+4	3E+4	1E-5	4E-8	3E-4	3E-3
		W, oxides, sulfides, and halides	-	2E+4	8E-6	3E-8	-	-
32	Germanium-67[2]	D, see ^{66}Ge	3E+4	9E+4	4E-5	1E-7	-	-
			St wall (4E+4)	-	-	-	6E-4	6E-3
		W, see ^{66}Ge	-	1E+5	4E-5	1E-7	-	-
32	Germanium-68	D, see ^{66}Ge	5E+3	4E+3	2E-6	5E-9	6E-5	6E-4

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		W, see ^{66}Ge	-	1E+2	4E-8	1E-10	-	-
32	Germanium-69	D, see ^{66}Ge	1E+4	2E+4	6E-6	2E-8	2E-4	2E-3
		W, see ^{66}Ge	-	8E+3	3E-6	1E-8	-	-
32	Germanium-71	D, see ^{66}Ge	5E+5	4E+5	2E-4	6E-7	7E-3	7E-2
		W, see ^{66}Ge	-	4E+4	2E-5	6E-8	-	-
32	Germanium-75[2]	D, see ^{66}Ge	4E+4 St wall (7E+4)	8E+4 -	3E-5 -	1E-7 -	- 9E-4	- 9E-3
		W, see ^{66}Ge	-	8E+4	4E-5	1E-7	-	-
32	Germanium-77	D, see ^{66}Ge	9E+3	1E+4	4E-6	1E-8	1E-4	1E-3
		W, see ^{66}Ge	-	6E+3	2E-6	8E-9	-	-
32	Germanium-78[2]	D, see ^{66}Ge	2E+4 St wall (2E+4)	2E+4 -	9E-6 -	3E-8 -	- 3E-4	- 3E-3
		W, see ^{66}Ge	-	2E+4	9E-6	3E-8	-	-
33	Arsenic-69[2]	W, all compounds	3E+4 St wall (4E+4)	1E+5 -	5E-5 -	2E-7 -	- 6E-4	- 6E-3
33	Arsenic-70[2]	W, all compounds	1E+4	5E+4	2E-5	7E-8	2E-4	2E-3
33	Arsenic-71	W, all compounds	4E+3	5E+3	2E-6	6E-9	5E-5	5E-4
33	Arsenic-72	W, all compounds	9E+2	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-73	W, all compounds	8E+3	2E+3	7E-7	2E-9	1E-4	1E-3
33	Arsenic-74	W, all compounds	1E+3	8E+2	3E-7	1E-9	2E-5	2E-4
33	Arsenic-76	W, all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-77	W, all compounds	4E+3 LLI wall (5E+3)	5E+3 -	2E-6 -	7E-9 -	- 6E-5	- 6E-4
33	Arsenic-78[2]	W, all compounds	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
34	Selenium-70[2]	D, all compounds except those given for W	2E+4	4E+4	2E-5	5E-8	1E-4	1E-3
		W, oxides, hydroxides, carbides, and elemental Se	1E+4	4E+4	2E-5	6E-8	-	-
34	Selenium-73m[2]	D, see ^{70}Se	6E+4	2E+5	6E-5	2E-7	4E-4	4E-3
		W, see ^{70}Se	3E+4	1E+5	6E-5	2E-7	-	-
34	Selenium-73	D, see ^{70}Se	3E+3	1E+4	5E-6	2E-8	4E-5	4E-4
		W, see ^{70}Se	-	2E+4	7E-6	2E-8	-	-
34	Selenium-75	D, see ^{70}Se	5E+2	7E+2	3E-7	1E-9	7E-6	7E-5
		W, see ^{70}Se	-	6E+2	3E-7	8E-10	-	-
34	Selenium-79	D, see ^{70}Se	6E+2	8E+2	3E-7	1E-9	8E-6	8E-5
		W, see ^{70}Se	-	6E+2	2E-7	8E-10	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
34	Selenium-81m[2]	D, see ^{70}Se	4E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		W, see ^{70}Se	2E+4	7E+4	3E-5	1E-7	-	-
34	Selenium-81[2]	D, see ^{70}Se	6E+4 St wall (8E+4)	2E+5 -	9E-5 -	3E-7 -	- 1E-3	- 1E-2
		W, see ^{70}Se	-	2E+5	1E-4	3E-7	-	-
34	Selenium-83[2]	D, see ^{70}Se	4E+4	1E+5	5E-5	2E-7	4E-4	4E-3
		W, see ^{70}Se	3E+4	1E+5	5E-5	2E-7	-	-
35	Bromine-74m[2]	D, bromides of H, Li, Na, K, Rb, Cs, and Fr	1E+4 St wall (2E+4)	4E+4 -	2E-5 -	5E-8 -	- 3E-4	- 3E-3
		W, bromides of lanthanides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, Hf, V, Nb, Ta, Mn, Tc, and Re	-	4E+4	2E-5	6E-8	-	-
35	Bromine-74[2]	D, see ^{74m}Br	2E+4 St wall (4E+4)	7E+4 -	3E-5 -	1E-7 -	- 5E-4	- 5E-3
		W, see ^{74m}Br	-	8E+4	4E-5	1E-7	-	-
35	Bromine-75[2]	D, see ^{74m}Br	3E+4 St wall (4E+4)	5E+4 -	2E-5 -	7E-8 -	- 5E-4	- 5E-3
		W, see ^{74m}Br	-	5E+4	2E-5	7E-8	-	-
35	Bromine-76	D, see ^{74m}Br	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
		W, see ^{74m}Br	-	4E+3	2E-6	6E-9	-	-
35	Bromine-77	D, see ^{74m}Br	2E+4	2E+4	1E-5	3E-8	2E-4	2E-3
		W, see ^{74m}Br	-	2E+4	8E-6	3E-8	-	-
35	Bromine-80m	D, see ^{74m}Br	2E+4	2E+4	7E-6	2E-8	3E-4	3E-3
		W, see ^{74m}Br	-	1E+4	6E-6	2E-8	-	-
35	Bromine-80[2]	D, see ^{74m}Br	5E+4 St wall (9E+4)	2E+5 -	8E-5 -	3E-7 -	- 1E-3	- 1E-2
		W, see ^{74m}Br	-	2E+5	9E-5	3E-7	-	-
35	Bromine-82	D, see ^{74m}Br	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W, see ^{74m}Br	-	4E+3	2E-6	5E-9	-	-
35	Bromine-83	D, see ^{74m}Br	5E+4 St wall (7E+4)	6E+4 -	3E-5 -	9E-8 -	- 9E-4	- 9E-3
		W, see ^{74m}Br	-	6E+4	3E-5	9E-8	-	-
35	Bromine-84[2]	D, see ^{74m}Br	2E+4 St wall (3E+4)	6E+4 -	2E-5 -	8E-8 -	- 4E-4	- 4E-3

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		W, see ^{74m}Br	-	6E+4	3E-5	9E-8	-	-
36	Krypton-74[2]	Submersion[1]	-	-	3E-6	1E-8	-	-
36	Krypton-76	Submersion[1]	-	-	9E-6	4E-8	-	-
36	Krypton-77[2]	Submersion[1]	-	-	4E-6	2E-8	-	-
36	Krypton-79	Submersion[1]	-	-	2E-5	7E-8	-	-
36	Krypton-81	Submersion[1]	-	-	7E-4	3E-6	-	-
36	Krypton-83m[2]	Submersion[1]	-	-	1E-2	5E-5	-	-
36	Krypton-85m	Submersion[1]	-	-	2E-5	1E-7	-	-
36	Krypton-85	Submersion[1]	-	-	1E-4	7E-7	-	-
36	Krypton-87[2]	Submersion[1]	-	-	5E-6	2E-8	-	-
36	Krypton-88	Submersion[1]	-	-	2E-6	9E-9	-	-
37	Rubidium-79[2]	D, all compounds	4E+4	1E+5	5E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	8E-4	8E-3
37	Rubidium-81m[2]	D, all compounds	2E+5	3E+5	1E-4	5E-7	-	-
			St wall (3E+5)	-	-	-	4E-3	4E-2
37	Rubidium-81	D, all compounds	4E+4	5E+4	2E-5	7E-8	5E-4	5E-3
37	Rubidium-82m	D, all compounds	1E+4	2E+4	7E-6	2E-8	2E-4	2E-3
37	Rubidium-83	D, all compounds	6E+2	1E+3	4E-7	1E-9	9E-6	9E-5
37	Rubidium-84	D, all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-86	D, all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-87	D, all compounds	1E+3	2E+3	6E-7	2E-9	1E-5	1E-4
37	Rubidium-88[2]	D, all compounds	2E+4	6E+4	3E-5	9E-8	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
37	Rubidium-89[2]	D, all compounds	4E+4	1E+5	6E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	9E-4	9E-3
38	Strontium-80[2]	D, all soluble compounds except $SrTiO_3$	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		Y, all insoluble compounds and $SrTiO_3$	-	1E+4	5E-6	2E-8	-	-
38	Strontium-81[2]	D, see ^{80}Sr	3E+4	8E+4	3E-5	1E-7	3E-4	3E-3
		Y, see ^{80}Sr	2E+4	8E+4	3E-5	1E-7	-	-
38	Strontium-82	D, see ^{80}Sr	3E+2	4E+2	2E-7	6E-10	-	-
			LLI wall (2E+2)	-	-	-	3E-6	3E-5

Appendix 4-B

Atomic No.	Radionuclide	Class	*Table I* Occupational Values Col. 1 Oral Ingestion ALI (μCi)	*Table I* Occupational Values Col. 2 Inhalation ALI (μCi)	*Table I* Occupational Values Col. 3 Inhalation DAC (μCi/ml)	*Table II* Effluent Concentrations Col. 1 Air (μCi/ml)	*Table II* Effluent Concentrations Col. 2 Water (μCi/ml)	*Table III* release to Sewers Monthly Average Concentration (μCi/ml)
		Y, see ^{80}Sr	2E+2	9E+1	4E-8	1E-10	-	-
38	Strontium-83	D, see ^{80}Sr	3E+3	7E+3	3E-6	1E-8	3E-5	3E-4
		Y, see ^{80}Sr	2E+3	4E+3	1E-6	5E-9	-	-
38	Strontium-85m[2]	D, see ^{80}Sr	2E+5	6E+5	3E-4	9E-7	3E-3	3E-2
		Y, see ^{80}Sr	-	8E+5	4E-4	1E-6	-	-
38	Strontium-85	D, see ^{80}Sr	3E+3	3E+3	1E-6	4E-9	4E-5	4E-4
		Y, see ^{80}Sr	-	2E+3	6E-7	2E-9	-	-
38	Strontium-87m	D, see ^{80}Sr	5E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		Y, see ^{80}Sr	4E+4	2E+5	6E-5	2E-7	-	-
38	Strontium-89	D, see ^{80}Sr	6E+2	8E+2	4E-7	1E-9	-	-
			LLI wall (6E+2)	-	-	-	8E-6	8E-5
		Y, see ^{80}Sr	5E+2	1E+2	6E-8	2E-10	-	-
38	Strontium-90	D, see ^{80}Sr	3E+1 Bone surf	2E+1 Bone surf	8E-9	-	-	-
			(4E+1)	(2E+1)	-	3E-11	5E-7	5E-6
		Y, see ^{80}Sr	-	4E+0	2E-9	6E-12	-	-
38	Strontium-91	D, see ^{80}Sr	2E+3	6E+3	2E-6	8E-9	2E-5	2E-4
		Y, see ^{80}Sr	-	4E+3	1E-6	5E-9	-	-
38	Strontium-92	D, see ^{80}Sr	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		Y, see ^{80}Sr	-	7E+3	3E-6	9E-9	-	-
39	Yttrium-86m[2]	W, all compounds except those given for Y	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
		Y, oxides and hydroxides	-	5E+4	2E-5	8E-8	-	-
39	Yttrium-86	W, see ^{86m}Y	1E+3	3E+3	1E-6	5E-9	2E-5	2E-4
		Y, see ^{86m}Y	-	3E+3	1E-6	5E-9	-	-
39	Yttrium-87	W, see ^{86m}Y	2E+3	3E+3	1E-6	5E-9	3E-5	3E-4
		Y, see ^{86m}Y	-	3E+3	1E-6	5E-9	-	-
39	Yttrium-88	W, see ^{86m}Y	1E+3	3E+2	1E-7	3E-10	1E-5	1E-4
		Y, see ^{86m}Y	-	2E+2	1E-7	3E-10	-	-
39	Yttrium-90m	W, see ^{86m}Y	8E+3	1E+4	5E-6	2E-8	1E-4	1E-3
		Y, see ^{86m}Y	-	1E+4	5E-6	2E-8	-	-
39	Yttrium-90	W, see ^{86m}Y	4E+2	7E+2	3E-7	9E-10	-	-
			LLI wall (5E+2)	-	-	-	7E-6	7E-5
		Y, see ^{86m}Y	-	6E+2	3E-7	9E-10	-	-
39	Yttrium-91m[2]	W, see ^{86m}Y	1E+5	2E+5	1E-4	3E-7	2E-3	2E-2
		Y, see ^{86m}Y	-	2E+5	7E-5	2E-7	-	-
39	Yttrium-91	W, see ^{86m}Y	5E+2	2E+2	7E-8	2E-10	-	-
			LLI wall (6E+2)	-	-	-	8E-6	8E-5
		Y, see ^{86m}Y	-	1E+2	5E-8	2E-10	-	-
39	Yttrium-92	W, see ^{86m}Y	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		Y, see ^{86m}Y	-	8E+3	3E-6	1E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
39	Yttrium-93	W, see ^{86m}Y	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, see ^{86m}Y	-	2E+3	1E-6	3E-9	-	-
39	Yttrium-94[2]	W, see ^{86m}Y	2E+4 St wall (3E+4)	8E+4 -	3E-5 -	1E-7 -	- 4E-4	- 4E-3
		Y, see ^{86m}Y	-	8E+4	3E-5	1E-7	-	-
39	Yttrium-95[2]	W, see ^{86m}Y	4E+4 St wall (5E+4)	2E+5 -	6E-5 -	2E-7 -	- 7E-4	- 7E-3
		Y, see ^{86m}Y	-	1E+5	6E-5	2E-7	-	-
40	Zirconium-86	D, all compounds except those given for W and Y	1E+3	4E+3	2E-6	6E-9	2E-5	2E-4
		W, oxides, hydroxides, halides, and nitrates	-	3E+3	1E-6	4E-9	-	-
		Y, carbide	-	2E+3	1E-6	3E-9	-	-
40	Zirconium-88	D, see ^{86}Zr	4E+3	2E+2	9E-8	3E-10	5E-5	5E-4
		W, see ^{86}Zr	-	5E+2	2E-7	7E-10	-	-
		Y, see ^{86}Zr	-	3E+2	1E-7	4E-10	-	-
40	Zirconium-89	D, see ^{86}Zr	2E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see ^{86}Zr	-	2E+3	1E-6	3E-9	-	-
		Y, see ^{86}Zr	-	2E+3	1E-6	3E-9	-	-
40	Zirconium-93	D, see ^{86}Zr	1E+3 Bone surf (3E+3)	6E+0 Bone surf (2E+1)	3E-9 -	- 2E-11	- 4E-5	- 4E-4
		W, see ^{86}Zr	- -	2E+1 Bone surf (6E+1)	1E-8 -	- 9E-11	- -	- -
		Y, see ^{86}Zr	- -	6E+1 Bone surf (7E+1)	2E-8 -	- 9E-11	- -	- -
40	Zirconium-95	D, see ^{86}Zr	1E+3	1E+2 Bone surf (3E+2)	5E-8 -	- 4E-10	2E-5 -	2E-4 -
		W, see ^{86}Zr	-	4E+2	2E-7	5E-10	-	-
		Y, see ^{86}Zr	-	3E+2	1E-7	4E-10	-	-
40	Zirconium-97	D, see ^{86}Zr	6E+2	2E+3	8E-7	3E-9	9E-6	9E-5
		W, see ^{86}Zr	-	1E+3	6E-7	2E-9	-	-
		Y, see ^{86}Zr	-	1E+3	5E-7	2E-9	-	-
41	Niobium-88[2]	W, all compounds except those given for Y	5E+4 St wall (7E+4)	2E+5 -	9E-5 -	3E-7 -	- 1E-3	- 1E-2
		Y, oxides and hydroxides	-	2E+5	9E-5	3E-7	-	-
41	Niobium-89[2] (66 min)	W, see ^{88}Nb	1E+4	4E+4	2E-5	6E-8	1E-4	1E-3
		Y, see ^{88}Nb	-	4E+4	2E-5	5E-8	-	-
41	Niobium-89 (122 min)	W, see ^{88}Nb	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y, see ^{88}Nb	-	2E+4	6E-6	2E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
41	Niobium-90	W, see ^{88}Nb	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		Y, see ^{88}Nb	-	2E+3	1E-6	3E-9	-	-
41	Niobium-93m	W, see ^{88}Nb	9E+3	2E+3	8E-7	3E-9	-	-
			LLI wall (1E+4)	-	-	-	2E-4	2E-3
		Y, see ^{88}Nb	-	2E+2	7E-8	2E-10	-	-
41	Niobium-94	W, see ^{88}Nb	9E+2	2E+2	8E-8	3E-10	1E-5	1E-4
		Y, see ^{88}Nb	-	2E+1	6E-9	2E-11	-	-
41	Niobium-95m	W, see ^{88}Nb	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		Y, see ^{88}Nb	-	2E+3	9E-7	3E-9	-	-
41	Niobium-95	W, see ^{88}Nb	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
		Y, see ^{88}Nb	-	1E+3	5E-7	2E-9	-	-
41	Niobium-96	W, see ^{88}Nb	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, see ^{88}Nb	-	2E+3	1E-6	3E-9	-	-
41	Niobium-97[2]	W, see ^{88}Nb	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
		Y, see ^{88}Nb	-	7E+4	3E-5	1E-7	-	-
41	Niobium-98[2]	W, see ^{88}Nb	1E+4	5E+4	2E-5	8E-8	2E-4	2E-3
		Y, see ^{88}Nb	-	5E+4	2E-5	7E-8	-	-
42	Molybdenum-90	D, all compounds except those given for Y	4E+3	7E+3	3E-6	1E-8	3E-5	3E-4
		Y, oxides, hydroxides, and MoS_2	2E+3	5E+3	2E-6	6E-9	-	-
42	Molybdenum-93m	D, see ^{90}Mo	9E+3	2E+4	7E-6	2E-8	6E-5	6E-4
		Y, see ^{90}Mo	4E+3	1E+4	6E-6	2E-8	-	-
42	Molybdenum-93	D, see ^{90}Mo	4E+3	5E+3	2E-6	8E-9	5E-5	5E-4
		Y, see ^{90}Mo	2E+4	2E+2	8E-8	2E-10	-	-
42	Molybdenum-99	D, see ^{90}Mo	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see ^{90}Mo	1E+3	1E+3	6E-7	2E-9	-	-
42	Molybdenum-101[2]	D, see ^{90}Mo	4E+4	1E+5	6E-5	2E-7	-	-
			St wall (5E+4)	-	-	-	7E-4	7E-3
		Y, see ^{90}Mo	-	1E+5	6E-5	2E-7	-	-
43	Technetium-93m[2]	D, all compounds except those given for W	7E+4	2E+5	6E-5	2E-7	1E-3	1E-2
		W, oxides, hydroxides, halides, and nitrates	-	3E+5	1E-4	4E-7	-	-
43	Technetium-93	D, see ^{93m}Tc	3E+4	7E+4	3E-5	1E-7	4E-4	4E-3
		W, see ^{93m}Tc	-	1E+5	4E-5	1E-7	-	-
43	Technetium-94m[2]	D, see ^{93m}Tc	2E+4	4E+4	2E-5	6E-8	3E-4	3E-3
		W, see ^{93m}Tc	-	6E+4	2E-5	8E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
43	Technetium-94	D, see ^{93m}Tc	9E+3	2E+4	8E-6	3E-8	1E-4	1E-3
		W, see ^{93m}Tc	-	2E+4	1E-5	3E-8	-	-
43	Technetium-95m	D, see ^{93m}Tc	4E+3	5E+3	2E-6	8E-9	5E-5	5E-4
		W, see ^{93m}Tc	-	2E+3	8E-7	3E-9	-	-
43	Technetium-95	D, see ^{93m}Tc	1E+4	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see ^{93m}Tc	-	2E+4	8E-6	3E-8	-	-
43	Technetium-96m[2]	D, see ^{93m}Tc	2E+5	3E+5	1E-4	4E-7	2E-3	2E-2
		W, see ^{93m}Tc	-	2E+5	1E-4	3E-7	-	-
43	Technetium-96	D, see ^{93m}Tc	2E+3	3E+3	1E-6	5E-9	3E-5	3E-4
		W, see ^{93m}Tc	-	2E+3	9E-7	3E-9	-	-
43	Technetium-97m	D, see ^{93m}Tc	5E+3	7E+3	3E-6	-	6E-5	6E-4
			-	St wall (7E+3)	-	1E-8	-	-
		W, see ^{93m}Tc	-	1E+3	5E-7	2E-9	-	-
43	Technetium-97	D, see ^{93m}Tc	4E+4	5E+4	2E-5	7E-8	5E-4	5E-3
		W, see ^{93m}Tc	-	6E+3	2E-6	8E-9	-	-
43	Technetium-98	D, see ^{93m}Tc	1E+3	2E+3	7E-7	2E-9	1E-5	1E-4
		W, see ^{93m}Tc	-	3E+2	1E-7	4E-10	-	-
43	Technetium-99m	D, see ^{93m}Tc	8E+4	2E+5	6E-5	2E-7	1E-3	1E-2
		W, see ^{93m}Tc	-	2E+5	1E-4	3E-7	-	-
43	Technetium-99	D, see ^{93m}Tc	4E+3	5E+3	2E-6	-	6E-5	6E-4
			-	St wall (6E+3)	-	8E-9	-	-
		W, see ^{93m}Tc	-	7E+2	3E-7	9E-10	-	-
43	Technetium-101[2]	D, see ^{93m}Tc	9E+4	3E+5	1E-4	5E-7	-	-
			St wall (1E+5)	-	-	-	2E-3	2E-2
		W, see ^{93m}Tc	-	4E+5	2E-4	5E-7	-	-
43	Technetium-104[2]	D, see ^{93m}Tc	2E+4	7E+4	3E-5	1E-7	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		W, see ^{93m}Tc	-	9E+4	4E-5	1E-7	-	-
44	Ruthenium-94[2]	D, all compounds except those given for W and Y	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, halides	-	6E+4	3E-5	9E-8	-	-
		Y, oxides and hydroxides	-	6E+4	2E-5	8E-8	-	-
44	Ruthenium-97	D, see ^{94}Ru	8E+3	2E+4	8E-6	3E-8	1E-4	1E-3
		W, see ^{94}Ru	-	1E+4	5E-6	2E-8	-	-
		Y, see ^{94}Ru	-	1E+4	5E-6	2E-8	-	-
44	Ruthenium-103	D, see ^{94}Ru	2E+3	2E+3	7E-7	2E-9	3E-5	3E-4
		W, see ^{94}Ru	-	1E+3	4E-7	1E-9	-	-
		Y, see ^{94}Ru	-	6E+2	3E-7	9E-10	-	-
44	Ruthenium-105	D, see ^{94}Ru	5E+3	1E+4	6E-6	2E-8	7E-5	7E-4
		W, see ^{94}Ru	-	1E+4	6E-6	2E-8	-	-
		Y, see ^{94}Ru	-	1E+4	5E-6	2E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1. Oral Ingestion ALI (μCi)	Table 1 Occupational Values Inhalation ALI (μCi)	Table 1 Occupational Values Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
44	Ruthenium-106	D, see ^{94}Ru	2E+2	9E+1	4E-8	1E-10	-	-
			LLI wall (2E+2)	-	-	-	3E-6	3E-5
		W, see ^{94}Ru	-	5E+1	2E-8	8E-11	-	-
		Y, see ^{94}Ru	-	1E+1	5E-9	2E-11	-	-
45	Rhodium-99m	D, all compounds except those given for W and Y	2E+4	6E+4	2E-5	8E-8	2E-4	2E-3
		W, halides	-	8E+4	3E-5	1E-7	-	-
		Y, oxides and hydroxides	-	7E+4	3E-5	9E-8	-	-
45	Rhodium-99	D, see ^{99m}Rh	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see ^{99m}Rh	-	2E+3	9E-7	3E-9	-	-
		Y, see ^{99m}Rh	-	2E+3	8E-7	3E-9	-	-
45	Rhodium-100	D, see ^{99m}Rh	2E+3	5E+3	2E-6	7E-9	2E-5	2E-4
		W, see ^{99m}Rh	-	4E+3	2E-6	6E-9	-	-
		Y, see ^{99m}Rh	-	4E+3	2E-6	5E-9	-	-
45	Rhodium-101m	D, see ^{99m}Rh	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, see ^{99m}Rh	-	8E+3	4E-6	1E-8	-	-
		Y, see ^{99m}Rh	-	8E+3	3E-6	1E-8	-	-
45	Rhodium-101	D, see ^{99m}Rh	2E+3	5E+2	2E-7	7E-10	3E-5	3E-4
		W, see ^{99m}Rh	-	8E+2	3E-7	1E-9	-	-
		Y, see ^{99m}Rh	-	2E+2	6E-8	2E-10	-	-
45	Rhodium-102m	D, see ^{99m}Rh	1E+3	5E+2	2E-7	7E-10	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		W, see ^{99m}Rh	-	4E+2	2E-7	5E-10	-	-
		Y, see ^{99m}Rh	-	1E+2	5E-8	2E-10	-	-
45	Rhodium-102	D, see ^{99m}Rh	6E+2	9E+1	4E-8	1E-10	8E-6	8E-5
		W, see ^{99m}Rh	-	2E+2	7E-8	2E-10	-	-
		Y, see ^{99m}Rh	-	6E+1	2E-8	8E-11	-	-
45	Rhodium-103m[2]	D, see ^{99m}Rh	4E+5	1E+6	5E-4	2E-6	6E-3	6E-2
		W, see ^{99m}Rh	-	1E+6	5E-4	2E-6	-	-
		Y, see ^{99m}Rh	-	1E+6	5E-4	2E-6	-	-
45	Rhodium-105	D, see ^{99m}Rh	4E+3	1E+4	5E-6	2E-8	-	-
			LLI wall (4E+3)	-	-	-	5E-5	5E-4
		W, see ^{99m}Rh	-	6E+3	3E-6	9E-9	-	-
		Y, see ^{99m}Rh	-	6E+3	2E-6	8E-9	-	-
45	Rhodium-106m	D, see ^{99m}Rh	8E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, see ^{99m}Rh	-	4E+4	2E-5	5E-8	-	-
		Y, see ^{99m}Rh	-	4E+4	1E-5	5E-8	-	-
45	Rhodium-107[2]	D, see ^{99m}Rh	7E+4	2E+5	1E-4	3E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
		W, see ^{99m}Rh	-	3E+5	1E-4	4E-7	-	-
		Y, see ^{99m}Rh	-	3E+5	1E-4	3E-7	-	-
46	Palladium-100	D, all compounds except those given for W and Y	1E+3	1E+3	6E-7	2E-9	2E-5	2E-4
		W, nitrates	-	1E+3	5E-7	2E-9	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		Y, oxides and hydroxides	-	1E+3	6E-7	2E-9	-	-
46	Palladium-101	D, see ^{100}Pd	1E+4	3E+4	1E-5	5E-8	2E-4	2E-3
		W, see ^{100}Pd	-	3E+4	1E-5	5E-8	-	-
		Y, see ^{100}Pd	-	3E+4	1E-5	4E-8	-	-
46	Palladium-103	D, see ^{100}Pd	6E+3	6E+3	3E-6	9E-9	-	-
			LLI wall (7E+3)	-	-	-	1E-4	1E-3
		W, see ^{100}Pd	-	4E+3	2E-6	6E-9	-	-
		Y, see ^{100}Pd	-	4E+3	1E-6	5E-9	-	-
46	Palladium-107	D, see ^{100}Pd	3E+4	2E+4	9E-6	-	-	-
			LLI wall (4E+4)	Kidneys (2E+4)	-	3E-8	5E-4	5E-3
		W, see ^{100}Pd	-	7E+3	3E-6	1E-8	-	-
		Y, see ^{100}Pd	-	4E+2	2E-7	6E-10	-	-
46	Palladium-109	D, see ^{100}Pd	2E+3	6E+3	3E-6	9E-9	3E-5	3E-4
		W, see ^{100}Pd	-	5E+3	2E-6	8E-9	-	-
		Y, see ^{100}Pd	-	5E+3	2E-6	6E-9	-	-
47	Silver-102[2]	D, all compounds except those given for W and Y	5E+4	2E+5	8E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	9E-4	9E-3
		W, nitrates and sulfides	-	2E+5	9E-5	3E-7	-	-
		Y, oxides and hydroxides	-	2E+5	8E-5	3E-7	-	-
47	Silver-103[2]	D, see ^{102}Ag	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
		W, see ^{102}Ag	-	1E+5	5E-5	2E-7	-	-
		Y, see ^{102}Ag	-	1E+5	5E-5	2E-7	-	-
47	Silver-104m[2]	D, see ^{102}Ag	3E+4	9E+4	4E-5	1E-7	4E-4	4E-3
		W, see ^{102}Ag	-	1E+5	5E-5	2E-7	-	-
		Y, see ^{102}Ag	-	1E+5	5E-5	2E-7	-	-
47	Silver-104[2]	D, see ^{102}Ag	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
		W, see ^{102}Ag	-	1E+5	6E-5	2E-7	-	-
		Y, see ^{102}Ag	-	1E+5	6E-5	2E-7	-	-
47	Silver-105	D, see ^{102}Ag	3E+3	1E+3	4E-7	1E-9	4E-5	4E-4
		W, see ^{102}Ag	-	2E+3	7E-7	2E-9	-	-
		Y, see ^{102}Ag	-	2E+3	7E-7	2E-9	-	-
47	Silver-106m	D, see ^{102}Ag	8E+2	7E+2	3E-7	1E-9	1E-5	1E-4
		W, see ^{102}Ag	-	9E+2	4E-7	1E-9	-	-
		Y, see ^{102}Ag	-	9E+2	4E-7	1E-9	-	-
47	Silver-106[2]	D, see ^{102}Ag	6E+4	2E+5	8E-5	3E-7	-	-
			St. wall (6E+4)	-	-	-	9E-4	9E-3
		W, see ^{102}Ag	-	2E+5	9E-5	3E-7	-	-
		Y, see ^{102}Ag	-	2E+5	8E-5	3E-7	-	-
47	Silver-108m	D, see ^{102}Ag	6E+2	2E+2	8E-8	3E-10	9E-6	9E-5
		W, see ^{102}Ag	-	3E+2	1E-7	4E-10	-	-
		Y, see ^{102}Ag	-	2E+1	1E-8	3E-11	-	-
47	Silver-110m	D, see ^{102}Ag	5E+2	1E+2	5E-8	2E-10	6E-6	6E-5
		W, see ^{102}Ag	-	2E+2	8E-8	3E-10	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		Y, see ^{102}Ag	-	9E+1	4E-8	1E-10	-	-
47	Silver-111	D, see ^{102}Ag	9E+2	2E+3	6E-7	-	-	-
			LLI wall (1E+3)	Liver (2E+3)	-	2E-9	2E-5	2E-4
		W, see ^{102}Ag	-	9E+2	4E-7	1E-9	-	-
		Y, see ^{102}Ag	-	9E+2	4E-7	1E-9	-	-
47	Silver-112	D, see ^{102}Ag	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see ^{102}Ag	-	1E+4	4E-6	1E-8	-	-
		Y, see ^{102}Ag	-	9E+3	4E-6	1E-8	-	-
47	Silver-115[2]	D, see ^{102}Ag	3E+4	9E+4	4E-5	1E-7	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		W, see ^{102}Ag	-	9E+4	4E-5	1E-7	-	-
		Y, see ^{102}Ag	-	8E+4	3E-5	1E-7	-	-
48	Cadmium-104[2]	D, all compounds except those given for W and Y	2E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	5E-5	2E-7	-	-
48	Cadmium-107	D, see ^{104}Cd	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
		W, see ^{104}Cd	-	6E+4	2E-5	8E-8	-	-
		Y, see ^{104}Cd	-	5E+4	2E-5	7E-8	-	-
48	Cadmium-109	D, see ^{104}Cd	3E+2	4E+1	1E-8	-	-	-
			Kidneys (4E+2)	Kidneys (5E+1)	-	7E-11	6E-6	6E-5
		W, see ^{104}Cd	-	1E+2	5E-8	-	-	-
			-	Kidneys (1E+2)	-	2E-10	-	-
		Y, see ^{104}Cd	-	1E+2	5E-8	2E-10	-	-
48	Cadmium-113m	D, see ^{104}Cd	2E+1	2E+0	1E-9	-	-	-
			Kidneys (4E+1)	Kidneys (4E+0)	-	5E-12	5E-7	5E-6
		W, see ^{104}Cd	-	8E+0	4E-9	-	-	-
			-	Kidneys (1E+1)	-	2E-11	-	-
		Y, see ^{104}Cd	-	1E+1	5E-9	2E-11	-	-
48	Cadmium-113	D, see ^{104}Cd	2E+1	2E+0	9E-10	-	-	-
			Kidneys (3E+1)	Kidneys (3E+0)	-	5E-12	4E-7	4E-6
		W, see ^{104}Cd	-	8E+0	3E-9	-	-	-
			-	Kidneys (1E+1)	-	2E-11	-	-
		Y, see ^{104}Cd	-	1E+1	6E-9	2E-11	-	-
48	Cadmium-115m	D, see ^{104}Cd	3E+2	5E+1	2E-8	-	4E-6	4E-5
			-	Kidneys (8E+1)	-	1E-10	-	-
		W, see ^{104}Cd	-	1E+2	5E-8	2E-10	-	-
		Y, see ^{104}Cd	-	1E+2	6E-8	2E-10	-	-
48	Cadmium-115	D, see ^{104}Cd	9E+2 LLI wall	1E+3	6E-7	2E-9	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			(1E+3)	-	-	-	1E-5	1E-4
		W, see ^{104}Cd	-	1E+3	5E-7	2E-9	-	-
		Y, see ^{104}Cd	-	1E+3	6E-7	2E-9	-	-
48	Cadmium-117m	D, see ^{104}Cd	5E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		W, see ^{104}Cd	-	2E+4	7E-6	2E-8	-	-
		Y, see ^{104}Cd	-	1E+4	6E-6	2E-8	-	-
48	Cadmium-117	D, see ^{104}Cd	5E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		W, see ^{104}Cd	-	2E+4	7E-6	2E-8	-	-
		Y, see ^{104}Cd	-	1E+4	6E-6	2E-8	-	-
49	Indium-109	D, all compounds except those given for W	2E+4	4E+4	2E-5	6E-8	3E-4	3E-3
		W, oxides, hydroxides, halides, and nitrates	-	6E+4	3E-5	9E-8	-	-
49	Indium-110[2] (69.1 min)	D, see ^{109}In	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{109}In	-	6E+4	2E-5	8E-8	-	-
49	Indium-110 (4.9 h)	D, see ^{109}In	5E+3	2E+4	7E-6	2E-8	7E-5	7E-4
		W, see ^{109}In	-	2E+4	8E-6	3E-8	-	-
49	Indium-111	D, see ^{109}In	4E+3	6E+3	3E-6	9E-9	6E-5	6E-4
		W, see ^{109}In	-	6E+3	3E-6	9E-9	-	-
49	Indium-112[2]	D, see ^{109}In	2E+5	6E+5	3E-4	9E-7	2E-3	2E-2
		W, see ^{109}In	-	7E+5	3E-4	1E-6	-	-
49	Indium-113m[2]	D, see ^{109}In	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
		W, see ^{109}In	-	2E+5	8E-5	3E-7	-	-
49	Indium-114m	D, see ^{109}In	3E+2 LLI wall (4E+2)	6E+1	3E-8	9E-11	-	-
			-	-	-	-	5E-6	5E-5
		W, see ^{109}In	-	1E+2	4E-8	1E-10	-	-
49	Indium-115m	D, see ^{109}In	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{109}In	-	5E+4	2E-5	7E-8	-	-
49	Indium-115	D, see ^{109}In	4E+1	1E+0	6E-10	2E-12	5E-7	5E-6
		W, see ^{109}In	-	5E+0	2E-9	8E-12	-	-
49	Indium-116m[2]	D, see ^{109}In	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
		W, see ^{109}In	-	1E+5	5E-5	2E-7	-	-
49	Indium-117m[2]	D, see ^{109}In	1E+4	3E+4	1E-5	5E-8	2E-4	2E-3
		W, see ^{109}In	-	4E+4	2E-5	6E-8	-	-
49	Indium-117[2]	D, see ^{109}In	6E+4	2E+5	7E-5	2E-7	8E-4	8E-3
		W, see ^{109}In	-	2E+5	9E-5	3E-7	-	-
49	Indium-119m[2]	D, see ^{109}In	4E+4 St wall (5E+4)	1E+5	5E-5	2E-7	-	-
			-	-	-	-	7E-4	7E-3
		W, see ^{109}In	-	1E+5	6E-5	2E-7	-	-
50	Tin-110	D, all compounds except those given for W	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
		W, sulfides, oxides,						

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		hydroxides, halides, nitrates, and stannic phosphate	-	1E+4	5E-6	2E-8	-	-
50	Tin-111[2]	D, see ^{110}Sn	7E+4	2E+5	9E-5	3E-7	1E-3	1E-2
		W, see ^{110}Sn	-	3E+5	1E-4	4E-7	-	-
50	Tin-113	D, see ^{110}Sn	2E+3	1E+3	5E-7	2E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		W, see ^{110}Sn	-	5E+2	2E-7	8E-10	-	-
50	Tin-117m	D, see ^{110}Sn	2E+3	1E+3	5E-7	-	-	-
			LLI wall (2E+3)	Bone surf (2E+3)	-	3E-9	3E-5	3E-4
		W, see ^{110}Sn	-	1E+3	6E-7	2E-9	-	-
50	Tin-119m	D, see ^{110}Sn	3E+3	2E+3	1E-6	3E-9	-	-
			LLI wall (4E+3)	-	-	-	6E-5	6E-4
		W, see ^{110}Sn	-	1E+3	4E-7	1E-9	-	-
50	Tin-121m	D, see ^{110}Sn	3E+3	9E+2	4E-7	1E-9	-	-
			LLI wall (4E+3)	-	-	-	5E-5	5E-4
		W, see ^{110}Sn	-	5E+2	2E-7	8E-10	-	-
50	Tin-121	D, see ^{110}Sn	6E+3	2E+4	6E-6	2E-8	-	-
			LLI wall (6E+3)	-	-	-	8E-5	8E-4
		W, see ^{110}Sn	-	1E+4	5E-6	2E-8	-	-
50	Tin-123m[2]	D, see ^{110}Sn	5E+4	1E+5	5E-5	2E-7	7E-4	7E-3
		W, see ^{110}Sn	-	1E+5	6E-5	2E-7	-	-
50	Tin-123	D, see ^{110}Sn	5E+2	6E+2	3E-7	9E-10	-	-
			LLI wall (6E+2)	-	-	-	9E-6	9E-5
		W, see ^{110}Sn	-	2E+2	7E-8	2E-10	-	-
50	Tin-125	D, see ^{110}Sn	4E+2	9E+2	4E-7	1E-9	-	-
			LLI wall (5E+2)	-	-	-	6E-6	6E-5
		W, see ^{110}Sn	-	4E+2	1E-7	5E-10	-	-
50	Tin-126	D, see ^{110}Sn	3E+2	6E+1	2E-8	8E-11	4E-6	4E-5
		W, see ^{110}Sn	-	7E+1	3E-8	9E-11	-	-
50	Tin-127	D, see ^{110}Sn	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		W, see ^{110}Sn	-	2E+4	8E-6	3E-8	-	-
50	Tin-128[2]	D, see ^{110}Sn	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, see ^{110}Sn	-	4E+4	1E-5	5E-8	-	-
51	Antimony-115[2]	D, all compounds except those given for W	8E+4	2E+5	1E-4	3E-7	1E-3	1E-2
		W, oxides, hydroxides, halides, sulfides, sulfates, and nitrates	-	3E+5	1E-4	4E-7	-	-
51	Antimony-116m[2]	D, see ^{115}Sb	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		W, see ^{115}Sb	-	1E+5	6E-5	2E-7	-	-
51	Antimony-116[2]	D, see ^{115}Sb	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
		W, see ^{115}Sb	-	3E+5	1E-4	5E-7	-	-
51	Antimony-117	D, see ^{115}Sb	7E+4	2E+5	9E-5	3E-7	9E-4	9E-3
		W, see ^{115}Sb	-	3E+5	1E-4	4E-7	-	-
51	Antimony-118m	D, see ^{115}Sb	6E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		W, see ^{115}Sb	5E+3	2E+4	9E-6	3E-8	-	-
51	Antimony-119	D, see ^{115}Sb	2E+4	5E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{115}Sb	2E+4	3E+4	1E-5	4E-8	-	-
51	Antimony-120[2] (16 min)	D, see ^{115}Sb	1E+5	4E+5	2E-4	6E-7	-	-
			St wall (2E+5)	-	-	-	2E-3	2E-2
		W, see ^{115}Sb	-	5E+5	2E-4	7E-7	-	-
51	Antimony-120 (5.76 d)	D, see ^{115}Sb	1E+3	2E+3	9E-7	3E-9	1E-5	1E-4
		W, see ^{115}Sb	9E+2	1E+3	5E-7	2E-9	-	-
51	Antimony-122	D, see ^{115}Sb	8E+2	2E+3	1E-6	3E-9	-	-
			LLI wall (8E+2)	-	-	-	1E-5	1E-4
		W, see ^{115}Sb	7E+2	1E+3	4E-7	2E-9	-	-
51	Antimony-124m[2]	D, see ^{115}Sb	3E+5	8E+5	4E-4	1E-6	3E-3	3E-2
		W, see ^{115}Sb	2E+5	6E+5	2E-4	8E-7	-	-
51	Antimony-124	D, see ^{115}Sb	6E+2	9E+2	4E-7	1E-9	7E-6	7E-5
		W, see ^{115}Sb	5E+2	2E+2	1E-7	3E-10	-	-
51	Antimony-125	D, see ^{115}Sb	2E+3	2E+3	1E-6	3E-9	3E-5	3E-4
		W, see ^{115}Sb	-	5E+2	2E-7	7E-10	-	-
51	Antimony-126m[2]	D, see ^{115}Sb	5E+4	2E+5	8E-5	3E-7	-	-
			St wall (7E+4)	-	-	-	9E-4	9E-3
		W, see ^{115}Sb	-	2E+5	8E-5	3E-7	-	-
51	Antimony-126	D, see ^{115}Sb	6E+2	1E+3	5E-7	2E-9	7E-6	7E-5
		W, see ^{115}Sb	5E+2	5E+2	2E-7	7E-10	-	-
51	Antimony-127	D, see ^{115}Sb	8E+2	2E+3	9E-7	3E-9	-	-
			LLI wall (8E+2)	-	-	-	1E-5	1E-4
		W, see ^{115}Sb	7E+2	9E+2	4E-7	1E-9	-	-
51	Antimony-128[2] (10.4 min)	D, see ^{115}Sb	8E+4	4E+5	2E-4	5E-7	-	-
			St wall (1E+5)	-	-	-	1E-3	1E-2
		W, see ^{115}Sb	-	4E+5	2E-4	6E-7	-	-
51	Antimony-128 (9.01 h)	D, see ^{115}Sb	1E+3	4E+3	2E-6	6E-9	2E-5	2E-4
		W, see ^{115}Sb	-	3E+3	1E-6	5E-9	-	-
51	Antimony-129	D, see ^{115}Sb	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		W, see ^{115}Sb	-	9E+3	4E-6	1E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
51	Antimony-130[2]	D, see ^{115}Sb	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		W, see ^{115}Sb	-	8E+4	3E-5	1E-7	-	-
51	Antimony-131[2]	D, see ^{115}Sb	1E+4 Thyroid (2E+4)	2E+4 Thyroid (4E+4)	1E-5 -	- 6E-8	- 2E-4	- 2E-3
		W, see ^{115}Sb	- -	2E+4 Thyroid (4E+4)	1E-5 -	6E-8	- -	- -
52	Tellurium-116	D, all compounds except those given for W	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, oxides, hydroxides, and nitrates	-	3E+4	1E-5	4E-8	-	-
52	Tellurium-121m	D, see ^{116}Te	5E+2 Bone surf (7E+2)	2E+2 Bone surf (4E+2)	8E-8 -	- 5E-10	- 1E-5	- 1E-4
		W, see ^{116}Te	-	4E+2	2E-7	6E-10	-	-
52	Tellurium-121	D, see ^{116}Te	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W, see ^{116}Te	-	3E+3	1E-6	4E-9	-	-
52	Tellurium-123m	D, see ^{116}Te	6E+2 Bone surf (1E+3)	2E+2 Bone surf (5E+2)	9E-8 -	- 8E-10	- 1E-5	- 1E-4
		W, see ^{116}Te	-	5E+2	2E-7	8E-10	-	-
52	Tellurium-123	D, see ^{116}Te	5E+2 Bone surf (1E+3)	2E+2 Bone surf (5E+2)	8E-8 -	- 7E-10	- 2E-5	- 2E-4
		W, see ^{116}Te	- -	4E+2 Bone surf (1E+3)	2E-7 -	- 2E-9	- -	- -
52	Tellurium-125m	D, see ^{116}Te	1E+3 Bone surf (1E+3)	4E+2 Bone surf (1E+3)	2E-7 -	- 1E-9	- 2E-5	- 2E-4
		W, see ^{116}Te	-	7E+2	3E-7	1E-9	-	-
52	Tellurium-127m	D, see ^{116}Te	6E+2	3E+2 Bone surf (4E+2)	1E-7 -	- 6E-10	9E-6 -	9E-5 -
		W, see ^{116}Te	-	3E+2	1E-7	4E-10	-	-
52	Tellurium-127	D, see ^{116}Te	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see ^{116}Te	-	2E+4	7E-6	2E-8	-	-
52	Tellurium-129m	D, see ^{116}Te	5E+2	6E+2	3E-7	9E-10	7E-6	7E-5
		W, see ^{116}Te	-	2E+2	1E-7	3E-10	-	-
52	Tellurium-129[2]	D, see ^{116}Te	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
		W, see ^{116}Te	-	7E+4	3E-5	1E-7	-	-
52	Tellurium-131m	D, see ^{116}Te	3E+2 Thyroid (6E+2)	4E+2 Thyroid (1E+3)	2E-7 -	- 2E-9	- 8E-6	- 8E-5
		W, see ^{116}Te	- -	4E+2 Thyroid (9E+2)	2E-7 -	- 1E-9	- -	- -

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
52	Tellurium-131[2]	D, see ^{116}Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- 8E-5	- 8E-4
		W, see ^{116}Te	- -	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- -	- -
52	Tellurium-132	D, see ^{116}Te	2E+2 Thyroid (7E+2)	2E+2 Thyroid (8E+2)	9E-8 -	- 1E-9	- 9E-6	- 9E-5
		W, see ^{116}Te	- -	2E+2 Thyroid (6E+2)	9E-8 -	- 9E-10	- -	- -
52	Tellurium-133m[2]	D, see ^{116}Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- 9E-5	- 9E-4
		W, see ^{116}Te	- -	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- -	- -
52	Tellurium-133[2]	D, see ^{116}Te	1E+4 Thyroid (3E+4)	2E+4 Thyroid (6E+4)	9E-6 -	- 8E-8	- 4E-4	- 4E-3
		W, see ^{116}Te	- -	2E+4 Thyroid (6E+4)	9E-6 -	- 8E-8	- -	- -
52	Tellurium-134[2]	D, see ^{116}Te	2E+4 Thyroid (2E+4)	2E+4 Thyroid (5E+4)	1E-5 -	- 7E-8	- 3E-4	- 3E-3
		W, see ^{116}Te	- -	2E+4 Thyroid (5E+4)	1E-5 -	- 7E-8	- -	- -
53	Iodine-120m[2]	D, all compounds	1E+4 Thyroid (1E+4)	2E+4 -	9E-6 -	3E-8 -	- 2E-4	- 2E-3
53	Iodine-120[2]	D, all compounds	4E+3 Thyroid (8E+3)	9E+3 Thyroid (1E+4)	4E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-121	D, all compounds	1E+4 Thyroid (3E+4)	2E+4 Thyroid (5E+4)	8E-6 -	- 7E-8	- 4E-4	- 4E-3
53	Iodine-123	D, all compounds	3E+3 Thyroid (1E+4)	6E+3 Thyroid (2E+4)	3E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-124	D, all compounds	5E+1 Thyroid (2E+2)	8E+1 Thyroid (3E+2)	3E-8 -	- 4E-10	- 2E-6	- 2E-5
53	Iodine-125	D, all compounds	4E+1 Thyroid (1E+2)	6E+1 Thyroid (2E+2)	3E-8 -	- 3E-10	- 2E-6	- 2E-5
53	Iodine-126	D, all compounds	2E+1	4E+1	1E-8	-	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			Thyroid (7E+1)	Thyroid (1E+2)	-	2E-10	1E-6	1E-5
53	Iodine-128[2]	D, all compounds	4E+4 St wall (6E+4)	1E+5 -	5E-5 -	2E-7 -	- 8E-4	- 8E-3
53	Iodine-129	D, all compounds	5E+0 Thyroid (2E+1)	9E+0 Thyroid (3E+1)	4E-9 -	- 4E-11	- 2E-7	- 2E-6
53	Iodine-130	D, all compounds	4E+2 Thyroid (1E+3)	7E+2 Thyroid (2E+3)	3E-7 -	- 3E-9	- 2E-5	- 2E-4
53	Iodine-131	D, all compounds	3E+1 Thyroid (9E+1)	5E+1 Thyroid (2E+2)	2E-8 -	- 2E-10	- 1E-6	- 1E-5
53	Iodine-132m[2]	D, all compounds	4E+3 Thyroid (1E+4)	8E+3 Thyroid (2E+4)	4E-6 -	- 3E-8	- 1E-4	- 1E-3
53	Iodine-132	D, all compounds	4E+3 Thyroid (9E+3)	8E+3 Thyroid (1E+4)	3E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-133	D, all compounds	1E+2 Thyroid (5E+2)	3E+2 Thyroid (9E+2)	1E-7 -	- 1E-9	- 7E-6	- 7E-5
53	Iodine-134[2]	D, all compounds	2E+4 Thyroid (3E+4)	5E+4 -	2E-5 -	6E-8 -	- 4E-4	- 4E-3
53	Iodine-135	D, all compounds	8E+2 Thyroid (3E+3)	2E+3 Thyroid (4E+3)	7E-7 -	- 6E-9	- 3E-5	- 3E-4
54	Xenon-120[2]	Submersion[1]	-	-	1E-5	4E-8	-	-
54	Xenon-121[2]	Submersion[1]	-	-	2E-6	1E-8	-	-
54	Xenon-122	Submersion[1]	-	-	7E-5	3E-7	-	-
54	Xenon-123	Submersion[1]	-	-	6E-6	3E-8	-	-
54	Xenon-125	Submersion[1]	-	-	2E-5	7E-8	-	-
54	Xenon-127	Submersion[1]	-	-	1E-5	6E-8	-	-
54	Xenon-129m	Submersion[1]	-	-	2E-4	9E-7	-	-
54	Xenon-131m	Submersion[1]	-	-	4E-4	2E-6	-	-
54	Xenon-133m	Submersion[1]	-	-	1E-4	6E-7	-	-
54	Xenon-133	Submersion[1]	-	-	1E-4	5E-7	-	-
54	Xenon-135m[2]	Submersion[1]	-	-	9E-6	4E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
54	Xenon-135	Submersion[1]	-	-	1E-5	7E-8	-	-
54	Xenon-138[2]	Submersion[1]	-	-	4E-6	2E-8	-	-
55	Cesium-125[2]	D, all compounds	5E+4	1E+5	6E-5	2E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
55	Cesium-127	D, all compounds	6E+4	9E+4	4E-5	1E-7	9E-4	9E-3
55	Cesium-129	D, all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
55	Cesium-130[2]	D, all compounds	6E+4	2E+5	8E-5	3E-7	-	-
			St wall (1E+5)	-	-	-	1E-3	1E-2
55	Cesium-131	D, all compounds	2E+4	3E+4	1E-5	4E-8	3E-4	3E-3
55	Cesium-132	D, all compounds	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
55	Cesium-134m	D, all compounds	1E+5	1E+5	6E-5	2E-7	-	-
			St wall (1E+5)	-	-	-	2E-3	2E-2
55	Cesium-134	D, all compounds	7E+1	1E+2	4E-8	2E-10	9E-7	9E-6
55	Cesium-135m[2]	D, all compounds	1E+5	2E+5	8E-5	3E-7	1E-3	1E-2
55	Cesium-135	D, all compounds	7E+2	1E+3	5E-7	2E-9	1E-5	1E-4
55	Cesium-136	D, all compounds	4E+2	7E+2	3E-7	9E-10	6E-6	6E-5
55	Cesium-137	D, all compounds	1E+2	2E+2	6E-8	2E-10	1E-6	1E-5
55	Cesium-138[2]	D, all compounds	2E+4	6E+4	2E-5	8E-8	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
56	Barium-126[2]	D, all compounds	6E+3	2E+4	6E-6	2E-8	8E-5	8E-4
56	Barium-128	D, all compounds	5E+2	2E+3	7E-7	2E-9	7E-6	7E-5
56	Barium-131m[2]	D, all compounds	4E+5	1E+6	6E-4	2E-6	-	-
			St wall (5E+5)	-	-	-	7E-3	7E-2
56	Barium-131	D, all compounds	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
56	Barium-133m	D, all compounds	2E+3	9E+3	4E-6	1E-8	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
56	Barium-133	D, all compounds	2E+3	7E+2	3E-7	9E-10	2E-5	2E-4
56	Barium-135m	D, all compounds	3E+3	1E+4	5E-6	2E-8	4E-5	4E-4
56	Barium-139[2]	D, all compounds	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
56	Barium-140	D, all compounds	5E+2	1E+3	6E-7	2E-9	-	-
			LLI wall					

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			(6E+2)	-	-	-	8E-6	8E-5
56	Barium-141[2]	D, all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
56	Barium-142[2]	D, all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
57	Lanthanum-131[2]	D, all compounds except those given for W	5E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		W, oxides and hydroxides	-	2E+5	7E-5	2E-7	-	-
57	Lanthanum-132	D, see ^{131}La	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4
		W, see ^{131}La	-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-135	D, see ^{131}La	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
		W, see ^{131}La	-	9E+4	4E-5	1E-7	-	-
57	Lanthanum-137	D, see ^{131}La	1E+4	6E+1 Liver	3E-8	-	2E-4	2E-3
			-	(7E+1)	-	1E-10	-	-
		W, see ^{131}La	-	3E+2	1E-7	-	-	-
			-	Liver (3E+2)	-	4E-10	-	-
57	Lanthanum-138	D, see ^{131}La	9E+2	4E+0	1E-9	5E-12	1E-5	1E-4
		W, see ^{131}La	-	1E+1	6E-9	2E-11	-	-
57	Lanthanum-140	D, see ^{131}La	6E+2	1E+3	6E-7	2E-9	9E-6	9E-5
		W, see ^{131}La	-	1E+3	5E-7	2E-9	-	-
57	Lanthanum-141	D, see ^{131}La	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
		W, see ^{131}La	-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-142[2]	D, see ^{131}La	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see ^{131}La	-	3E+4	1E-5	5E-8	-	-
57	Lanthanum-143[2]	D, see ^{131}La	4E+4	1E+5	4E-5	1E-7	-	-
			St wall (4E+4)	-	-	-	5E-4	5E-3
		W, see ^{131}La	-	9E+4	4E-5	1E-7	-	-
58	Cerium-134	W, all compounds except those given for Y	5E+2	7E+2	3E-7	1E-9	-	-
			LLI wall (6E+2)	-	-	-	8E-6	8E-5
		Y, oxides, hydroxides, and fluorides	-	7E+2	3E-7	9E-10	-	-
58	Cerium-135	W, see ^{134}Ce	2E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		Y, see ^{134}Ce	-	4E+3	1E-6	5E-9	-	-
58	Cerium-137m	W, see ^{134}Ce	2E+3	4E+3	2E-6	6E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		Y, see ^{134}Ce	-	4E+3	2E-6	5E-9	-	-
58	Cerium-137	W, see ^{134}Ce	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
		Y, see ^{134}Ce	-	1E+5	5E-5	2E-7	-	-
58	Cerium-139	W, see ^{134}Ce	5E+3	8E+2	3E-7	1E-9	7E-5	7E-4

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		Y, see ^{134}Ce	-	7E+2	3E-7	9E-10	-	-
58	Cerium-141	W, see ^{134}Ce	2E+3	7E+2	3E-7	1E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		Y, see ^{134}Ce	-	6E+2	2E-7	8E-10	-	-
58	Cerium-143	W, see ^{134}Ce	1E+3	2E+3	8E-7	3E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see ^{134}Ce	-	2E+3	7E-7	2E-9	-	-
58	Cerium-144	W, see ^{134}Ce	2E+2	3E+1	1E-8	4E-11	-	-
			LLI wall (3E+2)	-	-	-	3E-6	3E-5
		Y, see ^{134}Ce	-	1E+1	6E-9	2E-11	-	-
59	Praseodymium-136[2]	W, all compounds except those given for Y	5E+4	2E+5	1E-4	3E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
		Y, oxides, hydroxides, carbides, and fluorides	-	2E+5	9E-5	3E-7	-	-
59	Praseodymium-137[2]	W, see ^{136}Pr	4E+4	2E+5	6E-5	2E-7	5E-4	5E-3
		Y, see ^{136}Pr	-	1E+5	6E-5	2E-7	-	-
59	Praseodymium-138m	W, see ^{136}Pr	1E+4	5E+4	2E-5	8E-8	1E-4	1E-3
		Y, see ^{136}Pr	-	4E+4	2E-5	6E-8	-	-
59	Praseodymium-139	W, see ^{136}Pr	4E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		Y, see ^{136}Pr	-	1E+5	5E-5	2E-7	-	-
59	Praseodymium-142m[2]	W, see ^{136}Pr	8E+4	2E+5	7E-5	2E-7	1E-3	1E-2
		Y, see ^{136}Pr	-	1E+5	6E-5	2E-7	-	-
59	Praseodymium-142	W, see ^{136}Pr	1E+3	2E+3	9E-7	3E-9	1E-5	1E-4
		Y, see ^{136}Pr	-	2E+3	8E-7	3E-9	-	-
59	Praseodymium-143	W, see ^{136}Pr	9E+2	8E+2	3E-7	1E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see ^{136}Pr	-	7E+2	3E-7	9E-10	-	-
59	Praseodymium-144[2]	W, see ^{136}Pr	3E+4	1E+5	5E-5	2E-7	-	-
			St wall (4E+4)	-	-	-	6E-4	6E-3
		Y, see ^{136}Pr	-	1E+5	5E-5	2E-7	-	-
59	Praseodymium-145	W, see ^{136}Pr	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		Y, see ^{136}Pr	-	8E+3	3E-6	1E-8	-	-
59	Praseodymium-147[2]	W, see ^{136}Pr	5E+4	2E+5	8E-5	3E-7	-	-
			St wall (8E+4)	-	-	-	1E-3	1E-2
		Y, see ^{136}Pr	-	2E+5	8E-5	3E-7	-	-
60	Neodymium-136[2]	W, all compounds except those given for Y	1E+4	6E+4	2E-5	8E-8	2E-4	2E-3
		Y, oxides, hydroxides, carbides, and fluorides	-	5E+4	2E-5	8E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
60	Neodymium-138	W, see ^{136}Nd	2E+3	6E+3	3E-6	9E-9	3E-5	3E-4
		Y, see ^{136}Nd	-	5E+3	2E-6	7E-9	-	-
60	Neodymium-139m	W, see ^{136}Nd	5E+3	2E+4	7E-6	2E-8	7E-5	7E-4
		Y, see ^{136}Nd	-	1E+4	6E-6	2E-8	-	-
60	Neodymium-139[2]	W, see ^{136}Nd	9E+4	3E+5	1E-4	5E-7	1E-3	1E-2
		Y, see ^{136}Nd	-	3E+5	1E-4	4E-7	-	-
60	Neodymium-141	W, see ^{136}Nd	2E+5	7E+5	3E-4	1E-6	2E-3	2E-2
		Y, see ^{136}Nd	-	6E+5	3E-4	9E-7	-	-
60	Neodymium-147	W, see ^{136}Nd	1E+3	9E+2	4E-7	1E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see ^{136}Nd	-	8E+2	4E-7	1E-9	-	-
60	Neodymium-149[2]	W, see ^{136}Nd	1E+4	3E+4	1E-5	4E-8	1E-4	1E-3
		Y, see ^{136}Nd	-	2E+4	1E-5	3E-8	-	-
60	Neodymium-151[2]	W, see ^{136}Nd	7E+4	2E+5	8E-5	3E-7	9E-4	9E-3
		Y, see ^{136}Nd	-	2E+5	8E-5	3E-7	-	-
61	Promethium-141[2]	W, all compounds except those given for Y	5E+4	2E+5	8E-5	3E-7	-	-
			St wall (6E+4)	-	-	-	8E-4	8E-3
		Y, oxides, hydroxides, carbides, and fluorides	-	2E+5	7E-5	2E-7	-	-
61	Promethium-143	W, see ^{141}Pm	5E+3	6E+2	2E-7	8E-10	7E-5	7E-4
		Y, see ^{141}Pm	-	7E+2	3E-7	1E-9	-	-
61	Promethium-144	W, see ^{141}Pm	1E+3	1E+2	5E-8	2E-10	2E-5	2E-4
		Y, see ^{141}Pm	-	1E+2	5E-8	2E-10	-	-
61	Promethium-145	W, see ^{141}Pm	1E+4	2E+2	7E-8	-	1E-4	1E-3
			-	Bone surf (2E+2)	-	3E-10	-	-
		Y, see ^{141}Pm	-	2E+2	8E-8	3E-10	-	-
61	Promethium-146	W, see ^{141}Pm	2E+3	5E+1	2E-8	7E-11	2E-5	2E-4
		Y, see ^{141}Pm	-	4E+1	2E-8	6E-11	-	-
61	Promethium-147	W, see ^{141}Pm	4E+3	1E+2	5E-8	-	-	-
			LLI wall (5E+3)	Bone surf (2E+2)	-	3E-10	7E-5	7E-4
		Y, see ^{141}Pm	-	1E+2	6E-8	2E-10	-	-
61	Promethium-148m	W, see ^{141}Pm	7E+2	3E+2	1E-7	4E-10	1E-5	1E-4
		Y, see ^{141}Pm	-	3E+2	1E-7	5E-10	-	-
61	Promethium-148	W, see ^{141}Pm	4E+2	5E+2	2E-7	8E-10	-	-
			LLI wall (5E+2)	-	-	-	7E-6	7E-5
		Y, see ^{141}Pm	-	5E+2	2E-7	7E-10	-	-
61	Promethium-149	W, see ^{141}Pm	1E+3	2E+3	8E-7	3E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		Y, see ^{141}Pm	-	2E+3	8E-7	2E-9	-	-
61	Promethium-150	W, see ^{141}Pm	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y, see ^{141}Pm	-	2E+4	7E-6	2E-8	-	-
61	Promethium-151	W, see ^{141}Pm	2E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		Y, see ^{141}Pm	-	3E+3	1E-6	4E-9	-	-
62	Samarium-141m[2]	W, all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
62	Samarium-141[2]	W, all compounds	5E+4	2E+5	8E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	8E-4	8E-3
62	Samarium-142[2]	W, all compounds	8E+3	3E+4	1E-5	4E-8	1E-4	1E-3
62	Samarium-145	W, all compounds	6E+3	5E+2	2E-7	7E-10	8E-5	8E-4
62	Samarium-146	W, all compounds	1E+1	4E-2	1E-11	-	-	-
			Bone surf (3E+1)	Bone surf (6E-2)	-	9E-14	3E-7	3E-6
62	Samarium-147	W, all compounds	2E+1	4E-2	2E-11	-	-	-
			Bone surf (3E+1)	Bone surf (7E-2)	-	1E-13	4E-7	4E-6
62	Samarium-151	W, all compounds	1E+4	1E+2	4E-8	-	-	-
			LLI wall (1E+4)	Bone surf (2E+2)	-	2E-10	2E-4	2E-3
62	Samarium-153	W, all compounds	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
62	Samarium-155[2]	W, all compounds	6E+4	2E+5	9E-5	3E-7	-	-
			St wall (8E+4)	-	-	-	1E-3	1E-2
62	Samarium-156	W, all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
63	Europium-145	W, all compounds	2E+3	2E+3	8E-7	3E-9	2E-5	2E-4
63	Europium-146	W, all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
63	Europium-147	W, all compounds	3E+3	2E+3	7E-7	2E-9	4E-5	4E-4
63	Europium-148	W, all compounds	1E+3	4E+2	1E-7	5E-10	1E-5	1E-4
63	Europium-149	W, all compounds	1E+4	3E+3	1E-6	4E-9	2E-4	2E-3
63	Europium-150 (12.62 h)	W, all compounds	3E+3	8E+3	4E-6	1E-8	4E-5	4E-4
63	Europium-150 (34.2 y)	W, all compounds	8E+2	2E+1	8E-9	3E-11	1E-5	1E-4
63	Europium-152m	W, all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
63	Europium-152	W, all compounds	8E+2	2E+1	1E-8	3E-11	1E-5	1E-4
63	Europium-154	W, all compounds	5E+2	2E+1	8E-9	3E-11	7E-6	7E-5

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
63	Europium-155	W, all compounds	4E+3	9E+1	4E-8	-	5E-5	5E-4
			-	Bone surf (1E+2)	-	2E-10	-	-
63	Europium-156	W, all compounds	6E+2	5E+2	2E-7	6E-10	8E-6	8E-5
63	Europium-157	W, all compounds	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4
63	Europium-158[2]	W, all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
64	Gadolinium-145[2]	D, all compounds except those given for W	5E+4	2E+5	6E-5	2E-7	-	-
			St wall (5E+4)	-	-	-	6E-4	6E-3
		W, oxides, hydroxides, and fluorides	-	2E+5	7E-5	2E-7	-	-
64	Gadolinium-146	D, see ^{145}Gd	1E+3	1E+2	5E-8	2E-10	2E-5	2E-4
		W, see ^{145}Gd	-	3E+2	1E-7	4E-10	-	-
64	Gadolinium-147	D, see ^{145}Gd	2E+3	4E+3	2E-6	6E-9	3E-5	3E-4
		W, see ^{145}Gd	-	4E+3	1E-6	5E-9	-	-
64	Gadolinium-148	D, see ^{145}Gd	1E+1	8E+3	3E-12	-	-	-
			Bone surf (2E+1)	Bone surf (2E-2)	-	2E-14	3E-7	3E-6
		W, see ^{145}Gd	-	3E-2	1E-11	-	-	-
			-	Bone surf (6E-2)	-	8E-14	-	-
64	Gadolinium-149	D, see ^{145}Gd	3E+3	2E+3	9E-7	3E-9	4E-5	4E-4
		W, see ^{145}Gd	-	2E+3	1E-6	3E-9	-	-
64	Gadolinium-151	D, see ^{145}Gd	6E+3	4E+2	2E-7	-	9E-5	9E-4
			-	Bone surf (6E+2)	-	9E-10	-	-
		W, see ^{145}Gd	-	1E+3	5E-7	2E-9	-	-
64	Gadolinium-152	D, see ^{145}Gd	2E+1	1E-2	4E-12	-	-	-
			Bone surf (3E+1)	Bone surf (2E-2)	-	3E-14	4E-7	4E-6
		W, see ^{145}Gd	-	4E-2	2E-11	-	-	-
			-	Bone surf (8E-2)	-	1E-13	-	-
64	Gadolinium-153	D, see ^{145}Gd	5E+3	1E+2	6E-8	-	6E-5	6E-4
			-	Bone surf (2E+2)	-	3E-10	-	-
		W, see ^{145}Gd	-	6E+2	2E-7	8E-10	-	-
64	Gadolinium-159	D, see ^{145}Gd	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see ^{145}Gd	-	6E+3	2E-6	8E-9	-	-
65	Terbium-147[2]	W, all compounds	9E+3	3E+4	1E-5	5E-8	1E-4	1E-3
65	Terbium-149	W, all compounds	5E+3	7E+2	3E-7	1E-9	7E-5	7E-4
65	Terbium-150	W, all compounds	5E+3	2E+4	9E-6	3E-8	7E-5	7E-4

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
65	Terbium-151	W, all compounds	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
65	Terbium-153	W, all compounds	5E+3	7E+3	3E-6	1E-8	7E-5	7E-4
65	Terbium-154	W, all compounds	2E+3	4E+3	2E-6	6E-9	2E-5	2E-4
65	Terbium-155	W, all compounds	6E+3	8E+3	3E-6	1E-8	8E-5	8E-4
65	Terbium-156m (5.0 h)	W, all compounds	2E+4	3E+4	1E-5	4E-8	2E-4	2E-3
65	Terbium-156m (24.4 h)	W, all compounds	7E+3	8E+3	3E-6	1E-8	1E-4	1E-3
65	Terbium-156	W, all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4
65	Terbium-157	W, all compounds	5E+4 LLI wall (5E+4)	3E+2 Bone surf (6E+2)	1E-7 -	- 8E-10	- 7E-4	- 7E-3
65	Terbium-158	W, all compounds	1E+3	2E+1	8E-9	3E-11	2E-5	2E-4
65	Terbium-160	W, all compounds	8E+2	2E+2	9E-8	3E-10	1E-5	1E-4
65	Terbium-161	W, all compounds	2E+3 LLI wall (2E+3)	2E+3 -	7E-7 -	2E-9 -	- 3E-5	- 3E-4
66	Dysprosium-155	W, all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
66	Dysprosium-157	W, all compounds	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
66	Dysprosium-159	W, all compounds	1E+4	2E+3	1E-6	3E-9	2E-4	2E-3
66	Dysprosium-165	W, all compounds	1E+4	5E+4	2E-5	6E-8	2E-4	2E-3
66	Dysprosium-166	W, all compounds	6E+2 LLI wall (8E+2)	7E+2 -	3E-7 -	1E-9 -	- 1E-5	- 1E-4
67	Holmium-155[2]	W, all compounds	4E+4	2E+5	6E-5	2E-7	6E-4	6E-3
67	Holmium-157[2]	W, all compounds	3E+5	1E+6	6E-4	2E-6	4E-3	4E-2
67	Holmium-159[2]	W, all compounds	2E+5	1E+6	4E-4	1E-6	3E-3	3E-2
67	Holmium-161	W, all compounds	1E+5	4E+5	2E-4	6E-7	1E-3	1E-2
67	Holmium-162m[2]	W, all compounds	5E+4	3E+5	1E-4	4E-7	7E-4	7E-3
67	Holmium-162[2]	W, all compounds	5E+5 St wall (8E+5)	2E+6 -	1E-3 -	3E-6 -	- 1E-2	- 1E-1
67	Holmium-164m[2]	W, all compounds	1E+5	3E+5	1E-4	4E-7	1E-3	1E-2
67	Holmium-164[2]	W, all compounds	2E+5 St wall (2E+5)	6E+5 -	3E-4 -	9E-7 -	- 3E-3	- 3E-2
67	Holmium-166m	W, all compounds	6E+2	7E+0	3E-9	9E-12	9E-6	9E-5

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
67	Holmium-166	W, all compounds	9E+2	2E+3	7E-7	2E-9	-	-
			LLI wall (9E+2)	-	-	-	1E-5	1E-4
67	Holmium-167	W, all compounds	2E+4	6E+4	2E-5	8E-8	2E-4	2E-3
68	Erbium-161	W, all compounds	2E+4	6E+4	3E-5	9E-8	2E-4	2E-3
68	Erbium-165	W, all compounds	6E+4	2E+5	8E-5	3E-7	9E-4	9E-3
68	Erbium-169	W, all compounds	3E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (4E+3)	-	-	-	5E-5	5E-4
68	Erbium-171	W, all compounds	4E+3	1E+4	4E-6	1E-8	5E-5	5E-4
68	Erbium-172	W, all compounds	1E+3	1E+3	6E-7	2E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
69	Thulium-162[2]	W, all compounds	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
69	Thulium-166	W, all compounds	4E+3	1E+4	6E-6	2E-8	6E-5	6E-4
69	Thulium-167	W, all compounds	2E+3	2E+3	8E-7	3E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
69	Thulium-170	W, all compounds	8E+2	2E+2	9E-8	3E-10	-	-
			LLI wall (1E+3)	-	-	-	1E-5	1E-4
69	Thulium-171	W, all compounds	1E+4	3E+2	1E-7	-	-	-
			LLI wall (1E+4)	Bone surf (6E+2)	-	8E-10	2E-4	2E-3
69	Thulium-172	W, all compounds	7E+2	1E+3	5E-7	2E-9	-	-
			LLI wall (8E+2)	-	-	-	1E-5	1E-4
69	Thulium-173	W, all compounds	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
69	Thulium-175[2]	W, all compounds	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (9E+4)	-	-	-	1E-3	1E-2
70	Ytterbium-162[2]	W, all compounds except those given for Y	7E+4	3E+5	1E-4	4E-7	1E-3	1E-2
		Y, oxides, hydroxides, and fluorides	-	3E+5	1E-4	4E-7	-	-
70	Ytterbium-166	W, see ^{162}Yb	1E+3	2E+3	8E-7	3E-9	2E-5	2E-4
		Y, see ^{162}Yb	-	2E+3	8E-7	3E-9	-	-
70	Ytterbium-167[2]	W, see ^{162}Yb	3E+5	8E+5	3E-4	1E-6	4E-3	4E-2
		Y, see ^{162}Yb	-	7E+5	3E-4	1E-6	-	-
70	Ytterbium-169	W, see ^{162}Yb	2E+3	8E+2	4E-7	1E-9	2E-5	2E-4

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		Y, see ^{162}Yb	-	7E+2	3E-7	1E-9	-	-
70	Ytterbium-175	W, see ^{162}Yb	3E+3	4E+3	1E-6	5E-9	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
		Y, see ^{162}Yb	-	3E+3	1E-6	5E-9	-	-
70	Ytterbium-177[2]	W, see ^{162}Yb	2E+4	5E+4	2E-5	7E-8	2E-4	2E-3
		Y, see ^{162}Yb	-	5E+4	2E-5	6E-8	-	-
70	Ytterbium-178[2]	W, see ^{162}Yb	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		Y, see ^{162}Yb	-	4E+4	2E-5	5E-8	-	-
71	Lutetium-169	W, all compounds except those given for Y	3E+3	4E+3	2E-6	6E-9	3E-5	3E-4
		Y, oxides, hydroxides, and fluorides	-	4E+3	2E-6	6E-9	-	-
71	Lutetium-170	W, see ^{169}Lu	1E+3	2E+3	9E-7	3E-9	2E-5	2E-4
		Y, see ^{169}Lu	-	2E+3	8E-7	3E-9	-	-
71	Lutetium-171	W, see ^{169}Lu	2E+3	2E+3	8E-7	3E-9	3E-5	3E-4
		Y, see ^{169}Lu	-	2E+3	8E-7	3E-9	-	-
71	Lutetium-172	W, see ^{169}Lu	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
		Y, see ^{169}Lu	-	1E+3	5E-7	2E-9	-	-
71	Lutetium-173	W, see ^{169}Lu	5E+3	3E+2 Bone surf	1E-7	-	7E-5	7E-4
			-	(5E+2)	-	6E-10	-	-
		Y, see ^{169}Lu	-	3E+2	1E-7	4E-10	-	-
71	Lutetium-174m	W, see ^{169}Lu	2E+3	2E+2	1E-7	-	-	-
			LLI wall (3E+3)	Bone surf (3E+2)	-	5E-10	4E-5	4E-4
		Y, see ^{169}Lu	-	2E+2	9E-8	3E-10	-	-
71	Lutetium-174	W, see ^{169}Lu	5E+3	1E+2 Bone surf	5E-8	-	7E-5	7E-4
			-	(2E+2)	-	3E-10	-	-
		Y, see ^{169}Lu	-	2E+2	6E-8	2E-10	-	-
71	Lutetium-176m	W, see ^{169}Lu	8E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		Y, see ^{169}Lu	-	2E+4	9E-6	3E-8	-	-
71	Lutetium-176	W, see ^{169}Lu	7E+2	5E+0 Bone surf	2E-9	-	1E-5	1E-4
			-	(1E+1)	-	2E-11	-	-
		Y, see ^{169}Lu	-	8E+0	3E-9	1E-11	-	-
71	Lutetium-177m	W, see ^{169}Lu	7E+2	1E+2 Bone surf	5E-8	-	1E-5	1E-4
			-	(1E+2)	-	2E-10	-	-
		Y, see ^{169}Lu	-	8E+1	3E-8	1E-10	-	-
71	Lutetium-177	W, see ^{169}Lu	2E+3	2E+3	9E-7	3E-9	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
		Y, see ^{169}Lu	-	2E+3	9E-7	3E-9	-	-
71	Lutetium-178m[2]	W, see ^{169}Lu	5E+4	2E+5	8E-5	3E-7	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			St. wall (6E+4)	-	-	-	8E-4	8E-3
		Y, see ^{169}Lu	-	2E+5	7E-5	2E-7	-	-
71	Lutetium-178[2]	W, see ^{169}Lu	4E+4	1E+5	5E-5	2E-7	-	-
			St wall (4E+4)	-	-	-	6E-4	6E-3
		Y, see ^{169}Lu	-	1E+5	5E-5	2E-7	-	-
71	Lutetium-179	W, see ^{169}Lu	6E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		Y, see ^{169}Lu	-	2E+4	6E-6	3E-8	-	-
72	Hafnium-170	D, all compounds except those given for W	3E+3	6E+3	2E-6	8E-9	4E-5	4E-4
		W, oxides, hydroxides, carbides, and nitrates	-	5E+3	2E-6	6E-9	-	-
72	Hafnium-172	D, see ^{170}Hf	1E+3	9E+0	4E-9	-	2E-5	2E-4
			-	Bone surf (2E+1)	-	3E-11	-	-
		W, see ^{170}Hf	-	4E+1	2E-8	-	-	-
			-	Bone surf (6E+1)	-	8E-11	-	-
72	Hafnium-173	D, see ^{170}Hf	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see ^{170}Hf	-	1E+4	5E-6	2E-8	-	-
72	Hafnium-175	D, see ^{170}Hf	3E+3	9E+2	4E-7	-	4E-5	4E-4
			-	Bone surf (1E+3)	-	1E-9	-	-
		W, see ^{170}Hf	-	1E+3	5E-7	2E-9	-	-
72	Hafnium-177m[2]	D, see ^{170}Hf	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
		W, see ^{170}Hf	-	9E+4	4E-5	1E-7	-	-
72	Hafnium-178m	D, see ^{170}Hf	3E+2	1E+0	5E-10	-	3E-6	3E-5
			-	Bone surf (2E+0)	-	3E-12	-	-
		W, see ^{170}Hf	-	5E+0	2E-9	-	-	-
			-	Bone surf (9E+0)	-	1E-11	-	-
72	Hafnium-179m	D, see ^{170}Hf	1E+3	3E+2	1E-7	-	1E-5	1E-4
			-	Bone surf (6E+2)	-	8E-10	-	-
		W, see ^{170}Hf	-	6E+2	3E-7	8E-10	-	-
72	Hafnium-180m	D, see ^{170}Hf	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see ^{170}Hf	-	3E+4	1E-5	4E-8	-	-
72	Hafnium-181	D, see ^{170}Hf	1E+3	2E+2	7E-8	-	2E-5	2E-4
			-	Bone surf (4E+2)	-	6E-10	-	-
		W, see ^{170}Hf	-	4E+2	2E-7	6E-10	-	-
72	Hafnium-182m[2]	D, see ^{170}Hf	4E+4	9E+4	4E-5	1E-7	5E-4	5E-3
		W, see ^{170}Hf	-	1E+5	6E-5	2E-7	-	-
72	Hafnium-182	D, see ^{170}Hf	2E+2	8E-1	3E-10	-	-	-
			Bone surf (4E+2)	Bone surf (2E+0)	-	2E-12	5E-6	5E-5

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		W, see ^{170}Hf	-	3E+0 Bone surf	1E-9	-	-	-
			-	(7E+0)	-	1E-11	-	-
72	Hafnium-183[2]	D, see ^{170}Hf	2E+4	5E+4	2E-5	6E-8	3E-4	3E-3
		W, see ^{170}Hf	-	6E+4	2E-5	8E-8	-	-
72	Hafnium-184	D, see ^{170}Hf	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		W, see ^{170}Hf	-	6E+3	3E-6	9E-9	-	-
73	Tantalum-172[2]	W, all compounds except those given for Y	4E+4	1E+5	5E-5	2E-7	5E-4	5E-3
		Y, elemental Ta, oxides, hydroxides, halides, carbides, nitrates, and nitrides	-	1E+5	4E-5	1E-7	-	-
73	Tantalum-173	W, see ^{172}Ta	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		Y, see ^{172}Ta	-	2E+4	7E-6	2E-8	-	-
73	Tantalum-174[2]	W, see ^{172}Ta	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
		Y, see ^{172}Ta	-	9E+4	4E-5	1E-7	-	-
73	Tantalum-175	W, see ^{172}Ta	6E+3	2E+4	7E-6	2E-8	8E-5	8E-4
		Y, see ^{172}Ta	-	1E+4	6E-6	2E-8	-	-
73	Tantalum-176	W, see ^{172}Ta	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
		Y, see ^{172}Ta	-	1E+4	5E-6	2E-8	-	-
73	Tantalum-177	W, see ^{172}Ta	1E+4	2E+4	8E-6	3E-8	2E-4	2E-3
		Y, see ^{172}Ta	-	2E+4	7E-6	2E-8	-	-
73	Tantalum-178	W, see ^{172}Ta	2E+4	9E+4	4E-5	1E-7	2E-4	2E-3
		Y, see ^{172}Ta	-	7E+4	3E-5	1E-7	-	-
73	Tantalum-179	W, see ^{172}Ta	2E+4	5E+3	2E-6	8E-9	3E-4	3E-3
		Y, see ^{172}Ta	-	9E+2	4E-7	1E-9	-	-
73	Tantalum-180m	W, see ^{172}Ta	2E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		Y, see ^{172}Ta	-	6E+4	2E-5	8E-8	-	-
73	Tantalum-180	W, see ^{172}Ta	1E+3	4E+2	2E-7	6E-10	2E-5	2E-4
		Y, see ^{172}Ta	-	2E+1	1E-8	3E-11	-	-
73	Tantalum-182m[2]	W, see ^{172}Ta	2E+5 St wall	5E+5	2E-4	8E-7	-	-
			(2E+5)	-	-	-	3E-3	3E-2
		Y, see ^{172}Ta	-	4E+5	2E-4	6E-7	-	-
73	Tantalum-182	W, see ^{172}Ta	8E+2	3E+2	1E-7	5E-10	1E-5	1E-4
		Y, see ^{172}Ta	-	1E+2	6E-8	2E-10	-	-
73	Tantalum-183	W, see ^{172}Ta	9E+2 LLI wall	1E+3	5E-7	2E-9	-	-
			(1E+3)	-	-	-	2E-5	2E-4
		Y, see ^{172}Ta	-	1E+3	4E-7	1E-9	-	-
73	Tantalum-184	W, see ^{172}Ta	2E+3	5E+3	2E-6	8E-9	3E-5	3E-4
		Y, see ^{172}Ta	-	5E+3	2E-6	7E-9	-	-
73	Tantalum-185[2]	W, see ^{172}Ta	3E+4	7E+4	3E-5	1E-7	4E-4	4E-3
		Y, see ^{172}Ta	-	6E+4	3E-5	9E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
73	Tantalum-186[2]	W, see ^{172}Ta	5E+4	2E+5	1E-4	3E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
		Y, see ^{172}Ta	-	2E+5	9E-5	3E-7	-	-
74	Tungsten-176	D, all compounds	1E+4	5E+4	2E-5	7E-8	1E-4	1E-3
74	Tungsten-177	D, all compounds	2E+4	9E+4	4E-5	1E-7	3E-4	3E-3
74	Tungsten-178	D, all compounds	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
74	Tungsten-179[2]	D, all compounds	5E+5	2E+6	7E-4	2E-6	7E-3	7E-2
74	Tungsten-181	D, all compounds	2E+4	3E+4	1E-5	5E-8	2E-4	2E-3
74	Tungsten-185	D, all compounds	2E+3	7E+3	3E-6	9E-9	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
74	Tungsten-187	D, all compounds	2E+3	9E+3	4E-6	1E-8	3E-5	3E-4
74	Tungsten-188	D, all compounds	4E+2	1E+3	5E-7	2E-9	-	-
			LLI wall (5E+2)	-	-	-	7E-6	7E-5
75	Rhenium-177[2]	D, all compounds except those given for W	9E+4	3E+5	1E-4	4E-7	-	-
			St wall (1E+5)	-	-	-	2E-3	2E-2
		W, oxides, hydroxides, and nitrates	-	4E+5	1E-4	5E-7	-	-
75	Rhenium-178[2]	D, see ^{177}Re	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (1E+5)	-	-	-	1E-3	1E-2
		W, see ^{177}Re	-	3E+5	1E-4	4E-7	-	-
75	Rhenium-181	D, see ^{177}Re	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
		W, see ^{177}Re	-	9E+3	4E-6	1E-8	-	-
75	Rhenium-182 (12.7 h)	D, see ^{177}Re	7E+3	1E+4	5E-6	2E-8	9E-5	9E-4
		W, see ^{177}Re	-	2E+4	6E-6	2E-8	-	-
75	Rhenium-182 (64.0 h)	D, see ^{177}Re	1E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W, see ^{177}Re	-	2E+3	9E-7	3E-9	-	-
75	Rhenium-184m	D, see ^{177}Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see ^{177}Re	-	4E+2	2E-7	6E-10	-	-
75	Rhenium-184	D, see ^{177}Re	2E+3	4E+3	1E-6	5E-9	3E-5	3E-4
		W, see ^{177}Re	-	1E+3	6E-7	2E-9	-	-
75	Rhenium-186m	D, see ^{177}Re	1E+3	2E+3	7E-7	-	-	-
			St wall (2E+3)	St wall (2E+3)	-	3E-9	2E-5	2E-4
		W, see ^{177}Re	-	2E+2	6E-8	2E-10	-	-
75	Rhenium-186	D, see ^{177}Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see ^{177}Re	-	2E+3	7E-7	2E-9	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
75	Rhenium-187	D, see ^{177}Re	6E+5	8E+5 St wall (9E+5)	4E-4	-	8E-3	8E-2
			-	-	-	1E-6	-	-
		W, see ^{177}Re	-	1E+5	4E-5	1E-7	-	-
75	Rhenium-188m[2]	D, see ^{177}Re	8E+4	1E+5	6E-5	2E-7	1E-3	1E-2
		W, see ^{177}Re	-	1E+5	6E-5	2E-7	-	-
75	Rhenium-188	D, see ^{177}Re	2E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		W, see ^{177}Re	-	3E+3	1E-6	4E-9	-	-
75	Rhenium-189	D, see ^{177}Re	3E+3	5E+3	2E-6	7E-9	4E-5	4E-4
		W, see ^{177}Re	-	4E+3	2E-6	6E-9	-	-
76	Osmium-180[2]	D, all compounds except those given for W and Y	1E+5	4E+5	2E-4	5E-7	1E-3	1E-2
		W, halides and nitrates	-	5E+5	2E-4	7E-7	-	-
		Y, oxides and hydroxides	-	5E+5	2E-4	6E-7	-	-
76	Osmium-181[2]	D, see ^{180}Os	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{180}Os	-	5E+4	2E-5	6E-8	-	-
		Y, see ^{180}Os	-	4E+4	2E-5	6E-8	-	-
76	Osmium-182	D, see ^{180}Os	2E+3	6E+3	2E-6	8E-9	3E-5	3E-4
		W, see ^{180}Os	-	4E+3	2E-6	6E-9	-	-
		Y, see ^{180}Os	-	4E+3	2E-6	6E-9	-	-
76	Osmium-185	D, see ^{180}Os	2E+3	5E+2	2E-7	7E-10	3E-5	3E-4
		W, see ^{180}Os	-	8E+2	3E-7	1E-9	-	-
		Y, see ^{180}Os	-	8E+2	3E-7	1E-9	-	-
76	Osmium-189m	D, see ^{180}Os	8E+4	2E+5	1E-4	3E-7	1E-3	1E-2
		W, see ^{180}Os	-	2E+5	9E-5	3E-7	-	-
		Y, see ^{180}Os	-	2E+5	7E-5	2E-7	-	-
76	Osmium-191m	D, see ^{180}Os	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see ^{180}Os	-	2E+4	8E-6	3E-8	-	-
		Y, see ^{180}Os	-	2E+4	7E-6	2E-8	-	-
76	Osmium-191	D, see ^{180}Os	2E+3 LLI wall (3E+3)	2E+3	9E-7	3E-9	-	-
				-	-	-	3E-5	3E-4
		W, see ^{180}Os	-	2E+3	7E-7	2E-9	-	-
		Y, see ^{180}Os	-	1E+3	6E-7	2E-9	-	-
76	Osmium-193	D, see ^{180}Os	2E+3 LLI wall (2E+3)	5E+3	2E-6	6E-9	-	-
				-	-	-	2E-5	2E-4
		W, see ^{180}Os	-	3E+3	1E-6	4E-9	-	-
		Y, see ^{180}Os	-	3E+3	1E-6	4E-9	-	-
76	Osmium-194	D, see ^{180}Os	4E+2 LLI wall (6E+2)	4E+1	2E-8	6E-11	-	-
				-	-	-	8E-6	8E-5
		W, see ^{180}Os	-	6E+1	2E-8	8E-11	-	-
		Y, see ^{180}Os	-	8E+0	3E-9	1E-11	-	-
77	Iridium-182[2]	D, all compounds except those given for W and Y	4E+4 St wall (4E+4)	1E+5	6E-5	2E-7	-	-
				-	-	-	6E-4	6E-3

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		W, halides, nitrates, and metallic iridium	-	2E+5	6E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	5E-5	2E-7	-	-
77	Iridium-184	D, see ^{182}Ir	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see ^{182}Ir	-	3E+4	1E-5	5E-8	-	-
		Y, see ^{182}Ir	-	3E+4	1E-5	4E-8	-	-
77	Iridium-185	D, see ^{182}Ir	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see ^{182}Ir	-	1E+4	5E-6	2E-8	-	-
		Y, see ^{182}Ir	-	1E+4	4E-6	1E-8	-	-
77	Iridium-186	D, see ^{182}Ir	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		W, see ^{182}Ir	-	6E+3	3E-6	9E-9	-	-
		Y, see ^{182}Ir	-	6E+3	2E-6	8E-9	-	-
77	Iridium-187	D, see ^{182}Ir	1E+4	3E+4	1E-5	5E-8	1E-4	1E-3
		W, see ^{182}Ir	-	3E+4	1E-5	4E-8	-	-
		Y, see ^{182}Ir	-	3E+4	1E-5	4E-8	-	-
77	Iridium-188	D, see ^{182}Ir	2E+3	5E+3	2E-6	6E-9	3E-5	3E-4
		W, see ^{182}Ir	-	4E+3	1E-6	5E-9	-	-
		Y, see ^{182}Ir	-	3E+3	1E-6	5E-9	-	-
77	Iridium-189	D, see ^{182}Ir	5E+3 LLI wall (5E+3)	5E+3 -	2E-6 -	7E-9 -	- 7E-5	- 7E-4
		W, see ^{182}Ir	-	4E+3	2E-6	5E-9	-	-
		Y, see ^{182}Ir	-	4E+3	1E-6	5E-9	-	-
77	Iridium-190m[2]	D, see ^{182}Ir	2E+5	2E+5	8E-5	3E-7	2E-3	2E-2
		W, see ^{182}Ir	-	2E+5	9E-5	3E-7	-	-
		Y, see ^{182}Ir	-	2E+5	8E-5	3E-7	-	-
77	Iridium-190	D, see ^{182}Ir	1E+3	9E+2	4E-7	1E-9	1E-5	1E-4
		W, see ^{182}Ir	-	1E+3	4E-7	1E-9	-	-
		Y, see ^{182}Ir	-	9E+2	4E-7	1E-9	-	-
77	Iridium-192m	D, see ^{182}Ir	3E+3	9E+1	4E-8	1E-10	4E-5	4E-4
		W, see ^{182}Ir	-	2E+2	9E-8	3E-10	-	-
		Y, see ^{182}Ir	-	2E+1	6E-9	2E-11	-	-
77	Iridium-192	D, see ^{182}Ir	9E+2	3E+2	1E-7	4E-10	1E-5	1E-4
		W, see ^{182}Ir	-	4E+2	2E-7	6E-10	-	-
		Y, see ^{182}Ir	-	2E+2	9E-8	3E-10	-	-
77	Iridium-194m	D, see ^{182}Ir	6E+2	9E+1	4E-8	1E-10	9E-6	9E-5
		W, see ^{182}Ir	-	2E+2	7E-8	2E-10	-	-
		Y, see ^{182}Ir	-	1E+2	4E-8	1E-10	-	-
77	Iridium-194	D, see ^{182}Ir	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		W, see ^{182}Ir	-	2E+3	9E-7	3E-9	-	-
		Y, see ^{182}Ir	-	2E+3	8E-7	3E-9	-	-
77	Iridium-195m	D, see ^{182}Ir	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see ^{182}Ir	-	3E+4	1E-5	4E-8	-	-
		Y, see ^{182}Ir	-	2E+4	9E-6	3E-8	-	-
77	Iridium-195	D, see ^{182}Ir	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{182}Ir	-	5E+4	2E-5	7E-8	-	-
		Y, see ^{182}Ir	-	4E+4	2E-5	6E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
78	Platinum-186	D, all compounds	1E+4	4E+4	2E-5	5E-8	2E-4	2E-3
78	Platinum-188	D, all compounds	2E+3	2E+3	7E-7	2E-9	2E-5	2E-4
78	Platinum-189	D, all compounds	1E+4	3E+4	1E-5	4E-8	1E-4	1E-3
78	Platinum-191	D, all compounds	4E+3	8E+3	4E-6	1E-8	5E-5	5E-4
78	Platinum-193m	D, all compounds	3E+3	6E+3	3E-6	8E-9	-	-
			LLI wall (3E+4)	-	-	-	4E-5	4E-4
78	Platinum-193	D, all compounds	4E+4	2E+4	1E-5	3E-8	-	-
			LLI wall (5E+4)	-	-	-	6E-4	6E-3
78	Platinum-195m	D, all compounds	2E+3	4E+3	2E-6	6E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
78	Platinum-197m[2]	D, all compounds	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
78	Platinum-197	D, all compounds	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4
78	Platinum-199[2]	D, all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
78	Platinum-200	D, all compounds	1E+3	3E+3	1E-6	5E-9	2E-5	2E-4
79	Gold-193	D, all compounds except those given for W and Y	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, halides and nitrates	-	2E+4	9E-6	3E-8	-	-
		Y, oxides and hydroxides	-	2E+4	8E-6	3E-8	-	-
79	Gold-194	D, see ^{193}Au	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see ^{193}Au	-	5E+3	2E-6	8E-9	-	-
		Y, see ^{193}Au	-	5E+3	2E-6	7E-9	-	-
79	Gold-195	D, see ^{193}Au	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see ^{193}Au	-	1E+3	6E-7	2E-9	-	-
		Y, see ^{193}Au	-	4E+2	2E-7	6E-10	-	-
79	Gold-198m	D, see ^{193}Au	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		W, see ^{193}Au	-	1E+3	5E-7	2E-9	-	-
		Y, see ^{193}Au	-	1E+3	5E-7	2E-9	-	-
79	Gold-198	D, see ^{193}Au	1E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		W, see ^{193}Au	-	2E+3	8E-7	3E-9	-	-
		Y, see ^{193}Au	-	2E+3	7E-7	2E-9	-	-
79	Gold-199	D, see ^{193}Au	3E+3	9E+3	4E-6	1E-8	-	-
			LLI wall (3E+3)	-	-	-	4E-5	4E-4
		W, see ^{193}Au	-	4E+3	2E-6	6E-9	-	-
		Y, see ^{193}Au	-	4E+3	2E-6	5E-9	-	-
79	Gold-200m	D, see ^{193}Au	1E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see ^{193}Au	-	3E+3	1E-6	4E-9	-	-
		Y, see ^{193}Au	-	2E+4	1E-6	3E-9	-	-
79	Gold-200[2]	D, see ^{193}Au	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		W, see ^{193}Au	-	8E+4	3E-5	1E-7	-	-
		Y, see ^{193}Au	-	7E+4	3E-5	1E-7	-	-
79	Gold-201[2]	D, see ^{193}Au	7E+4 St wall (9E+4)	2E+5	9E-5	3E-7	-	-
				-	-	-	1E-3	1E-2
		W, see ^{193}Au	-	2E+5	1E-4	3E-7	-	-
		Y, see ^{193}Au	-	2E+5	9E-5	3E-7	-	-
80	Mercury-193m	Vapor	-	8E+3	4E-6	1E-8	-	-
		Organic D	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		D, sulfates	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		W, oxides, hydroxides, halides, nitrates, and sulfides	-	8E+3	3E-6	1E-8	-	-
80	Mercury-193	Vapor	-	3E+4	1E-5	4E-8	-	-
		Organic D	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		D, see ^{193m}Hg	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{193m}Hg	-	4E+4	2E-5	6E-8	-	-
80	Mercury-194	Vapor	-	3E+1	1E-8	4E-11	-	-
		Organic D	2E+1	3E+1	1E-8	4E-11	2E-7	2E-6
		D, see ^{193m}Hg	8E+2	4E+1	2E-8	6E-11	1E-5	1E-4
		W, see ^{193m}Hg	-	1E+2	5E-8	2E-10	-	-
80	Mercury-195m	Vapor	-	4E+3	2E-6	6E-9	-	-
		Organic D	3E+3	6E+3	3E-6	8E-9	4E-5	4E-4
		D, see ^{193m}Hg	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4
		W, see ^{193m}Hg	-	4E+3	2E-6	5E-9	-	-
80	Mercury-195	Vapor	-	3E+4	1E-5	4E-8	-	-
		Organic D	2E+4	5E+4	2E-5	6E-8	2E-4	2E-3
		D, see ^{193m}Hg	1E+4	4E+4	1E-5	5E-8	2E-4	2E-3
		W, see ^{193m}Hg	-	3E+4	1E-5	5E-8	-	-
80	Mercury-197m	Vapor	-	5E+3	2E-6	7E-9	-	-
		Organic D	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
		D, see ^{193m}Hg	3E+3	7E+3	3E-6	1E-8	4E-5	4E-4
		W, see ^{193m}Hg	-	5E+3	2E-6	7E-9	-	-
80	Mercury-197	Vapor	-	8E+3	4E-6	1E-8	-	-
		Organic D	7E+3	1E+4	6E-6	2E-8	9E-5	9E-4
		D, see ^{193m}Hg	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, see ^{193m}Hg	-	9E+3	4E-6	1E-8	-	-
80	Mercury-199m[2]	Vapor	-	8E+4	3E-5	1E-7	-	-
		Organic D	6E+4 St wall (1E+5)	2E+5	7E-5	2E-7	-	-
				-	-	-	1E-3	1E-2
		D, see ^{193m}Hg	6E+4	1E+5	6E-5	2E-7	8E-4	8E-3
		W, see ^{193m}Hg	-	2E+5	7E-5	2E-7	-	-
80	Mercury-203	Vapor	-	8E+2	4E-7	1E-9	-	-
		Organic D	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
		D, see ^{193m}Hg	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
		W, see ^{193m}Hg	-	1E+3	5E-7	2E-9	-	-
81	Thallium-194m[2]	D, all compounds	5E+4 St wall (7E+4)	2E+5	6E-5	2E-7	-	-
				-	-	-	1E-3	1E-2

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
81	Thallium-194[2]	D, all compounds	3E+5	6E+5	2E-4	8E-7	-	-
			St wall (3E+5)	-	-	-	4E-3	4E-2
81	Thallium-195[2]	D, all compounds	6E+4	1E+5	5E-5	2E-7	9E-4	9E-3
81	Thallium-197	D, all compounds	7E+4	1E+5	5E-5	2E-7	1E-3	1E-2
81	Thallium-198m[2]	D, all compounds	3E+4	5E+4	2E-5	8E-8	4E-4	4E-3
81	Thallium-198	D, all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
81	Thallium-199	D, all compounds	6E+4	8E+4	4E-5	1E-7	9E-4	9E-3
81	Thallium-200	D, all compounds	8E+3	1E+4	5E-6	2E-8	1E-4	1E-3
81	Thallium-201	D, all compounds	2E+4	2E+4	9E-6	3E-8	2E-4	2E-3
81	Thallium-202	D, all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
81	Thallium-204	D, all compounds	2E+3	2E+3	9E-7	3E-9	2E-5	2E-4
82	Lead-195m[2]	D, all compounds	6E+4	2E+5	8E-5	3E-7	8E-4	8E-3
82	Lead-198	D, all compounds	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
82	Lead-199[2]	D, all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
82	Lead-200	D, all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
82	Lead-201	D, all compounds	7E+3	2E+4	8E-6	3E-8	1E-4	1E-3
82	Lead-202m	D, all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
82	Lead-202	D, all compounds	1E+2	5E+1	2E-8	7E-11	2E-6	2E-5
82	Lead-203	D, all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
82	Lead-205	D, all compounds	4E+3	1E+3	6E-7	2E-9	5E-5	5E-4
82	Lead-209	D, all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
82	Lead-210	D, all compounds	6E-1 Bone surf	2E-1 Bone surf	1E-10	-	-	-
			(1E+0)	(4E-1)	-	6E-13	1E-8	1E-7
82	Lead-211[2]	D, all compounds	1E+4	6E+2	3E-7	9E-10	2E-4	2E-3
82	Lead-212	D, all compounds	8E+1 Bone surf	3E+1	1E-8	5E-11	-	-
			(1E+2)	-	-	-	2E-6	2E-5
82	Lead-214[2]	D, all compounds	9E+3	8E+2	3E-7	1E-9	1E-4	1E-3
83	Bismuth-200[2]	D, nitrates	3E+4	8E+4	4E-5	1E-7	4E-4	4E-3
		W, all other compounds	-	1E+5	4E-5	1E-7	-	-
83	Bismuth-201[2]	D, see ^{200}Bi	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see ^{200}Bi	-	4E+4	2E-5	5E-8	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
83	Bismuth-202[2]	D, see ^{200}Bi	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{200}Bi	-	8E+4	3E-5	1E-7	-	-
83	Bismuth-203	D, see ^{200}Bi	2E+3	7E+3	3E-6	9E-9	3E-5	3E-4
		W, see ^{200}Bi	-	6E+3	3E-6	9E-9	-	-
83	Bismuth-205	D, see ^{200}Bi	1E+3	3E+3	1E-6	3E-9	2E-5	2E-4
		W, see ^{200}Bi	-	1E+3	5E-7	2E-9	-	-
83	Bismuth-206	D, see ^{200}Bi	6E+2	1E+3	6E-7	2E-9	9E-6	9E-5
		W, see ^{200}Bi	-	9E+2	4E-7	1E-9	-	-
83	Bismuth-207	D, see ^{200}Bi	1E+3	2E+3	7E-7	2E-9	1E-5	1E-4
		W, see ^{200}Bi	-	4E+2	1E-7	5E-10	-	-
83	Bismuth-210m	D, see ^{200}Bi	4E+1 Kidneys (6E+1)	5E+0 Kidneys (6E+0)	2E-9	-	-	-
					-	9E-12	8E-7	8E-6
		W, see ^{200}Bi	-	7E-1	3E-10	9E-13	-	-
83	Bismuth-210	D, see ^{200}Bi	8E+2	2E+2	1E-7	-	1E-5	1E-4
			-	Kidneys				
			-	(4E+2)	-	5E-10	-	-
		W, see ^{200}Bi	-	3E+1	1E-8	4E-11	-	-
83	Bismuth-212[2]	D, see ^{200}Bi	5E+3	2E+2	1E-7	3E-10	7E-5	7E-4
		W, see ^{200}Bi	-	3E+2	1E-7	4E-10	-	-
83	Bismuth-213[2]	D, see ^{200}Bi	7E+3	3E+2	1E-7	4E-10	1E-4	1E-3
		W, see ^{200}Bi	-	4E+2	1E-7	5E-10	-	-
83	Bismuth-214[2]	D, see ^{200}Bi	2E+4	8E+2	3E-7	1E-9	-	-
			St wall					
			(2E+4)	-	-	-	3E-4	3E-3
		W, see ^{200}Bi	-	9E-2	4E-7	1E-9	-	-
84	Polonium-203[2]	D, all compounds except those given for W	3E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		W, oxides, hydroxides, and nitrates	-	9E+4	4E-5	1E-7	-	-
84	Polonium-205[2]	D, see ^{203}Po	2E+4	4E+4	2E-5	5E-8	3E-4	3E-3
		W, see ^{203}Po	-	7E+4	3E-5	1E-7	-	-
84	Polonium-207	D, see ^{203}Po	8E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		W, see ^{203}Po	-	3E+4	1E-5	4E-8	-	-
84	Polonium-210	D, see ^{203}Po	3E+0	6E-1	3E-10	9E-13	4E-8	4E-7
		W, see ^{203}Po	-	6E-1	3E-10	9E-13	-	-
85	Astatine-207[2]	D, halides	6E+3	3E+3	1E-6	4E-9	8E-5	8E-4
		W	-	2E+3	9E-7	3E-9	-	-
85	Astatine-211	D, halides	1E+2	8E+1	3E-8	1E-10	2E-6	2E-5
		W	-	5E+1	2E-8	8E-11	-	-
86	Radon-220	With daughters removed	-	2E+4	7E-6	2E-8	-	-
		With daughters present	-	2E+1 (or 12 working level months)	9E-9 (or 1.0 working level)	3E-11	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
86	Radon-222	With daughters removed	-	1E+4	4E-6	1E-8	-	-
		With daughters present	-	1E+2 (or 4 working level months)	3E-8 (or 0.33 working level)	1E-10	-	-
87	Francium-222[2]	D, all compounds	2E+3	5E+2	2E-7	6E-10	3E-5	3E-4
87	Francium-223[2]	D, all compounds	6E+2	8E+2	3E-7	1E-9	8E-6	8E-5
88	Radium-223	W, all compounds	5E+0 Bone surf (9E+0)	7E-1 -	3E-10 -	9E-13 -	- 1E-7	- 1E-6
88	Radium-224	W, all compounds	8E+0 Bone surf (2E+1)	2E+0 -	7E-10 -	2E-12 -	- 2E-7	- 2E-6
88	Radium-225	W, all compounds	8E+0 Bone surf (2E+1)	7E-1 -	3E-10 -	9E-13 -	- 2E-7	- 2E-6
88	Radium-226	W, all compounds	2E+0 Bone surf (5E+0)	6E-1 -	3E-10 -	9E-13 -	- 6E-8	- 6E-7
88	Radium-227[2]	W, all compounds	2E+4 Bone surf (2E+4)	1E+4 Bone surf (2E+4)	6E-6 -	- 3E-8	- 3E-4	- 3E-3
88	Radium-228	W, all compounds	2E+0 Bone surf (4E+0)	1E+0 -	5E-10 -	2E-12 -	- 6E-8	- 6E-7
89	Actinium-224	D, all compounds except those given for W and Y	2E+3 LLI wall (2E+3)	3E+1 Bone surf (4E+1)	1E-8 -	- 5E-11	- 3E-5	- 3E-4
		W, halides and nitrates	-	5E+1	2E-8	7E-11	-	-
		Y, oxides and hydroxides	-	5E+1	2E-8	6E-11	-	-
89	Actinium-225	D, see ^{224}Ac	5E+1 LLI wall (5E+1)	3E-1 Bone surf (5E-1)	1E-10 -	- 7E-13	- 7E-7	- 7E-6
		W, see ^{224}Ac	-	6E-1	3E-10	9E-13	-	-
		Y, see ^{224}Ac	-	6E-1	3E-10	9E-13	-	-
89	Actinium-226	D, see ^{224}Ac	1E+2 LLI wall (1E+2)	3E+0 Bone surf (4E+0)	1E-9 -	- 5E-12	- 2E-6	- 2E-5
		W, see ^{224}Ac	-	5E+0	2E-9	7E-12	-	-
		Y, see ^{224}Ac	-	5E+0	2E-9	6E-12	-	-
89	Actinium-227	D, see ^{224}Ac	2E-1 Bone surf (4E-1)	4E-4 Bone surf (8E-4)	2E-13 -	- 1E-15	- 5E-9	- 5E-8
		W, see ^{224}Ac	-	2E-3 Bone surf (3E-3)	7E-13 -	- 4E-15	- -	- -

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		Y, see ^{224}Ac	-	4E-3	2E-12	6E-15	-	-
89	Actinium-228	D, see ^{224}Ac	2E+3	9E+0	4E-9	-	3E-5	3E-4
			-	Bone surf (2E+1)	-	2E-11	-	-
		W, see ^{224}Ac	-	4E+1	2E-8	-	-	-
			-	Bone surf (6E+1)	-	8E-11	-	-
		Y, see ^{224}Ac	-	4E+1	2E-8	6E-11	-	-
90	Thorium-226[2]	W, all compounds except those given for Y	5E+3	2E+2	6E-8	2E-10	-	-
			St wall (5E+3)	-	-	-	7E-5	7E-4
		Y, oxides and hydroxides	-	1E+2	6E-8	2E-10	-	-
90	Thorium-227	W, see ^{226}Th	1E+2	3E-1	1E-10	5E-13	2E-6	2E-5
		Y, see ^{226}Th	-	3E-1	1E-10	5E-13	-	-
90	Thorium-228	W, see ^{226}Th	6E+0	1E-2	4E-12	-	-	-
			Bone surf (1E+1)	Bone surf (2E-2)	-	3E-14	2E-7	2E-6
		Y, see ^{226}Th	-	2E-2	7E-12	2E-14	-	-
90	Thorium-229	W, see ^{226}Th	6E-1	9E-4	4E-13	-	-	-
			Bone surf (1E+0)	Bone surf (2E-3)	-	3E-15	2E-8	2E-7
		Y, see ^{226}Th	-	2E-3	1E-12	-	-	-
			-	Bone surf (3E-3)	-	4E-15	-	-
90	Thorium-230	W, see ^{226}Th	4E+0	6E-3	3E-12	-	-	-
			Bone surf (9E+0)	Bone surf (2E-2)	-	2E-14	1E-7	1E-6
		Y, see ^{226}Th	-	2E-2	6E-12	-	-	-
			-	Bone surf (2E-2)	-	3E-14	-	-
90	Thorium-231	W, see ^{226}Th	4E+3	6E+3	3E-6	9E-9	5E-5	5E-4
		Y, see ^{226}Th	-	6E+3	3E-6	9E-9	-	-
90	Thorium-232	W, see ^{226}Th	7E-1	1E-3	5E-13	-	-	-
			Bone surf (2E+0)	Bone surf (3E-3)	-	4E-15	3E-8	3E-7
		Y, see ^{226}Th	-	3E-3	1E-12	-	-	-
			-	Bone surf (4E-3)	-	6E-15	-	-
90	Thorium-234	W, see ^{226}Th	3E+2	2E+2	8E-8	3E-10	-	-
			LLI wall (4E+2)	-	-	-	5E-6	5E-5
		Y, see ^{226}Th	-	2E+2	6E-8	2E-10	-	-
91	Protactinium-227[2]	W, all compounds except those given for Y	4E+3	1E+2	5E-8	2E-10	5E-5	5E-4
		Y, oxides and hydroxides	-	1E+2	4E-8	1E-10	-	-
91	Protactinium-228	W, see ^{227}Pa	1E+3	1E+1	5E-9	-	2E-5	2E-4
			-	Bone surf (2E+1)	-	3E-11	-	-
		Y, see ^{227}Pa	-	1E+1	5E-9	2E-11	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
91	Protactinium-230	W, see ^{227}Pa	6E+2 Bone surf	5E+0	2E-9	7E-12	-	-
			(9E+2)	-	-	-	1E-5	1E-4
		Y, see ^{227}Pa	-	4E+0	1E-9	5E-12	-	-
91	Protactinium-231	W, see ^{227}Pa	2E-1 Bone surf	2E-3 Bone surf	6E-13	-	-	-
			(5E-1)	(4E-3)	-	6E-15	6E-9	6E-8
		Y, see ^{227}Pa	-	4E-3 Bone surf	2E-12	-	-	-
			-	(6E-3)	-	8E-15	-	-
91	Protactinium-232	W, see ^{227}Pa	1E+3	2E+1 Bone surf	9E-9	-	2E-5	2E-4
			-	(6E+1)	-	8E-11	-	-
		Y, see ^{227}Pa	-	6E+1 Bone surf	2E-8	-	-	-
			-	(7E+1)	-	1E-10	-	-
91	Protactinium-233	W, see ^{227}Pa	1E+3 LLI wall	7E+2	3E-7	1E-9	-	-
			(2E+3)	-	-	-	2E-5	2E-4
		Y, see ^{227}Pa	-	6E+2	2E-7	8E-10	-	-
91	Protactinium-234	W, see ^{227}Pa	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		Y, see ^{227}Pa	-	7E+3	3E-6	9E-9	-	-
92	Uranium-230	D, UF_6, UO_2F_2, $UO_2(NO_3)_2$	4E+0 Bone surf	4E-1 Bone surf	2E-10	-	-	-
			(6E+0)	(6E-1)	-	8E-13	8E-8	8E-7
		W, UO_3, UF_4, UCl_4	-	4E-1	1E-10	5E-13	-	-
		Y, UO_2, U_3O_8	-	3E-1	1E-10	4E-13	-	-
92	Uranium-231	D, see ^{230}U	5E+3 LLI wall	8E+3	3E-6	1E-8	-	-
			(4E+3)	-	-	-	6E-5	6E-4
		W, see ^{230}U	-	6E+3	2E-6	8E-9	-	-
		Y, see ^{230}U	-	5E+3	2E-6	6E-9	-	-
92	Uranium-232	D, see ^{230}U	2E+0 Bone surf	2E-1 Bone surf	9E-11	-	-	-
			(4E+0)	(4E-1)	-	6E-13	6E-8	6E-7
		W, see ^{230}U	-	4E-1	2E-10	5E-13	-	-
		Y, see ^{230}U	-	8E-3	3E-12	1E-14	-	-
92	Uranium-233	D, see ^{230}U	1E+1 Bone surf	1E+0 Bone surf	5E-10	-	-	-
			(2E+1)	(2E+0)	-	3E-12	3E-7	3E-6
		W, see ^{230}U	-	7E-1	3E-10	1E-12	-	-
		Y, see ^{230}U	-	4E-2	2E-11	5E-14	-	-
92	Uranium-234[3]	D, see ^{230}U	1E+1 Bone surf	1E+0 Bone surf	5E-10	-	-	-
			(2E+1)	(2E+0)	-	3E-12	3E-7	3E-6
		W, see ^{230}U	-	7E-1	3E-10	1E-12	-	-
		Y, see ^{230}U	-	4E-2	2E-11	5E-14	-	-
92	Uranium-235[3]	D, see ^{230}U	1E+1	1E+0	6E-10	-	-	-

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			Bone surf (2E+1)	Bone surf (2E+0)	-	3E-12	3E-7	3E-6
		W, see ^{230}U	-	8E-1	3E-10	1E-12	-	-
		Y, see ^{230}U	-	4E-2	2E-11	6E-14	-	-
92	Uranium-236	D, see ^{230}U	1E+1	1E+0	5E-10	-	-	-
			Bone surf (2E+1)	Bone surf (2E+0)	-	3E-12	3E-7	3E-6
		W, see ^{230}U	-	8E-1	3E-10	1E-12	-	-
		Y, see ^{230}U	-	4E-2	2E-11	6E-14	-	-
92	Uranium-237	D, see ^{230}U	2E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		W, see ^{230}U	-	2E+3	7E-7	2E-9	-	-
		Y, see ^{230}U	-	2E+3	6E-7	2E-9	-	-
92	Uranium-238[3]	D, see ^{230}U	1E+1	1E+0	6E-10	-	-	-
			Bone surf (2E+1)	Bone surf (2E+0)	-	3E-12	3E-7	3E-6
		W, see ^{230}U	-	8E-1	3E-10	1E-12	-	-
		Y, see ^{230}U	-	4E-2	2E-11	6E-14	-	-
92	Uranium-239[2]	D, see ^{230}U	7E+4	2E+5	8E-5	3E-7	9E-4	9E-3
		W, see ^{230}U	-	2E+5	7E-5	2E-7	-	-
		Y, see ^{230}U	-	2E+5	6E-5	2E-7	-	-
92	Uranium-240	D, see ^{230}U	1E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		W, see ^{230}U	-	3E+3	1E-6	4E-9	-	-
		Y, see ^{230}U	-	2E+3	1E-6	3E-9	-	-
92	Uranium-natural[3]	D, see ^{230}U	1E+1	1E+0	5E-10	-	-	-
			Bone surf (2E+1)	Bone surf (2E+0)	-	3E-12	3E-7	3E-6
		W, see ^{230}U	-	8E-1	3E-10	9E-13	-	-
		Y, see ^{230}U	-	5E-2	2E-11	9E-14	-	-
93	Neptunium-232[2]	W, all compounds	1E+5	2E+3	7E-7	-	2E-3	2E-2
			-	Bone surf (5E+2)	-	6E-9	-	-
93	Neptunium-233[2]	W, all compounds	8E+5	3E+6	1E-3	4E-6	1E-2	1E-1
93	Neptunium-234	W, all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
93	Neptunium-235	W, all compounds	2E+4	8E+2	3E-7	-	-	-
			LLI wall (2E+4)	Bone surf (1E+3)	-	2E-9	3E-4	3E-3
93	Neptunium-236 (1.15E+5 y)	W, all compounds	3E+0	2E-2	9E-12	-	-	-
			Bone surf (6E+0)	Bone surf (5E-2)	-	8E-14	9E-8	9E-7
93	Neptunium-236 (22.5 h)	W, all compounds	3E+3	3E+1	1E-8	-	-	-
			Bone surf (4E+3)	Bone surf (7E+1)	-	1E-10	5E-5	5E-4
93	Neptunium-237	W, all compounds	5E-1	4E-3	2E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	1E-14	2E-8	2E-7

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
93	Neptunium-238	W, all compounds	1E+3	6E+1 Bone surf	3E-8	-	2E-5	2E-4
			-	(2E+2)	-	2E-10	-	-
93	Neptunium-239	W, all compounds	2E+3	2E+3	9E-7	3E-9	-	-
			LLI wall (2E+3)	-	-	-	2E-5	2E-4
93	Neptunium-240[2]	W, all compounds	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
94	Plutonium-234	W, all compounds except PuO_2	8E+3	2E+2	9E-8	3E-10	1E-4	1E-3
		Y, PuO_2	-	2E+2	8E-8	3E-10	-	-
94	Plutonium-235[2]	W, see ^{234}Pu	9E+5	3E+6	1E-3	4E-6	1E-2	1E-1
		Y, see ^{234}Pu	-	3E+6	1E-3	3E-6	-	-
94	Plutonium-236	W, see ^{234}Pu	2E+0 Bone surf	2E-2 Bone surf	8E-12	-	-	-
			(4E+0)	(4E-2)	-	5E-14	6E-8	6E-7
		Y, see ^{234}Pu	-	4E-2	2E-11	6E-14	-	-
94	Plutonium-237	W, see ^{234}Pu	1E+4	3E+3	1E-6	5E-9	2E-4	2E-3
		Y, see ^{234}Pu	-	3E+3	1E-6	4E-9	-	-
94	Plutonium-238	W, see ^{234}Pu	9E-1 Bone surf	7E-3 Bone surf	3E-12	-	-	-
			(2E+0)	(1E-2)	-	2E-14	2E-8	2E-7
		Y, see ^{234}Pu	-	2E-2	8E-12	2E-14	-	-
94	Plutonium-239	W, see ^{234}Pu	8E-1 Bone surf	6E-3 Bone surf	3E-12	-	-	-
			(1E+0)	(1E-2)	-	2E-14	2E-8	2E-7
		Y, see ^{234}Pu	-	2E-2 Bone surf	7E-12	-	-	-
			-	(2E-2)	-	2E-14	-	-
94	Plutonium-240	W, see ^{234}Pu	8E-1 Bone surf	6E-3 Bone surf	3E-12	-	-	-
			(1E+0)	(1E-2)	-	2E-14	2E-8	2E-7
		Y, see ^{234}Pu	-	2E-2 Bone surf	7E-12	-	-	-
			-	(2E-2)	-	2E-14	-	-
94	Plutonium-241	W, see ^{234}Pu	4E+1 Bone surf	3E-1 Bone surf	1E-10	-	-	-
			(7E+1)	(6E-1)	-	8E-13	1E-6	1E-5
		Y, see ^{234}Pu	-	8E-1 Bone surf	3E-10	-	-	-
			-	(1E+0)	-	1E-12	-	-
94	Plutonium-242	W, see ^{234}Pu	8E-1 Bone surf	7E-3 Bone surf	3E-12	-	-	-
			(1E+0)	(1E-2)	-	2E-14	2E-8	2E-7
		Y, see ^{234}Pu	-	2E-2 Bone surf	7E-12	-	-	-
			-	(2E-2)	-	2E-14	-	-
94	Plutonium-243	W, see ^{234}Pu	2E+4	4E+4	2E-5	5E-8	2E-4	2E-3
		Y, see ^{234}Pu	-	4E+4	2E-5	5E-8	-	-

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Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
94	Plutonium-244	W, see ^{234}Pu	8E-1 Bone surf (2E+0)	7E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
		Y, see ^{234}Pu	- -	2E-2 Bone surf (2E-2)	7E-12 -	- 2E-14	- -	- -
94	Plutonium-245	W, see ^{234}Pu	2E+3	5E+3	2E-6	6E-9	3E-5	3E-4
		Y, see ^{234}Pu	-	4E+3	2E-6	6E-9	-	-
94	Plutonium-246	W, see ^{234}Pu	4E+2 LLI wall (4E+2)	3E+2 -	1E-7 -	4E-10 -	- 6E-6	- 6E-5
		Y, see ^{234}Pu	-	3E+2	1E-7	4E-10	-	-
95	Americium-237[2]	W, all compounds	8E+4	3E+5	1E-4	4E-7	1E-3	1E-2
95	Americium-238[2]	W, all compounds	4E+4 -	3E+3 Bone surf (6E+3)	1E-6 -	- 9E-9	5E-4 -	5E-3 -
95	Americium-239	W, all compounds	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
95	Americium-240	W, all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
95	Americium-241	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
95	Americium-242m	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
95	Americium-242	W, all compounds	4E+3 -	8E+1 Bone surf (9E+1)	4E-8 -	- 1E-10	5E-5 -	5E-4 -
95	Americium-243	W, all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	- 2E-14	- 2E-8	- 2E-7
95	Americium-244m[2]	W, all compounds	6E+4 St wall (8E+4)	4E+3 Bone surf (7E+3)	2E-6 -	- 1E-8	- 1E-3	- 1E-2
95	Americium-244	W, all compounds	3E+3 -	2E+2 Bone surf (3E+2)	8E-8 -	- 4E-10	4E-5 -	4E-4 -
95	Americium-245	W, all compounds	3E+4	8E+4	3E-5	1E-7	4E-4	4E-3
95	Americium-246m[2]	W, all compounds	5E+4 St wall (6E+4)	2E+5 -	8E-5 -	3E-7 -	- 8E-4	- 8E-3
95	Americium-246[2]	W, all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
96	Curium-238	W, all compounds	2E+4	1E+3	5E-7	2E-9	2E-4	2E-3
96	Curium-240	W, all compounds	6E+1	6E-1	2E-10	-	-	-

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Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
			Bone surf (8E+1)	Bone surf (6E-1)	-	9E-13	1E-6	1E-5
96	Curium-241	W, all compounds	1E+3	3E+1	1E-8	-	2E-5	2E-4
			-	Bone surf (4E+1)	-	5E-11	-	-
96	Curium-242	W, all compounds	3E+1	3E-1	1E-10	-	-	-
			Bone surf (5E+1)	Bone surf (3E-1)	-	4E-13	7E-7	7E-6
96	Curium-243	W, all compounds	1E+0	9E-3	4E-12	-	-	-
			Bone surf (2E+0)	Bone surf (2E-2)	-	2E-14	3E-8	3E-7
96	Curium-244	W, all compounds	1E+0	1E-2	5E-12	-	-	-
			Bone surf (3E+0)	Bone surf (2E-2)	-	3E-14	3E-8	3E-7
96	Curium-245	W, all compounds	7E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
96	Curium-246	W, all compounds	7E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
96	Curium-247	W, all compounds	8E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
96	Curium-248	W, all compounds	2E-1	2E-3	7E-13	-	-	-
			Bone surf (4E-1)	Bone surf (3E-3)	-	4E-15	5E-9	5E-8
96	Curium-249[2]	W, all compounds	5E+4	2E+4	7E-6	-	7E-4	7E-3
			-	Bone surf (3E+4)	-	4E-8	-	-
96	Curium-250	W, all compounds	4E-2	3E-4	1E-13	-	-	-
			Bone surf (6E-2)	Bone surf (5E-4)	-	8E-16	9E-10	9E-9
97	Berkelium-245	W, all compounds	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
97	Berkelium-246	W, all compounds	3E+3	3E+3	1E-6	4E-9	4E-5	4E-4
97	Berkelium-247	W, all compounds	5E-1	4E-3	2E-12	-	-	-
			Bone surf (1E+0)	Bone surf (9E-3)	-	1E-14	2E-8	2E-7
97	Berkelium-249	W, all compounds	2E+2	2E+0	7E-10	-	-	-
			Bone surf (5E+2)	Bone surf (4E+0)	-	5E-12	6E-6	6E-5
97	Berkelium-250	W, all compounds	9E+3	3E+2	1E-7	-	1E-4	1E-3
			-	Bone surf (7E+2)	-	1E-9	-	-
98	Californium-244[2]	W, all compounds except						

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
		those given for Y	3E+4 St wall (3E+4)	6E+2 -	2E-7 -	8E-10 -	- 4E-4	- 4E-3
		Y, oxides and hydroxides	-	6E+2	2E-7	8E-10	-	-
98	Californium-246	W, see ^{244}Cf	4E+2	9E+0	4E-9	1E-11	5E-6	5E-5
		Y, see ^{244}Cf	-	9E+0	4E-9	1E-11	-	-
98	Californium-248	W, see ^{244}Cf	8E+0 Bone surf (2E+1)	6E-2 Bone surf (1E-1)	3E-11 -	- 2E-13	- 2E-7	- 2E-6
		Y, see ^{244}Cf	-	1E-1	4E-11	1E-13	-	-
98	Californium-249	W, see ^{244}Cf	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12 -	- 1E-14	- 2E-8	- 2E-7
		Y, see ^{244}Cf	-	1E-2 Bone surf (1E-2)	4E-12 -	- 2E-14	-	-
98	Californium-250	W, see ^{244}Cf	1E+0 Bone surf (2E+0)	9E-3 Bone surf (2E-2)	4E-12 -	- 3E-14	- 3E-8	- 3E-7
		Y, see ^{244}Cf	-	3E-2	1E-11	4E-14	-	-
98	Californium-251	W, see ^{244}Cf	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12 -	- 1E-14	- 2E-8	- 2E-7
		Y, see ^{244}Cf	-	1E-2 Bone surf (1E-2)	4E-12 -	- 2E-14	-	-
98	Californium-252	W, see ^{244}Cf	2E+0 Bone surf (5E+0)	2E-2 Bone surf (4E-2)	8E-12 -	- 5E-14	- 7E-8	- 7E-7
		Y, see ^{244}Cf	-	3E-2	1E-11	5E-14	-	-
98	Californium-253	W, see ^{244}Cf	2E+2 Bone surf (4E+2)	2E+0 -	8E-10 -	3E-12 -	- 5E-6	- 5E-5
		Y, see ^{244}Cf	-	2E+0	7E-10	2E-12	-	-
98	Californium-254	W, see ^{244}Cf	2E+0	2E-2	9E-12	3E-14	3E-8	3E-7
		Y, see ^{244}Cf	-	2E-2	7E-12	2E-14	-	-
99	Einsteinium-250	W, all compounds	4E+4 -	5E+2 Bone surf (1E+3)	2E-7 -	- 2E-9	6E-4 -	6E-3 -
99	Einsteinium-251	W, all compounds	7E+3 -	9E+2 Bone surf (1E+3)	4E-7 -	- 2E-9	1E-4 -	1E-3 -
99	Einsteinium-253	W, all compounds	2E+2	1E+0	6E-10	2E-12	2E-6	2E-5
99	Einsteinium-254m	W, all compounds	3E+2 LLI wall (3E+2)	1E+1 -	4E-9 -	1E-11 -	- 4E-6	- 4E-5

Appendix 4-B

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
99	Einsteinium-254	W, all compounds	8E+0 Bone surf (2E+1)	7E-2 Bone surf (1E-1)	3E-11 -	- 2E-13	- 2E-7	- 2E-6
100	Fermium-252	W, all compounds	5E+2	1E+1	5E-9	2E-11	6E-6	6E-5
100	Fermium-253	W, all compounds	1E+3	1E+1	4E-9	1E-11	1E-5	1E-4
100	Fermium-254	W, all compounds	3E+3	9E+1	4E-8	1E-10	4E-5	4E-4
100	Fermium-255	W, all compounds	5E+2	2E+1	9E-9	3E-11	7E-6	7E-5
100	Fermium-257	W, all compounds	2E+1 Bone surf (4E+1)	2E-1 Bone surf (2E-1)	7E-11 -	- 3E-13	- 5E-7	- 5E-6
101	Mendelevium-257	W, all compounds	7E+3 -	8E+1 Bone surf (9E+1)	4E-8 -	- 1E-10	1E-4 -	1E-3 -
101	Mendelevium-258	W, all compounds	3E+1 Bone surf (5E+1)	2E-1 Bone surf (3E-1)	1E-10 -	- 5E-13	- 6E-7	- 6E-6
-	Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life less than 2 hours	Submersion[1]	-	2E+2	1E-7	1E-9	-	-
-	Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours		-	2E-1	1E-10	1E-12	1E-8	1E-7
-	Any single radionuclide not listed above that decays by alpha emission or spontaneous fission, or any mixture for which either the identity or the concentration of any radionuclide in the mixture is not known		-	4E-4	2E-13	1E-15	2E-9	2E-8

FOOTNOTES:

[1]"Submersion" means that values given are for submersion in a hemispherical semi-infinite cloud of airborne material.

[2]These radionuclides have radiological half-lives of less than 2 hours. The total effective dose equivalent received during operations with these radionuclides might include a significant contribution from external exposure. The DAC values for all radionuclides, other than those designated Class "Submersion," are based upon the committed effective dose equivalent due to the intake of the radionuclide into the body and do NOT include potentially significant contributions to dose equivalent from external exposures. The licensee may substitute 1E-7 μCi/ml for the listed DAC to account for the submersion dose prospectively, but should use individual monitoring devices or other radiation measuring instruments that measure external exposure to demonstrate compliance with the limits. (See180 NAC 4-007.)

[3]For soluble mixtures of U-238, U-234, and U-235 in air, chemical toxicity may be the limiting factor (see180 NAC 4-004, item 5). If the percent by weight (enrichment) of U-235 is not greater than 5, the concentration value for a 40-hour workweek is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40-hour workweek shall not exceed 8E-3 (SA) μCi-hr/ml, where SA is the specific activity of the uranium inhaled. The specific activity for natural uranium is 6.77E-7 curies per gram U. The specific activity for other mixtures of U-238, U-235, and U-234, if not known, shall be:

~~Appendix 4-B~~

Atomic No.	Radionuclide	Class	Table I Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table I Occupational Values Col. 2 Inhalation ALI (μCi)	Table I Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
SA = 3.6E-7 curies/gram U U-depleted								
SA = [0.4 + 0.38 (enrichment) + 0.0034 (enrichment)^2] E-6 , enrichment ≥ 0.72								
where enrichment is the percentage by weight of U-235, expressed as percent.								

NOTE:

1. If the identity of each radionuclide in a mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture shall be the most restrictive DAC of any radionuclide in the mixture.

2. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in this appendix are not present in the mixture, the inhalation ALI, DAC, and effluent and sewage concentrations for the mixture are the lowest values specified in this appendix for any radionuclide that is not known to be absent from the mixture; or

+If it is known that Ac-227-D and Cm-250-W are not present		-	7E-4	3E-13	-	-	-
If, in addition, it is known that Ac-227-W,Y, Th-229-W,Y, Th-230-W, Th-232-W,Y, Pa-231-W,Y, Np-237-W, Pu-239-W, Pu-240-W, Pu-242-W, Am-241-W, Am-242m-W, Am-243-W, Cm-245-W, Cm-246-W, Cm-247-W, Cm-248-W, Bk-247-W, Cf-249-W, and Cf-251-W are not present		-	7E-3	3E-12	-	-	-
If, in addition, it is known that Sm-146-W, Sm-147-W, Gd-148-D,W, Gd-152-D,W, Th-228-W,Y, Th-230-Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, Np-236-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-Y, Pu-240-Y, Pu-242-Y, Pu-244-W,Y, Cm-243-W, Cm-244-W, Cf-248-W, Cf-249-Y, Cf-250-W,Y, Cf-251-Y, Cf-252-W,Y, and Cf-254-W,Y are not present		-	7E-2	3E-11	-	-	-
If, in addition, it is known that Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-Y, Es-254-W, Fm-257-W, and Md-258-W are not present		-	7E-1	3E-10	-	-	-
If, in addition, it is known that Si-32-Y, Ti-44-Y, Fe-60-D, Sr-90-Y, Zr-93-D, Cd-113m-D, Cd-113-D, In-115-D,W, La-138-D, Lu-176-W, Hf-178m-D,W, Hf-182-D,W, Bi-210m-D, Ra-224-W, Ra-228-W, Ac-226-D,W,Y, Pa-230-W,Y, U-233-D,W, U-234-D,W, U-235-D,W, U-236-D,W, U-238-D,W, Pu-241-Y, Bk-249-W, Cf-253-W,Y, and Es-253-W are not present		-	7E+0	3E-9	-	-	-
If it is known that Ac-227-D,W,Y, Th-229-W,Y, Th-232-W,Y, Pa-231-W,Y, Cm-248-W, and Cm-250-W are not present-		-	-	1E-14	-	-	
If, in addition, it is known that Sm-146-W, Gd-148-D,W, Gd-152-D, Th-228-W,Y, Th-230-W,Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, U-Nat-Y, Np-236-W, Np-237-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-W,Y, Pu-240-W,Y, Pu-242-W,Y, Pu-244-W,Y, Am-241-W, Am-242m-W, Am-243-W,							

Appendix 4-B

Atomic No.	Radionuclide	Class	Table 1 Occupational Values Col. 1 Oral Ingestion ALI (μCi)	Table 1 Occupational Values Col. 2 Inhalation ALI (μCi)	Table 1 Occupational Values Col. 3 Inhalation DAC (μCi/ml)	Table II Effluent Concentrations Col. 1 Air (μCi/ml)	Table II Effluent Concentrations Col. 2 Water (μCi/ml)	Table III release to Sewers Monthly Average Concentration (μCi/ml)
	Cm-243-W, Cm-244-W, Cm-245-W, Cm-246-W, Cm-247-W, Bk-247-W, Cf-249-W,Y, Cf-250-W,Y, Cf-251-W,Y, Cf-252-W,Y, and Cf-254-W,Y are not present		-	-	-	1E-13	-	-
	If, in addition, it is known that Sm-147-W, Gd-152-W, Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, U-Nat-W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-W,Y, Es-254-W, Fm-257-W, and Md-258-W are not present		-	-	-	1E-12	-	-
	If, in addition it is known that Fe-60, Sr-90, Cd-113m, Cd-113, In-115, I-129, Cs-134, Sm-145, Sm-147, Gd-148, Gd-152, Hg-194 (organic), Bi-210m, Ra-223, Ra-224, Ra-225, Ac-225, Th-228, Th-230, U-233, U-234, U-235, U-236, U-238, U-Nat, Cm-242, Cf-248, Es-254, Fm-257, and Md-258 are not present		-	-	-	-	1E-6	1E-5

3. If a mixture of radionuclides consists of uranium and its daughters in ore dust (10 μm AMAD particle distribution assumed) prior to chemical separation of the uranium from the ore, the following values may be used for the DAC of the mixture: 6E-11 μCi of gross alpha activity from uranium-238, uranium-234, thorium-230, and radium-226 per milliliter of air; 3E-11 μCi of natural uranium per milliliter of air; or 45 micrograms of natural uranium per cubic meter of air.

4. If the identity and concentration of each radionuclide in a mixture are known, the limiting values should be derived as follows: determine, for each radionuclide in the mixture, the ratio between the concentration present in the mixture and the concentration otherwise established in 180 NAC Appendix 4-B for the specific radionuclide when not in a mixture. The sum of such ratios for all of the radionuclides in the mixture may not exceed "1" (i.e., "unity").

   Example: If radionuclides "A," "B," and "C" are present in concentrations CA, CB, and CC, and if the applicable DACs are DAC_A, DAC_B, and DAC_C, respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_A}{DAC_A} + \frac{C_B}{DAC_B} + \frac{C_C}{DAC_C} \leq 1$$

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Hydrogen-3	1,000	Manganese-56	1,000
Beryllium-7	1,000	Iron-52	100
Beryllium-10	1	Iron-55	100
Carbon-11	1,000	Iron-59	10
Carbon-14	100	Iron-60	1
Fluorine-18	1,000	Cobalt-55	100
Sodium-22	10	Cobalt-56	10
Sodium-24	100	Cobalt-57	100
Magnesium-28	100	Cobalt-58m	1,000
Aluminum-26	10	Cobalt-58	100
Silicon-31	1,000	Cobalt-60m	1,000
Silicon-32	1	Cobalt-60	1
Phosphorus-32	10	Cobalt-61	1,000
Phosphorus-33	100	Cobalt-62m	1,000
Sulfur-35	100	Nickel-56	100
Chlorine-36	10	Nickel-57	100
Chlorine-38	1,000	Nickel-59	100
Chlorine-39	1,000	Nickel-63	100
Argon-39	1,000	Nickel-65	1,000
Argon-41	1,000	Nickel-66	10
Potassium-40	100	Copper-60	1,000
Potassium-42	1,000	Copper-61	1,000
Potassium-43	1,000	Copper-64	1,000
Potassium-44	1,000	Copper-67	1,000
Potassium-45	1,000	Zinc-62	100
Calcium-41	100	Zinc-63	1,000
Calcium-45	100	Zinc-65	10
Calcium-47	100	Zinc-69m	100
Scandium-43	1,000	Zinc-69	1,000
Scandium-44m	100	Zinc-71m	1,000
Scandium-44	100	Zinc-72	100
Scandium-46	10	Gallium-65	1,000
Scandium-47	100	Gallium-66	100
Scandium-48	100	Gallium-67	1,000
Scandium-49	1,000	Gallium-68	1,000
Titanium-44	1	Gallium-70	1,000
Titanium-45	1,000	Gallium-72	100
Vanadium-47	1,000	Gallium-73	1,000
Vanadium-48	100	Germanium-66	1,000
Vanadium-49	1,000	Germanium-67	1,000
Chromium-48	1,000	Germanium-68	10
Chromium-49	1,000	Germanium-69	1,000
Chromium-51	1,000	Germanium-71	1,000
Manganese-51	1,000	Germanium-75	1,000
Manganese-52m	1,000	Germanium-77	1,000
Manganese-52	100	Germanium-78	1,000
Manganese-53	1,000	Arsenic-69	1,000
Manganese-54	100	Arsenic-70	1,000

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Arsenic-71	100	Strontium-85m	1,000
Arsenic-72	100	Strontium-85	100
Arsenic-73	100	Strontium-87m	1,000
Arsenic-74	100	Strontium-89	10
Arsenic-76	100	Strontium-90	0.1
Arsenic-77	100	Strontium-91	100
Arsenic-78	1,000	Strontium-92	100
Selenium-70	1,000	Yttrium-86m	1,000
Selenium-73m	1,000	Yttrium-86	100
Selenium-73	100	Yttrium-87	100
Selenium-75	100	Yttrium-88	10
Selenium-79	100	Yttrium-90m	1,000
Selenium-81m	1,000	Yttrium-90	10
Selenium-81	1,000	Yttrium-91m	1,000
Selenium-83	1,000	Yttrium-91	10
Bromine-74m	1,000	Yttrium-92	100
Bromine-74	1,000	Yttrium-93	100
Bromine-75	1,000	Yttrium-94	1,000
Bromine-76	100	Yttrium-95	1,000
Bromine-77	1,000	Zirconium-86	100
Bromine-80m	1,000	Zirconium-88	10
Bromine-80	1,000	Zirconium-89	10
Bromine-82	100	Zirconium-93	1
Bromine-83	1,000	Zirconium-95	10
Bromine-84	1,000	Zirconium-97	100
Krypton-74	1,000	Niobium-88	1,000
Krypton-76	1,000	Niobium-89 (66 min)	1,000
Krypton-77	1,000	Niobium-89 (122 min)	1,000
Krypton-79	1,000	Niobium-90	100
Krypton-81	1,000	Niobium-93m	10
Krypton-83m	1,000	Niobium-94	1
Krypton-85m	1,000	Niobium-95m	100
Krypton-85	1,000	Niobium-95	100
Krypton-87	1,000	Niobium-96	100
Krypton-88	1,000	Niobium-97	1,000
Rubidium-79	1,000	Niobium-98	1,000
Rubidium-81m	1,000	Molybdenum-90	100
Rubidium-81	1,000	Molybdenum-93m	100
Rubidium-82m	1,000	Molybdenum-93	10
Rubidium-83	100	Molybdenum-99	100
Rubidium-84	100	Molybdenum-101	1,000
Rubidium-86	100	Technetium-93m	1,000
Rubidium-87	100	Technetium-93	1,000
Rubidium-88	1,000	Technetium-94m	1,000
Rubidium-89	1,000	Technetium-94	1,000
Strontium-80	100	Technetium-96m	1,000
Strontium-81	1,000	Technetium-96	100
Strontium-83	100	Technetium-97m	100

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Technetium-97	1,000	Indium-109	1,000
Technetium-98	10	Indium-110 (69.1m)	1,000
Technetium-99m	1,000	Indium-110 (4.9h)	1,000
Technetium-99	100	Indium-111	100
Technetium-101	1,000	Indium-112	1,000
Technetium-104	1,000	Indium-113m	1,000
Ruthenium-94	1,000	Indium-114m	10
Ruthenium-97	1,000	Indium-115m	1,000
Ruthenium-103	100	Indium-115	100
Ruthenium-105	1,000	Indium-116m	1,000
Ruthenium-106	1	Indium-117m	1,000
Rhodium-99m	1,000	Indium-117	1,000
Rhodium-99	100	Indium-119m	1,000
Rhodium-100	100	Tin-110	100
Rhodium-101m	1,000	Tin-111	1,000
Rhodium-101	10	Tin-113	100
Rhodium-102m	10	Tin-117m	100
Rhodium-102	10	Tin-119m	100
Rhodium-103m	1,000	Tin-121m	100
Rhodium-105	100	Tin-121	1,000
Rhodium-106m	1,000	Tin-123m	1,000
Rhodium-107	1,000	Tin-123	10
Palladium-100	100	Tin-125	10
Palladium-101	1,000	Tin-126	10
Palladium-103	100	Tin-127	1,000
Palladium-107	10	Tin-128	1,000
Palladium-109	100	Antimony-115	1,000
Silver-102	1,000	Antimony-116m	1,000
Silver-103	1,000	Antimony-116	1,000
Silver-104m	1,000	Antimony-117	1,000
Silver-104	1,000	Antimony-118m	1,000
Silver-105	100	Antimony-119	1,000
Silver-106m	100	Antimony-120 (16min.)	1,000
Silver-106	1,000	Antimony-120 (5.76d)	100
Silver-108m	1	Antimony-122	100
Silver-110m	10	Antimony-124m	1,000
Silver-111	100	Antimony-124	10
Silver-112	100	Antimony-125	100
Silver-115	1,000	Antimony-126m	1,000
Cadmium-104	1,000	Antimony-126	100
Cadmium-107	1,000	Antimony-127	100
Cadmium-109	1	Antimony-128 (10.4min.)	1,000
Cadmium-113m	0.1	Antimony-128 (9.01h)	100
Cadmium-113	100	Antimony-129	100
Cadmium-115m	10	Antimony-130	1,000
Cadmium-115	100	Antimony-131	1,000
Cadmium-117m	1,000	Tellurium-116	1,000
Cadmium-117	1,000	Tellurium-121m	10

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Tellurium-121	100	Cesium-132	100
Tellurium-123m	10	Cesium-134m	1,000
Tellurium-123	100	Cesium-134	10
Tellurium-125m	10	Cesium-135m	1,000
Tellurium-127m	10	Cesium-135	100
Tellurium-127	1,000	Cesium-136	10
Tellurium-129m	10	Cesium-137	10
Tellurium-129	1,000	Cesium-138	1,000
Tellurium-131m	10	Barium-126	1,000
Tellurium-131	100	Barium-128	100
Tellurium-132	10	Barium-131m	1,000
Tellurium-133m	100	Barium-131	100
Tellurium-133	1,000	Barium-133m	100
Tellurium-134	1,000	Barium-133	100
Iodine-120m	1,000	Barium-135m	100
Iodine-120	100	Barium-139	1,000
Iodine-121	1,000	Barium-140	100
Iodine-123	100	Barium-141	1,000
Iodine-124	10	Barium-142	1,000
Iodine-125	1	Lanthanum-131	1,000
Iodine-126	1	Lanthanum-132	100
Iodine-128	1,000	Lanthanum-135	1,000
Iodine-129	1	Lanthanum-137	10
Iodine-130	10	Lanthanum-138	100
Iodine-131	1	Lanthanum-140	100
Iodine-132m	100	Lanthanum-141	100
Iodine-132	100	Lanthanum-142	1,000
Iodine-133	10	Lanthanum-143	1,000
Iodine-134	1,000	Cerium-134	100
Iodine-135	100	Cerium-135	100
Xenon-120	1,000	Cerium-137m	100
Xenon-121	1,000	Cerium-137	1,000
Xenon-122	1,000	Cerium-139	100
Xenon-123	1,000	Cerium-141	100
Xenon-125	1,000	Cerium-143	100
Xenon-127	1,000	Cerium-144	1
Xenon-129m	1,000	Praseodymium-136	1,000
Xenon-131m	1,000	Praseodymium-137	1,000
Xenon-133m	1,000	Praseodymium-138m	1,000
Xenon-133	1,000	Praseodymium-139	1,000
Xenon-135m	1,000	Praseodymium-142m	1,000
Xenon-135	1,000	Praseodymium-142	100
Xenon-138	1,000	Praseodymium-143	100
Cesium-125	1,000	Praseodymium-144	1,000
Cesium-127	1,000	Praseodymium-145	100
Cesium-129	1,000	Praseodymium-147	1,000
Cesium-130	1,000	Neodymium-136	1,000
Cesium-131	1,000	Neodymium-138	100

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Neodymium-139m	1,000	Gadolinium-153	10
Neodymium-139	1,000	Gadolinium-159	100
Neodymium-141	1,000	Terbium-147	1,000
Neodymium-147	100	Terbium-149	100
Neodymium-149	1,000	Terbium-150	1,000
Neodymium-151	1,000	Terbium-151	100
Promethium-141	1,000	Terbium-153	1,000
Promethium-143	100	Terbium-154	100
Promethium-144	10	Terbium-155	1,000
Promethium-145	10	Terbium-156m (5.0h)	1,000
Promethium-146	1	Terbium-156m (24.4h)	1,000
Promethium-147	10	Terbium-156	100
Promethium-148m	10	Terbium-157	10
Promethium-148	10	Terbium-158	1
Promethium-149	100	Terbium-160	10
Promethium-150	1,000	Terbium-161	100
Promethium-151	100	Dysprosium-155	1,000
Samarium-141m	1,000	Dysprosium-157	1,000
Samarium-141	1,000	Dysprosium-159	100
Samarium-142	1,000	Dysprosium-165	1,000
Samarium-145	100	Dysprosium-166	100
Samarium-146	1	Holmium-155	1,000
Samarium-147	100	Holmium-157	1,000
Samarium-151	10	Holmium-159	1,000
Samarium-153	100	Holmium-161	1,000
Samarium-155	1,000	Holmium-162m	1,000
Samarium-156	1,000	Holmium-162	1,000
Europium-145	100	Holmium-164m	1,000
Europium-146	100	Holmium-164	1,000
Europium-147	100	Holmium-166m	1
Europium-148	10	Holmium-166	100
Europium-149	100	Holmium-167	1,000
Europium-150 (12.62h)	100	Erbium-161	1,000
Europium-150 (34.2y)	1	Erbium-165	1,000
Europium-152m	100	Erbium-169	100
Europium-152	1	Erbium-171	100
Europium-154	1	Erbium-172	100
Europium-155	10	Thulium-162	1,000
Europium-156	100	Thulium-166	100
Europium-157	100	Thulium-167	100
Europium-158	1,000	Thulium-170	10
Gadolinium-145	1,000	Thulium-171	10
Gadolinium-146	10	Thulium-172	100
Gadolinium-147	100	Thulium-173	100
Gadolinium-148	0.001	Thulium-175	1,000
Gadolinium-149	100	Ytterbium-162	1,000
Gadolinium-151	10	Ytterbium-166	100
Gadolinium-152	100	Ytterbium-167	1,000

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Ytterbium-169	100	Tungsten-177	1,000
Ytterbium-175	100	Tungsten-178	1,000
Ytterbium-177	1,000	Tungsten-179	1,000
Ytterbium-178	1,000	Tungsten-181	1,000
Lutetium-169	100	Tungsten-185	100
Lutetium-170	100	Tungsten-187	100
Lutetium-171	100	Tungsten-188	10
Lutetium-172	100	Rhenium-177	1,000
Lutetium-173	10	Rhenium-178	1,000
Lutetium-174m	10	Rhenium-181	1,000
Lutetium-174	10	Rhenium-182 (12.7h)	1,000
Lutetium-176m	1,000	Rhenium-182 (64.0h)	100
Lutetium-176	100	Rhenium-184m	10
Lutetium-177m	10	Rhenium-184	100
Lutetium-177	100	Rhenium-186m	10
Lutetium-178m	1,000	Rhenium-186	100
Lutetium-178	1,000	Rhenium-187	1,000
Lutetium-179	1,000	Rhenium-188m	1,000
Hafnium-170	100	Rhenium-188	100
Hafnium-172	1	Rhenium-189	100
Hafnium-173	1,000	Osmium-180	1,000
Hafnium-175	100	Osmium-181	1,000
Hafnium-177m	1,000	Osmium-182	100
Hafnium-178m	0.1	Osmium-185	100
Hafnium-179m	10	Osmium-189m	1,000
Hafnium-180m	1,000	Osmium-191m	1,000
Hafnium-181	10	Osmium-191	100
Hafnium-182m	1,000	Osmium-193	100
Hafnium-182	0.1	Osmium-194	1
Hafnium-183	1,000	Iridium-182	1,000
Hafnium-184	100	Iridium-184	1,000
Tantalum-172	1,000	Iridium-185	1,000
Tantalum-173	1,000	Iridium-186	100
Tantalum-174	1,000	Iridium-187	1,000
Tantalum-175	1,000	Iridium-188	100
Tantalum-176	100	Iridium-189	100
Tantalum-177	1,000	Iridium-190m	1,000
Tantalum-178	1,000	Iridium-190	100
Tantalum-179	100	Iridium-192 (73.8d)	1
Tantalum-180m	1,000	Iridium-192m (1.4min.)	10
Tantalum-180	100	Iridium-194m	10
Tantalum-182m	1,000	Iridium-194	100
Tantalum-182	10	Iridium-195m	1,000
Tantalum-183	100	Iridium-195	1,000
Tantalum-184	100	Platinum-186	1,000
Tantalum-185	1,000	Platinum-188	100
Tantalum-186	1,000	Platinum-189	1,000
Tungsten-176	1,000	Platinum-191	100

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Platinum-193m	100	Lead-212	1
Platinum-193	1,000	Lead-214	100
Platinum-195m	100	Bismuth-200	1,000
Platinum-197m	1,000	Bismuth-201	1,000
Platinum-197	100	Bismuth-202	1,000
Platinum-199	1,000	Bismuth-203	100
Platinum-200	100	Bismuth-205	100
Gold-193	1,000	Bismuth-206	100
Gold-194	100	Bismuth-207	10
Gold-195	10	Bismuth-210m	0.1
Gold-198m	100	Bismuth-210	1
Gold-198	100	Bismuth-212	10
Gold-199	100	Bismuth-213	10
Gold-200m	100	Bismuth-214	100
Gold-200	1,000	Polonium-203	1,000
Gold-201	1,000	Polonium-205	1,000
Mercury-193m	100	Polonium-207	1,000
Mercury-193	1,000	Polonium-210	0.1
Mercury-194	1	Astatine-207	100
Mercury-195m	100	Astatine-211	10
Mercury-195	1,000	Radon-220	1
Mercury-197m	100	Radon-222	1
Mercury-197	1,000	Francium-222	100
Mercury-199m	1,000	Francium-223	100
Mercury-203	100	Radium-223	0.1
Thallium-194m	1,000	Radium-224	0.1
Thallium-194	1,000	Radium-225	0.1
Thallium-195	1,000	Radium-226	0.1
Thallium-197	1,000	Radium-227	1,000
Thallium-198m	1,000	Radium-228	0.1
Thallium-198	1,000	Actinium-224	1
Thallium-199	1,000	Actinium-225	0.01
Thallium-200	1,000	Actinium-226	0.1
Thallium-201	1,000	Actinium-227	0.001
Thallium-202	100	Actinium-228	1
Thallium-204	100	Thorium-226	10
Lead-195m	1,000	Thorium-227	0.01
Lead-198	1,000	Thorium-228	0.001
Lead-199	1,000	Thorium-229	0.001
Lead-200	100	Thorium-230	0.001
Lead-201	1,000	Thorium-231	100
Lead-202m	1,000	Thorium-232	100
Lead-202	10	Thorium-234	10
Lead-203	1,000	Thorium-natural	100
Lead-205	100	Protactinium-227	10
Lead-209	1,000	Protactinium-228	1
Lead-210	0.01	Protactinium-230	0.1
Lead-211	100	Protactinium-231	0.001

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide	
Protactinium-232	1	Americium-246m	1,000
Protactinium-233	100	Americium-246	1,000
Protactinium-234	100	Curium-238	100
Uranium-230	0.01	Curium-240	0.1
Uranium-231	100	Curium-241	1
Uranium-232	0.001	Curium-242	0.01
Uranium-233	0.001	Curium-243	0.001
Uranium-234	0.001	Curium-244	0.001
Uranium-235	0.001	Curium-245	0.001
Uranium-236	0.001	Curium-246	0.001
Uranium-237	100	Curium-247	0.001
Uranium-238	100	Curium-248	0.001
Uranium-239	1,000	Curium-249	1,000
Uranium-240	100	Berkelium-245	100
Uranium-natural	100	Berkelium-246	100
Neptunium-232	100	Berkelium-247	0.001
Neptunium-233	1,000	Berkelium-249	0.1
Neptunium-234	100	Berkelium-250	10
Neptunium-235	100	Californium-244	100
Neptunium-236 (1.15×10^5y)	0.001	Californium-246	1
Neptunium-236 (22.5h)	1	Californium-248	0.01
Neptunium-237	0.001	Californium-249	0.001
Neptunium-238	10	Californium-250	0.001
Neptunium-239	100	Californium-251	0.001
Neptunium-240	1,000	Californium-252	0.001
Plutonium-234	10	Californium-253	0.1
Plutonium-235	1,000	Californium-254	0.001
Plutonium-236	0.001	Any alpha emitting radionuclide	
Plutonium-237	100	not listed above or mixtures	
Plutonium-238	0.001	of alpha emitters of unknown	
Plutonium-239	0.001	composition	0.001
Plutonium-240	0.001	Einsteinium-250	100
Plutonium-241	0.01	Einsteinium-251	100
Plutonium-242	0.001	Einsteinium-253	0.1
Plutonium-243	1,000	Einsteinium-254m	1
Plutonium-244	0.001	Einsteinium-254	0.01
Plutonium-245	100	Fermium-252	1
Americium-237	1,000	Fermium-253	1
Americium-238	100	Fermium-254	10
Americium-239	1,000	Fermium-255	1
Americium-240	100	Fermium-257	0.01
Americium-241	0.001	Mendelevium-257	10
Americium-242m	0.001	Mendelevium-258	0.01
Americium-242	10	Any radionuclide other than alpha-emitting	
Americium-243	0.001	radionuclides not listed above, or mixtures of	
Americium-244m	100	beta- emitters of unknown composition	0.01
Americium-244	10		
Americium-245	1,000		

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-C

QUANTITIES[1] MATERIAL REQUIRING LABELING

Radionuclide	Quantity Quantity (μCi)* (μCi)*	Radionuclide

[1]The quantities listed above were derived by taking 1/10th of the most restrictive ALI listed in Table I, Columns 1 and 2, of Appendix 004-B to Section 004, rounding to the nearest factor of 10, and constraining the values listed between 37 Bq and 37 MBq (0.001 and 1,000 μCi). Values of 3.7 MBq (100 μCi) have been assigned for radionuclides having a radioactive half-life in excess of 10^9 years, except rhenium, 37 MBq (1,000 μCi), to take into account their low specific activity.

NOTE: For purposes of 180 NAC 4-32.05, 4-035.01 and 4-055.01, item 1 where there is involved a combination of radionuclides in known amounts, the limit for the combination should be derived as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific radionuclide when not in combination. The sum of such ratios for all radionuclides in the combination may not exceed "1" -- that is, unity.

*To convert μCi to kBq, multiply the μCi value by 37.

APPENDIX 4-D

REQUIREMENTS FOR TRANSFERS OF LOW-LEVEL RADIOACTIVE WASTE INTENDED FOR DISPOSAL AT LICENSED DISPOSAL FACILITIES AND MANIFESTS

Section I. - Manifest.

A waste generator, collector, or processor who transports, or offers for transportation, low-level radioactive waste intended for ultimate disposal at a licensed low-level radioactive waste disposal facility must prepare a Manifest reflecting information requested on the following forms, U.S. Nuclear Regulatory Commission (U.S. NRC) U.S. NRC 540, (Uniform Low-Level Radioactive Waste Manifest (Shipping Paper) and U.S. Form NRC 541 (Uniform Low-Level Radioactive Waste Manifest (Container and Waste Description) and if necessary, on Department Form NRC 542 (Uniform Low-Level Radioactive Waste Manifest (Manifest Index and Regional Compact Tabulation). U.S. NRC 540 and U.S. NRC 540A, must be completed and must physically accompany the pertinent low-level radioactive waste shipment. Upon agreement between shipper and consignee, U.S. Forms U.S. NRC 541 and U.S. NRC 541A and U.S. NRC 542 and U.S. NRC 542A may be completed, transmitted, and stored in electronic media with the capability for producing legible, accurate, and complete records on the respective forms. Licensees are not required by the Department to comply with the manifesting requirements of this section, when they ship:

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(a) Low-Level Waste for processing and expect its return (that is, for storage under their license) prior to disposal at a licensed land disposal facility;

(b) Low-Level Waste that is being returned to the licensee who is the "waste generator" or "generator," as defined in this section; or

(c) Radioactively contaminated material to a "waste processor" that becomes the processor's "residual waste".

For guidance in completing these forms, refer to the instructions that accompany the forms. Copies of manifests required by this appendix may be legible carbon copies, photocopies, or computer printouts that reproduce the data in the format of the uniform manifest.

Forms U.S. NRC 540, U.S. NRC 541, U.S. NRC 541A and U.S. NRC 542 and U.S. NRC 542A and the accompanying instructions, in hard copy, may be obtained from

Department of Health and Human Services,
Division of Public Health, Office of Radiological Health,
301 Centennial Mall South
P.O. Box 95026
Lincoln, Nebraska 68509-5026

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This appendix includes information requirements of the Department of Transportation, as codified in 49 CFR part 172. Information on hazardous, medical, or other waste, required to meet Environmental Protection Department regulations, as codified in 40 CFR parts 259, 261 or elsewhere, is not addressed in this section, and must be provided on the required EPA forms. However, the required EPA forms must accompany the Uniform Low-Level Radioactive Waste Manifest required by this section.

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As used in this appendix, the following definitions apply:

"Chelating agent" has the same meaning as that given in 180 NAC 1-002.

"Chemical description" means a description of the principal chemical characteristics of a low-level radioactive waste.

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"Computer-readable medium" means that the Department's computer can transfer the information from the medium into its memory.

"Consignee" means the designated receiver of the shipment of low-level radioactive waste.

Decontamination facility" means a facility operating under a Department, U.S. Nuclear Regulatory Commission or Agreement State or license whose principal purpose is decontamination of equipment or materials to accomplish recycle, reuse, or other waste management objectives, and, for purposes of this section, is not considered to be a consignee for low-level waste shipments.

"Disposal container" means a container principally used to confine low-level radioactive waste during disposal operations at a land disposal facility (also see "high integrity container"). Note that for some shipments, the disposal container may be the transport package.

"EPA identification number" means the number received by a transporter following application to the Administrator of EPA as required by 40 CFR part 263.

"Generator" means a licensee operating under a Department, U.S. Nuclear Regulatory Commission or Agreement State license who (1) is a waste generator as defined in this part, or (2) is the licensee to whom waste can be attributed within the context of the Low-Level Radioactive Waste Policy Amendments Act of 1985 (e.g., waste generated as a result of decontamination or recycle activities).

"High integrity container (HIC)" means a container commonly designed to meet the structural stability requirements of Appendix 180 NAC 4-E, Section II , and to meet Department of Transportation requirements for a Type A package.

U.S. NRC Forms 540, 540A, 541, 541A, 542, and 542A are Forms referenced in this appendix. Licensees need not use originals of these U.S. NRC Forms as long as any substitute forms are equivalent to the original document in respect to content, clarity, size, and location of information. Upon agreement between the shipper and consignee, U.S. NRC Forms 541 (and 541A) and U.S. NRC Forms 542 and (542A) may be completed, transmitted, and stored in electronic media. The electronic media must have the capability for producing legible, accurate, and complete records in the format of the uniform manifest.

"Package" means the assembly of components necessary to ensure compliance with the packaging requirements of DOT regulations, together with its radioactive contents, as presented for transport.

"Physical description" means the items called for on Form U.S. NRC 541 to describe a low-level radioactive waste.

"Residual waste" means low-level radioactive waste resulting from processing or decontamination activities that cannot be easily separated into distinct batches attributable to specific waste generators. This waste is attributable to the processor or decontamination facility, as applicable.

"Shipper" means the licensed entity (i.e., the waste generator, waste collector, or waste processor) who offers low-level radioactive waste for transportation, typically consigning this type of waste to a licensed waste collector, waste processor, or land disposal facility operator.

"Shipping paper" means U.S. NRC 540 and, if required Form U.S. NRC 540A, which includes the information required by DOT in 49 CFR part 172.

"Source material" has the same meaning as that given in180 NAC 1-002.

"Special nuclear material" has the same meaning as that given in180 NAC 1-002.

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"Uniform Low-Level Radioactive Waste Manifest" or "Uniform Manifest" means the combination of U.S. NRC Forms 540, 541, and if necessary, 542, and their respective continuation sheets as needed, or equivalent.

"Waste collector" means an entity, operating under a Department, U.S. Nuclear Regulatory Commission or Agreement State license, whose principal purpose is to collect and consolidate waste generated by others, and to transfer this waste, without processing or repackaging the collected waste, to another licensed waste collector, licensed waste processor, or licensed disposal facility.

"Waste description" means the physical, chemical and radiological description of a low-level radioactive waste as called for on Form U.S. NRC 541.

"Waste generator" means an entity, operating under a Department, U.S. Nuclear Regulatory Commission or Agreement State license, who (1) possesses any material or component that contains radioactivity or is radioactively contaminated for which the licensee foresees no further use, and (2) transfers this material or component to a licensed disposal facility or to a licensed waste collector or processor for handling or treatment prior to disposal. A licensee performing processing or decontamination services may be a "waste generator" if the transfer of low-level radioactive waste from its facility is defined as "residual waste."

"Waste processor" means an entity, operating under a Department, U.S. Nuclear Regulatory Commission or Agreement State license, whose principal purpose is to process, repackage, or otherwise treat low-level radioactive material or waste generated by others prior to eventual transfer of waste to a licensed low-level radioactive waste disposal facility.

"Waste type" means a waste within a disposal container having a unique physical description that is, a specific waste descriptor code or description; or a waste sorbed on or solidified in a specifically defined media).

INFORMATION REQUIREMENTS

A. General Information

The shipper of the low-level radioactive waste, must provide the following information on the uniform manifest:

1. The name, facility address, and telephone number of the licensee shipping the waste;

2. An explicit declaration indicting whether the shipper is acting as a waste generator, collector, processor, or a combination of these identifiers for purposes of the manifested shipment; and

3. The name, address, and telephone number, or the name and EPA identification number for the carrier transporting the waste.

B. Shipment Information

The shipper of the radioactive waste must provide the following information regarding the waste shipment on the uniform manifest:

1. The date of the waste shipment;

2. The total number of packages/disposal containers;

3. The total disposal volume and disposal weight in the shipment;

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APPENDIX 4-D

4. The total radionuclide activity in the shipment.

5. The activity of each of the radionuclides H-3, C-14, Tc-99, and I-129 contained in the shipment; and

6. The total masses of U-233, U-235, and plutonium in the form of special nuclear material, and the total mass of uranium and thorium in the form of source material.

C. Disposal Container and Waste Information

The shipper of the radioactive waste must provide the following information on the uniform manifest regarding the waste and each disposal container of waste in the shipment: Deleted: shall

1. An alphabetic or numeric identification that uniquely identifies each disposal container in the shipment;

2. A physical description of the disposal container, including the manufacturer and model of any high integrity container;

3. The volume displaced by the disposal container;

4. The gross weight of the disposal container, including the waste;

5. For waste consigned to a disposal facility, the maximum radiation level at the surface of each disposal container;

6. A physical and chemical description of the waste;

7. The total weight percentage of chelating agent for any waste containing more than 0.1% chelating agent by weight, plus the identity of the principal chelating agent;

8. The approximate volume of waste within a container;

9. The sorbing or solidification media, if any, and the identity of the solidification media vendor and brand name;

10. The identities and activities of individual radionuclides contained in each container, the masses of U-233, U-235, and plutonium in the form of special nuclear material, and the masses of uranium and thorium in the form of source material. For discrete waste types (that is, activated materials, contaminated equipment, mechanical filters, sealed source/devices, and wastes in solidification/stabilization media), the identities and activities of individual radionuclides associated with a disposal container must be reported; Deleted: i.e. Deleted: shall

11. The total radioactivity within each container; and

12. For wastes consigned to a disposal facility, the classification of the waste pursuant to Appendix 4-E, Section I. Waste not meeting the structural stability requirements of Appendix 4-E, Section II(b) must be identified.

D. Uncontainerized Waste Information

The shipper of the radioactive waste must provide the following information on the uniform manifest regarding a waste shipment delivered without a disposal container: Deleted: shall

1. The approximate volume and weight of the waste;

APPENDIX 4-D

2. A physical and chemical description of the waste;

3. The total weight percentage of chelating agent if the chelating agent exceeds 0.1% by weight, plus the identity of the principal chelating agent;

4. For waste consigned to a disposal facility, the classification of the waste pursuant to Appendix 180 NAC 4-E, Section I. Waste not meeting the structural stability requirements of Appendix 180 NAC 4-E, Section II(b) must be identified.

5. The identities and activities of individual radionuclides contained in the waste, the masses of U-233, U-235, and plutonium in the form of special nuclear material, and the masses of uranium and thorium in the form of source material; and

6. For wastes consigned to a disposal facility, the maximum radiation levels at the surface of the waste.

E. Multi-Generator Disposal Container Information

This section applies to disposal containers enclosing mixtures of waste originating from different generators. (Note: The origin of the low-level waste resulting from a processor's activities may be attributable to one or more "generators" (including "waste generators") as defined in this section). It also applies to mixtures of wastes shipped in an uncontainerized form, for which portions of the mixture within the shipment originate from different generators.

1. For homogeneous mixtures of waste, such as incinerator ash, provide the waste description applicable to the mixture and the volume of the waste attributed to each generator.

2. For heterogeneous mixtures of waste, such as the combined products from a large compactor, identify each generator contributing waste to the disposal container, and, for discrete waste types (that is activated materials, contaminated equipment, mechanical filters, sealed source/devices, and wastes in solidification/stabilization media), the identities and activities of individual radionuclides contained on these waste types within the disposal container. For each generator, provide the following:

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(a) The volume of waste within the disposal container;

(b) A physical and chemical description of the waste, including the solidification agent, if any;

(c) The total weight percentage of chelating agents for any disposal container containing more than 0.1% chelating agent by weight, plus the identity of the principal chelating agent;

(d) The sorbing or solidification media, if any, and the identity of the solidification media vendor and brand name if the media is claimed to meet stability requirements in Appendix 180 NAC 4-E, Section II(b); and

(e) Radionuclide identities and activities contained in the waste, the masses of U-233, U-235, and plutonium in the form of special nuclear material, and the masses of uranium and thorium in the form of source material if contained in the waste.

Section II - Certification

An authorized representative of the waste generator, processor, or collector must certify by signing and dating the shipment manifest that the transported materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the

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APPENDIX 4-D

Department of Transportation and the Department. A collector in signing the certification is certifying that nothing has been done to the collected waste which would invalidate the waste generator's certification. Deleted: Agency

Section III - Control and Tracking

A. Any licensee who transfers radioactive waste to a land disposal facility or a licensed waste collector must comply with the requirements in A.1 through 9 of this section. Any licensee who transfers waste to a licensed waste processor for waste treatment or repackaging of A.4 through 9 of this section. A licensee shall: Deleted: shall

1. Prepare all wastes so that the waste is classified according to Appendix 180 NAC 4-E, Section I and meets waste characteristics requirements in, Appendix 180 NAC 4-E, Section II.

2. Label each disposal container (or transport package if potential radiation hazards preclude labeling of the individual disposal container) of waste to identify whether it is Class A waste, Class B waste, Class C waste, or greater than Class C waste, in accordance with Appendix 180 NAC 4-E, Section I.

3. Conduct a quality assurance program to assure compliance with Appendix 180 NAC 4-E, Section I and Section II (the program must include management evaluation of audits);

4. Prepare the Department Uniform Low-Level Radioactive Waste Manifest as required by this appendix; Deleted: Agency

5. Forward a copy or electronically transfer the Uniform Low-Level Radioactive Waste Manifest to the intended consignee so that either (i) receipt of the manifest precedes the low-level waste shipment or (ii) the manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both (i) and (ii) is also acceptable;

6. Include Forms U.S. NRC 540 and U.S. NRC 540A, if required, with the shipment regardless of the option in Paragraph A.5 of this section;.

7. Retain a copy of the manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by 180 NAC 3. This includes those manifests and documents required under the standards for protection against radiation in effect prior to May 30, 1994; and

8. Retain a copy of or electronically store the Uniform Low-Level Radioactive Waste Manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by Appendix 180 NAC 4-D.

9. For any shipments or any part of a shipment for which acknowledgment of receipt has not been received within the times set forth in this appendix, conduct an investigation in accordance with Paragraph E of this appendix.

B. Any waste collector licensee who handles only prepackaged waste must: Deleted: shall

1. Acknowledge receipt of the waste from the shipper within one week of receipt by returning a signed copy of Form U.S. NRC 540.

2. Prepare a new manifest to reflect consolidated shipments that meet the requirements of this appendix. The waste collector must ensure that, for each container of waste in the shipment, the manifest identifies the generator of that container of waste; Deleted: shall

APPENDIX 4-D

3. Forward a copy or electronically transfer the Uniform Low-Level Radioactive Waste Manifest to the intended consignee so that either: (i) Receipt of the manifest precedes the low-level waste shipment or (ii) the manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both (i) and (ii) is also acceptable;

4. Include Forms U.S. NRC 540 and NRC 540A, if required, with the shipment regardless of the option chosen in Paragraph B.3 of this section;

5. Retain a copy of the manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by180 NAC 3, and retain information from generator manifest until the license is terminated. This includes those manifests and documents of acknowledgment of receipt required under the standards for protection against radiation in effect prior to May 30, 1994; and

6. Retain a copy of or electronically store the Uniform Low-Level Radioactive Waste Manifest and documentation of acknowledgment of receipt;

7. For any shipments or any part of a shipment for which acknowledgment of receipt has not been received within the times set forth in this appendix, conduct an investigation in accordance with Paragraph E of this appendix; and

8. Notify the shipper and the Department when any shipment, or part of a shipment, has not arrived within 60 days after receipt of an advance manifest, unless notified by the shipper that the shipment has been canceled.

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C. Any licensed waste processor who treats or repackages waste must:

Deleted: shall

1. Acknowledge receipt of the waste from the shipper within one week of receipt by returning a signed copy of Form U.S. NRC 540;

2. Prepare a new manifest that meets the requirements of this appendix. Preparation of the new manifest reflects that the processor is responsible for meeting these requirements. For each container of waste in the shipment, the manifest must identify the waste generators, the preprocessed waste volume, and other information as required in Section J.E. of this appendix;

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3. Prepare all wastes so that the waste is classified according to Appendix 18- NAC 4-E, Section I, of Appendix 180 NAC 4-D and meets the waste characteristics requirements in Appendix 180 NAC 4-E, Section II;

4. Label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with Appendix 180 NAC 4-E, Section I and Section III;

5. Conduct a quality assurance program to assure compliance with Appendix 180 NAC 4- E, Section I and II (the program must include management evaluation of audits);

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6. Forward a copy or electronically transfer the Uniform Low-Level Radioactive Waste Manifest to the intended consignee so that either: (i) receipt of the manifest precedes the low-level waste shipment or (ii) the manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both (i) and (ii) is also acceptable;

7. Include Forms U.S. NRC 540 and NRC 540A, if required, with the shipment regardless of the option chosen in Paragraph C.6 of this section;

APPENDIX 4-D

8. Retain copies of the original manifests and new manifests and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by 180 NAC 3. This includes those manifests and documents of acknowledgment of receipt required under the standards for protection against radiation in effect prior to May 30, 1994; and

9. Retain a copy of or electronically store the Uniform Low-Level Radioactive Waste Manifest and documentation of acknowledgment of receipt as the record of transfer of licensed material as required by 180 NAC 3;

10. For any shipment or any part of a shipment for which acknowledgment of receipt has not been received within the times set forth in this appendix, conduct an investigation in accordance with Paragraph E of this appendix; and

11. Notify the shipper and the Department when any shipment, or any part of a shipment, has not arrived within 60 days after receipt of an advance manifest, unless notified by the shipper that the shipment has been canceled.

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D. The land disposal facility operator must:

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1. Acknowledge receipt of the waste within one week of receipt by returning, as a minimum, a signed copy of Form U.S. NRC 540 to the shipper. The shipper to be notified is the licensee who last possessed the waste and transferred the waste to the operator. If any discrepancy exists between materials listed on the Uniform Low-Level Radioactive Waste Manifest and materials received, copies or electronic transfer of the affected forms must be returned indicating that discrepancy.

2. Maintain copies of all completed manifests or equivalent documentation until the license is terminated. This includes those manifests or equivalent documents required under the standards for protection against radiation in effect prior to May 30, 1994.

3. Notify the shipper and the Department when any shipment, or part of a shipment, has not arrived within 60 days after receipt of an advance manifest, unless notified by the shipper that the shipment has been canceled.

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E. Any shipments or part of a shipment for which acknowledgment is not received within the times set forth in this section must:

1. Be investigated by the shipper if the shipper has not received notification or receipt within 20 days after transfer; and

2. Be traced and reported. The investigation must include tracing the shipment and filing a report with the Department. Each licensee who conducts a trace investigation must file a written report with the Department within two weeks of completion of the investigation.

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APPENDIX 4-E

CLASSIFICATION AND CHARACTERISTICS OF LOW-LEVEL RADIOACTIVE WASTE

I. Classification of Radioactive Waste for Land Disposal

a) Considerations. Determination of the classification of radioactive waste involves two considerations. First, consideration must be given to the concentration of long-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements on institutional controls, waste form, and disposal methods are effective.

b) Classes of waste.

1) Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A waste must meet the minimum requirements set forth in Section II. (a). If Class A waste also meets the stability requirements set forth in Section II. (b), it is not necessary to segregate the waste for disposal.

2) Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in Section II.

3) Class C waste is waste that not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in Section II.

c) Classification determined by long-lived radionuclides.If the radioactive waste contains only radionuclides listed in Table I, classification must be determined as follows:

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1) If the concentration does not exceed 0.1 times the value in Table I, the waste is Class A.

2) If the concentration exceeds 0.1 times the value in Table I, but does not exceed the value in Table I, the waste is Class C.

3) If the concentration exceeds the value in Table I, the waste is not generally acceptable for near surface disposal.

4) For wastes containing mixtures of radionuclides listed in Table I, the total concentration shall be determined by the sum of fractions rule described in Section I. (g).

APPENDIX 4-E

Table I		
	Concentration	
Radionuclide	curie/cubic meter[a]	nanocurie/gram[b]
C-14	8	
C-14 in activated metal	80	
Ni-59 in activated metal	220	
Nb-94 in activated metal	0.2	
Tc-99	3	
I-129	0.08	
Alpha emitting transuranic radionuclides with half-life greater than five years		100
Pu-241		3,500
Cm-242		20,000
Ra-226		100
[a]To convert the Ci/m^3 values to gigabecquerel (Gbq) per cubic meter, multiply the Ci/m^3 value by 37.		
[b]To convert the nCi/g values to becquerel (Bq) per gram, multiply the nCi/g value by 37.		

d) Classification determined by short-lived radionuclides. If the waste does not contain any of the radionuclides listed in Table I classification must be determined based on the concentrations shown in Table II. However, as specified in Section I. (f), if radioactive waste does not contain any nuclides listed in either Table I or II, it is Class A.

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1) If the concentration does not exceed the value in Column 1, the waste is Class A.

2) If the concentration exceeds the value in Column 1 but does not exceed the value in Column 2, the waste is Class B.

3) If the concentration exceeds the value in Column 2 but does not exceed the value in Column 3, the waste is Class C.

4) If the concentration exceeds the value in Column 3, the waste is not generally acceptable for near-surface disposal.

5) For wastes containing mixtures of the radionuclides listed in Table II, the total concentration must be determined by the sum of fractions rule described in Section I. (g).

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APPENDIX 4-E

Table II			
	Concentration, curie/cubic meter*		
Radionuclide	Column 1	Column 2	Column 3
Total of all radionuclides with less than 5-year half-life	700	-----	-----
H-3	40	-----	-----
Co-60	700	-----	-----
Ni-63	3.5	70	700
Ni-63 in activated metal	35	700	7000
Sr-90	0.04	150	7000
Cs-137	1	44	4600

*DEPARTMENT NOTE: To convert the Ci/m^3 value to gigabecquerel (Gbq) per cubic meter, multiply the Ci/m^3 value by 37. There are no limits established for these radionuclides in Class B or C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations for these wastes. These wastes shall be Class B unless the concentrations of other radionuclides in Table II determine the waste to be Class C independent of these radionuclides.

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e) Classification determined by both long- and short-lived radionuclides. If the radioactive waste contains a mixture of radionuclides, some of which are listed in Table I and some of which are listed in Table II, classification must be determined as follows:

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1) If the concentration of a radionuclide listed in Table I is less than 0.1 times the value listed in Table I, the class must be that determined by the concentration of radionuclides listed in Table II.

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2) If the concentration of a radionuclide listed in Table I exceeds 0.1 times the value listed in Table I, but does not exceed the value in Table I, the waste must be Class C, provided the concentration of radionuclides listed in Table II does not exceed the value shown in Column 3 of Table II.

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f) Classification of wastes with radionuclides other than those listed in Tables I and II. If the waste does not contain any radionuclides listed in either Table I or II, it is Class A.

g) The sum of the fractions rule for mixtures of radionuclides. For determining classification for waste that contains a mixture of radionuclides, it is necessary to determine the sum of fractions by dividing each radionuclide's concentration by the appropriate limit and adding the resulting values. The appropriate limits must all be taken from the same column of the same table. The sum of the fractions for the column must be less than 1.0 if the waste class is to be determined by that column. Example: A waste contains Sr-90 in a concentration of 1.85 TBq/m^3 (50 Ci/m^3) and Cs-137 in a concentration of 814 GBq/m^3 (22 Ci/m^3). Since the concentrations both exceed the values in Column 1, Table II, they must be compared to Column 2 values. For Sr-90 fraction, 50/150 = 0.33., for Cs-137 fraction, 22/44 = 0.5; the sum of the fractions = 0.83. Since the sum is less than 1.0, the waste is Class B.

h) Determination of concentrations in wastes. The concentration of a radionuclide may be determined by indirect methods such as use of scaling factors which relate the inferred concentration of one

APPENDIX 4-E

radionuclide to another that is measured, or radionuclide material accountability, if there is reasonable a7ssurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may be averaged over the volume of the waste, or weight of the waste if the units are expressed as becquerel (nanocurie) per gram.

II. Radioactive Waste Characteristics

a) The following are minimum requirements for all classes of waste and are intended to facilitate handling and provide protection of health and safety of personnel at the disposal site.

1) Wastes must be packaged in conformance with the conditions of the license issued to the site operator to which the waste will be shipped. Where the conditions of the site license are more restrictive than the provisions of 180 NAC 4, the site license conditions shall govern. Deleted: shall

2) Wastes must not be packaged for disposal in cardboard or fiberboard boxes. Deleted: shall

3) Liquid waste must be packaged in sufficient absorbent material to absorb twice the volume of the liquid. Deleted: shall

4) Solid waste containing liquid must contain as little free-standing and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume. Deleted: shall

5) Waste must not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water. Deleted: shall

6) Waste must not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste. This does not apply to radioactive gaseous waste packaged in accordance with Section II.(a)(8). Deleted: shall

7) Waste must not be pyrophoric. Pyrophoric materials contained in wastes must be treated, prepared, and packaged to be nonflammable.[1] Deleted: shall

8) Wastes in a gaseous form shall be packaged at an absolute pressure that does not exceed 1.5 atmospheres at 20°C. Total activity must not exceed 3.7 TBq (100 Ci) per container. Deleted: shall

9) Wastes containing hazardous, biological, pathogenic, or infectious material must be treated to reduce to the maximum extent practicable the potential hazard from the non-radiological materials. Deleted: shall

b) The following requirements are intended to provide stability of the waste. Stability is intended to ensure that the waste does not degrade and affect overall stability of the site through slumping, collapse, or other failure of the disposal unit and thereby lead to water infiltration. Stability is also a factor in limiting exposure to an inadvertent intruder, since it provides a recognizable and nondispersible waste.

1) Waste must have structural stability. A structurally stable waste form will generally maintain its physical dimensions and its form, under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, and microbial activity, and internal factors such as radiation effects and chemical changes. Structural stability can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability after disposal. Deleted: shall

[1]See 180 NAC 1-002 for definition of pyrophoric.

APPENDIX 4-E

2) Notwithstanding the provisions in Section II. (a)(3) and (4), liquid wastes, or wastes containing liquid, must be converted into a form that contains as little free-standing and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume of the waste when the waste is in a disposal container designed to ensure stability, or 0.5% of the volume of the waste for waste processed to a stable form. Deleted: shall

3) Void spaces within the waste and between the waste and its package must be reduced to the extent practicable. Deleted: shall

III. Labeling

Each package of waste must be clearly labeled to identify whether it is Class A, Class B, or Class C waste, in accordance with Section I. Deleted: shall

APPENDIX 4-F

QUANTITIES FOR USE WITH DECOMMISSIONING

(To convert μCi to kBq, multiply the μCi value by 37.)

Material	Microcurie
Americium-241	0.01
Antimony-122	100
Antimony-124	10
Antimony-125	10
Arsenic-73	100
Arsenic-74	10
Arsenic-76	10
Arsenic-77	100
Barium-131	10
Barium-133	10
Barium-140	10
Bismuth-210	1
Bromine-82	10
Cadmium-109	10
Cadmium-115m	10
Cadmium-115	100
Calcium-45	10
Calcium-47	10
Carbon-14	100
Cerium-141	100
Cerium-143	100
Cerium-144	1
Cesium-131	1,000
Cesium-134m	100
Cesium-134	1
Cesium-135	10
Cesium-136	10
Cesium-137	10
Chlorine-36	10
Chlorine-38	10
Chromium-51	1,000
Cobalt-58m	10
Cobalt-58	10
Cobalt-60	1
Copper-64	100
Dysprosium-165	10
Dysprosium-166	100
Erbium-169	100
Erbium-171	100
Europium-152 (9.2 h)	100
Europium-152 (13 yr)	1
Europium-154	1
Europium-155	10
Florine-18	1,000
Gadolinium-153	10
Gadolinium-159	100
Gallium-72	10
Germanium-71	100
Gold-198	100
Gold-199	100
Hafnium-181	10

APPENDIX 4-F

QUANTITIES FOR USE WITH DECOMMISSIONING

(To convert μCi to kBq, multiply the μCi value by 37.)

Material	Microcurie
Holmium-166	100
Hydrogen-3	1,000
Indium-113m	100
Indium-114m	10
Indium-115m	100
Indium-115	10
Iodine-125	1
Iodine-126	1
Iodine-129	0.1
Iodine-131	1
Iodine-132	10
Iodine-133	1
Iodine-134	10
Iodine-135	10
Iridium-192	10
Iridium-194	100
Iron-55	100
Iron-59	10
Krypton-85	100
Krypton-87	10
Lanthanum-140	10
Lutetium-177	100
Manganese-52	10
Manganese-54	10
Manganese-56	10
Mercury-197m	100
Mercury-197	100
Mercury-203	10
Molybdenum-99	100
Neodymium-147	100
Neodymium-149	100
Nickel-59	100
Nickel-63	10
Nickel-65	100
Niobium-93m	10
Niobium-95	10
Niobium-97	10
Osmium-185	10
Osmium-191m	100
Osmium-191	100
Osmium-193	100
Palladium-103	100
Palladium-109	100
Phosphorus-32	10
Platinum-191	100
Platinum-193m	100
Platinum-193	100
Platinum-197m	100
Platinum-197	100
Plutonium-239	0.01
Polonium-210	0.1

APPENDIX 4-F

QUANTITIES FOR USE WITH DECOMMISSIONING

(To convert μCi to kBq, multiply the μCi value by 37.)

Material	Microcurie
Potassium-42	10
Praseodymium-142	100
Praseodymium-143	100
Promethium-147	10
Promethium-149	10
Radium-226	0.01
Rhenium-186	100
Rhenium-188	100
Rhodium-103m	100
Rhodium-105	100
Rubidium-86	10
Rubidium-87	10
Ruthenium-97	100
Ruthenium-103	10
Ruthenium-105	10
Ruthenium-106	1
Samarium-151	10
Samarium-153	100
Scandium-46	10
Scandium-47	100
Scandium-48	10
Selenium-75	10
Silicon-31	100
Silver-105	10
Silver-110m	1
Silver-111	100
Sodium-22	1
Sodium-24	10
Strontium-85	10
Strontium-89	1
Strontium-90	0.1
Strontium-91	10
Strontium-92	10
Sulfur-35	100
Tantalum-182	10
Technetium-96	10
Technetium-97m	100
Technetium-97	100
Technetium-99m	100
Technetium-99	10
Tellurium-125m	10
Tellurium-127m	10
Tellurium-127	100
Tellurium-129m	10
Tellurium-129	100

APPENDIX 4-F
QUANTITIES FOR USE WITH DECOMMISSIONING

(To convert μCi to kBq, multiply the μCi value by 37.)

Material	Microcurie
Tellurium-131m	10
Tellurium-132	10
Terbium-160	10
Thallium-200	100
Thallium-201	100
Thallium-202	100
Thallium-204	10
Thorium (natural)[1]	100
Thulium-170	10
Thulium-171	10
Tin-113	10
Tin-125	10
Tungsten-181	10
Tungsten-185	10
Tungsten-187	100
Uranium (natural)[2]	100
Uranium-233	0.01
Uranium-234	0.01
Uranium-235	0.01
Vanadium-48	10
Xenon-131m	1,000
Xenon-133	100
Xenon-135	100
Ytterbium-175	100
Yttrium-90	10
Yttrium-91	10
Yttrium-92	100
Yttrium-93	100
Zinc-65	10
Zinc-69m	100
Zinc-69	1,000
Zirconium-93	10
Zirconium-95	10
Zirconium-97	10
Any alpha emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition	0.01

[1]Based on alpha disintegration rate of Th-232, Th-230 and their daughter products.

[2]Based on alpha disintegration rate of U-238, U-234 and U-235.

APPENDIX 4-F
QUANTITIES FOR USE WITH DECOMMISSIONING
(To convert μCi to kBq, multiply the μCi value by 37.)

Material	Microcurie
Any radionuclide other than alpha emitting radionuclides, not listed above or mixtures of beta emitters of unknown composition	0.1

APPENDIX 4-F
QUANTITIES FOR USE WITH DECOMMISSIONING

Deleted: (To convert μCi to kBq, multiply the μCi value by 37.)

Deleted: Material . Microcurie

NOTE: Where there is involved a combination of isotopes in known amounts, the limit for the combination should be derived as follows: Determine, 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" -- that is, unity.

APPENDIX 4-G
CONCENTRATION AND ACTIVITY LIMITS OF NUCLIDES FOR DISPOSAL IN A CITY OR COUNTY LANDFILL DISPOSAL FACILITY
(For use in 180 NAC 4-038)

Nuclides	Concentration Limits (Ci/m^3)	Annual Generator Disposal Limit (Ci/yr)
F-18	3E-1	8
Si-31	1E-2	3E+3
Na-24	9E-4	2E-2
P-32	2	5E+1
P-33	10	3E+2
S-35	9	2E+2
Ar-41	3E-1	8
K-42	2E-2	5E-1
Ca-45	4	1E+2
Ca-47	2E-2	5E-1
Sc-46	2E-3	5E-2
Cr-51	6E-1	2E+1
Fe-59	5E-3	1E-1
Co-57	6E-2	2
Co-58	1E-2	3E-1
Zn-65	7E-3	2E-1
Ga-67	3E-1	8
Se-75	5E-2	1
Br-82	2E-3	5E-2
Rb-86	4E-2	1
Sr-85	2E-2	5E-1
Sr-89	8	2E+2
Y-90	4	1E+2
Y-91	4E-1	10
Zr-95	8E-3	2E-1
Nb-95	8E-3	2E-1
Mo-99	5E-2	1

APPENDIX 4-G
CONCENTRATION AND ACTIVITY LIMITS OF NUCLIDES FOR DISPOSAL IN A CITY OR COUNTY LANDFILL DISPOSAL FACILITY
(For use in 180 NAC 4-038)

Nuclides	Concentration Limits (Ci/m^3)	Annual Generator Disposal Limit (Ci/yr)
Tc-99m	1	3E+1
Rh-106	1	3E+1
Ag-110m	2E-3	5E-2
Cd-115m	2E-1	5
In-111	9E-2	2
In-113m	9	2E+2
Sn-113	6E-2	2
Sn-119	2E+1	5E+2
Sb-124	2E-3	5E-2
Te-129	2E-1	5
I-123	4E-1	1E+1
I-125	7E-1	2E+1
I-131	4E-2	1
I-133	2E-2	5E-1
Xe-127	8E-2	2
Xe-133	1	3E+1
Ba-140	2E-3	5E-2
La-140	2E-3	5E-2
Ce-141	4E-1	1E+1
Ce-144	1E-3	3E-2
Pr-143	6	2E+2
Nd-147	7E-2	2
Yb-169	6E-2	2
Ir-192	1E-2	3E-1
Au-198	3E-2	8E-1
Hg-197	8E-1	2E+1
Tl-201	4E-1	1E+1

APPENDIX 4-G
CONCENTRATION AND ACTIVITY LIMITS OF NUCLIDES FOR DISPOSAL IN A CITY OR COUNTY LANDFILL DISPOSAL FACILITY
(For use in 180 NAC 4-038)

Nuclides	Concentration Limits (Ci/m^3)	Annual Generator Disposal Limit (Ci/yr)
Hg-203	1E-1	3

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

Deleted: shall

For each radionuclide in the mixture, calculate the ratio between the quantity present in the mixture and the limit established in Appendix 004-G 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").

Examples: If radionuclides a, b, and c are present in concentrations C_a, C_b, and C_c, and if the applicable concentrations are CL_a, CL_b, and CL_c respectively, then the concentrations shall be limited so that the following relationship exists:

$$(C_a/CL_a) + (C_b/CL_b) + (C_c/CL_c) \leq 1$$

If the total curies for radionuclides a, b, and c are represented A_a, A_b, and A_c, and the annual curie limit for each radionuclide is AL_a, AL_b, and AL_c, then the generator is limited to the following:

$$(A_a/AL_a) + (A_b/AL_b) + (A_c/AL_c) \leq 1$$

APPENDIX 4-H
NATIONALLY TRACKED SOURCE THRESHOLDS

The Terabecquerel (TBq) values are the regulatory standard. The curie (Ci) values specified are obtained by converting from the TBq value. The curie values are provided for practical usefulness only and are rounded after conversion.

Radioactive material	Category 1 (TBq)	Category 1 (Ci)	Category 2 (TBq)	Category 2 (Ci)
Actinium-227	20	540	0.2	5.4
Americium-241	60	1,600	0.6	16
Americium-241/Be	60	1,600	0.6	16
Californium-252	20	540	0.2	5.4
Cobalt-60	30	810	0.3	8.1
Curium-244	50	1,400	0.5	14
Cesium-137	100	2,700	1.0	27
Gadolinium-153	1,000	27,000	10	270
Iridum-192	80	2,200	0.8	22
Plutonium-238	60	1,600	0.6	16
Plutonium-239/Be	60	1,600	0.6	16
Polonium-210	60	1,600	0.6	16
Promethium-147	40,000	1,100,000	400	11,000
Radium-226	40	1,100	0.4	11
Selenium-75	200	5,400	2	54
Strontium-90	1,000	27,000	10	270
Thorium-228	20	540	0.2	5.4
Thorium-229	20	540	0.2	5.4
Thulium-170	20,000	540,000	200	5,400
Ytterbium-169	300	8,100	3	81

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Nebraska Department of Health and Human Services, Office of Radiological Health

CUMULATIVE OCCUPATIONAL EXPOSURE HISTORY

NRH-1
Effective Date

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1. NAME (LAST, FIRST, MIDDLE INITIAL)		2. IDENTIFICATION NUMBER		3. ID TYPE	4. SEX MALE ☐ FEMALE ☐	5. DATE OF BIRTH
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER	9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE / 16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER	9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE / 16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER	9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE / 16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER	9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE / 16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER	9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE / 16. CDE	17. TEDE	18. TODE
6. MONITORING PERIOD		7. LICENSEE OR REGISTRANT NAME		8. LICENSE OR REGISTRATION NUMBER	9. RECORD ☐ ESTIMATE ☐ NO RECORD ☐	10. ROUTINE ☐ PSE ☐
11. DDE	12. LDE	13. SDE, WB	14. SDE, ME	15. CEDE / 16. CDE	17. TEDE	18. TODE

19. SIGNATURE OF MONITORED INDIVIDUAL	20. DATE SIGNED	21. CERTIFYING ORGANIZATION	22. SIGNATURE OF DESIGNEE	23. DATE SIGNED

INSTRUCTIONS AND ADDITIONAL INFORMATION PERTINENT TO THE COMPLETION OF NRH-1
(All doses should be stated in rems)

1. Type or print the full name of the monitored individual in the order of last name (include "Jr," "Sr," "III," etc.), first name, middle initial (if applicable).

2. Enter the individual's identification number, including punctuation. This number should be a unique number.

3. Enter the code for the type of identification used as shown below:

CODE	ID TYPE
SSN	U.S. Social Security Number
PPN	Passport Number
CSI	Canadian Social Insurance Number
WPN	Work Permit Number
IND	INDEX Identification Number
OTH	Other

4. Check the box that denotes the sex of the individual being monitored.

5. Enter the date of birth of the individual being monitored in the format MM/DD/YY.

6. Enter the monitoring period for which this report is filed. The format should be MM/DD/YY - MM/DD/YY.

7. Enter the name of the licensee, registrant, or facility not licensed by the Department that provided monitoring.

8. Enter the Department license or registration number or numbers.

9. Place an "X" in Record, Estimate, or No Record. Choose "Record" if the dose data listed represent a final determination of the dose received to the best of the licensee's or registrant's knowledge. Choose "Estimate" only if the listed dose data are preliminary and will be superseded by a final determination resulting in a subsequent report. An example of such an instance would be dose data based on self-reading dosimeter results and the licensee or registrant intends to assign the record dose on the basis of TLD results that are not yet available.

10. Place an "X" in either Routine or PSE. Choose "Routine" if the data represent the results of monitoring for routine exposures. Choose "PSE" if the listed dose data represents the results of monitoring of planned specialexposures received during the monitoring period. If more than one PSE was received in a single year, the licensee should sum them and report the total of all PSEs.

11. Enter the deep dose equivalent (DDE) to the whole body.

12. Enter the eye dose equivalent (LDE) recorded for the lens of the eye.

13. Enter the shallow dose equivalent recorded for the skin of the whole body (SDE,WB).

14. Enter the shallow dose equivalent recorded for the skin of the extremity receiving the maximum dose (SDE,ME).

15. Enter the committed effective dose equivalent (CEDE).

16. Enter the committed dose equivalent (CDE) recorded for the maximally exposed organ.

17. Enter the total effective dose equivalent (TEDE). The TEDE is the sum of items 11 and 15.

18. Enter the total organ dose equivalent (TODE) for the maximally exposed organ. The TODE is the sum of items 11 and 16.

19. Signature of the monitored individual. The signature of the monitored individual on this form indicates that the information contained on the form is complete and correct to the best of his or her knowledge.

20. Enter the date this form was signed by the monitored individual.

21. [OPTIONAL] Enter the name of the licensee, registrant or facility not licensed by the Department, providing monitoring for exposure to radiation (such as a DOE facility) or the employer if the individual is not employed by the licensee or registrant and the employer chooses to maintain exposure records for its employees.

22. [OPTIONAL] Signature of the person designated to represent the licensee, registrant or employer entered in item 21. The licensee, registrant or employer who chooses to countersign the form should have on file documentation of all the information on the Department Form Y being signed.

23. [OPTIONAL] Enter the date this form was signed by the designated representative.

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Deleted: the 9-digit social security number if at all possible. If the individual has no social security number, enter the number from another official identification such as a passport or work permit.

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Nebraska Department of Health and Human Services, Office of Radiological Health

NRH-2
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OCCUPATIONAL EXPOSURE RECORD FOR A MONITORING PERIOD

1. NAME (LAST, FIRST, MIDDLE INITIAL)	2. IDENTIFICATION NUMBER	3. ID TYPE	4. SEX MALE____ FEMALE____	5. DATE OF BIRTH

6. MONITORING PERIOD	7. LICENSEE OR REGISTRANT NAME	8. LICENSE OR REGISTRATION NUMBER(S)	9A.		9B.	
				RECORD		ROUTINE
				ESTIMATE		PSE

INTAKES

10A. RADIONUCLIDE	10B. CLASS	10C. MODE	10D. INTAKE IN μCi

DOSES (in rem)

DEEP DOSE EQUIVALENT (DDE)	11.
EYE DOSE EQUIVALENT TO THE LENS OF THE EYE (LDE)	12.
SHALLOW DOSE EQUIVALENT, WHOLE BODY (SDE,WB)	13.
SHALLOW DOSE EQUIVALENT, MAX EXTREMITY (SDE,ME)	14.
COMMITTED EFFECTIVE DOSE EQUIVALENT (CEDE)	15.
COMMITTED DOSE EQUIVALENT, MAXIMALLY EXPOSED ORGAN (CDE)	16.
TOTAL EFFECTIVE DOSE EQUIVALENT (BLOCKS 11+15) (TEDE)	17.
TOTAL ORGAN DOSE EQUIVALENT, MAX ORGAN (BLOCKS 11+16) (TODE)	18.

19. COMMENTS

20. SIGNATURE – LICENSEE OR REGISTRANT	21. DATE PREPARED

INSTRUCTIONS AND ADDITIONAL INFORMATION PERTINENT TO THE COMPLETION OF NRH-2
(All doses should be stated in rems)

1. Type or print the full name of the monitored individual in the order of last name (include "Jr," "Sr," "III," etc.), first name, middle initial (if applicable).

2. Enter the individual's identification number, including punctuation. This number should be a unique number.

3. Enter the code for the type of identification used as shown below:

CODE	ID TYPE
SSN	U.S. Social Security Number
PPN	Passport Number
CSI	Canadian Social Insurance Number
WPN	Work Permit Number
IND	INDEX Identification Number
OTH	Other

4. Check the box that denotes the sex of the individual being monitored.

5. Enter the date of birth of the individual being monitored in the format MM/DD/YY.

6. Enter the monitoring period for which this report is filed. The format should be MM/DD/YY - MM/DD/YY.

7. Enter the name of the licensee or registrant.

8. Enter the Department license or registration number or numbers.

9A. Place an "X" in Record or Estimate. Choose "Record" if the dose data listed represent a final determination of the dose received to the best of the licensee's or registrant's knowledge. Choose "Estimate" only if the listed dose data are preliminary and will be superseded by a final determination resulting in a subsequent report. An example of such an instance would be dose data based on self-reading dosimeter results and the licensee intends to assign the record dose on the basis of TLD results that are not yet available.

9B. Place an "X" in either Routine or PSE. Choose "Routine" if the data represent the results of monitoring for routine exposures. Choose "PSE" if the listed dose data represents the results of monitoring of planned special exposures received during the monitoring period. If more than one PSE was received in a single year, the licensee or registrant should sum them and report the total of all PSEs.

10A. Enter the symbol for each radionuclide that resulted in an internal exposure recorded for the individual, using the format "Xx-###x," for instance, Cs-137 or Tc-99m.

10B. Enter the lung clearance class as listed in Appendix B to Part D (D, W, Y, V, or O for other) for all intakes by inhalation.

10C. Enter the mode of intake. For inhalation, enter "H." For absorption through the skin, enter "B." For oral ingestion, enter "G." For injection, enter "J."

10D. Enter the intake of each radionuclide in μCi.

11. Enter the deep dose equivalent (DDE) to the whole body.

12. Enter the eye dose equivalent (LDE) recorded for the lens of the eye.

13. Enter the shallow dose equivalent recorded for the skin of the whole body (SDE,WB).

14. Enter the shallow dose equivalent recorded for the skin of the extremity receiving the maximum dose (SDE,ME).

15. Enter the committed effective dose equivalent (CEDE) or "NR" for "Not Required" or "NC" for "Not Calculated".

16. Enter the committed dose equivalent (CDE) recorded for the maximally exposed organ or "NR" for "Not Required" or "NC" for "Not Calculated".

17. Enter the total effective dose equivalent (TEDE). The TEDE is the sum of items 11 and 15.

18. Enter the total organ dose equivalent (TODE) for the maximally exposed organ. The TODE is the sum of items 11 and 16.

19. Signature of the person designated to represent the licensee or registrant.

20. Enter the date this form was prepared.

21. COMMENTS.
In the space provided, enter additional information that might be needed to determine compliance with limits. An example might be to enter the note that the SDE,ME was the result of exposure from a discrete hot particle. Another possibility would be to indicate that an overexposed report has been sent to the Department in reference to the exposure report.

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ATTACHMENT 4-1

29 CFR 1910.134(l)(1)(ii)(A-E)

(B) All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use; and

(C) Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

(ii) The employer shall ensure that respirator inspections include the following:

(A) A check of respirator function, tightness of connections, and the condition of the various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, and cartridges, canisters or filters; and

(B) A check of elastomeric parts for pliability and signs of deterioration.

(iii) In addition to the requirements of paragraphs (h)(3)(i) and (ii) of this section, self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls to 90% of the manufacturer's recommended pressure level. The employer shall determine that the regulator and warning devices function properly.

(iv) For respirators maintained for emergency use, the employer shall:

(A) Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator; and

(B) Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent certification.

(v) *Repairs.* The employer shall ensure that respirators that fail an inspection or are otherwise found to be defective are removed from service, and are discarded or repaired or adjusted in accordance with the following procedures:

(i) Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer's NIOSH-approved parts designed for the respirator;

(ii) Repairs shall be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed; and

(iii) Reducing and admission valves, regulators, and alarms shall be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

(i) *Breathing air quality and use.* This paragraph requires the employer to provide employees using atmosphere-supplying respirators (supplied-air and SCBA) with breathing gases of high purity.

(1) The employer shall ensure that compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration accords with the following specifications:

(i) Compressed and liquid oxygen shall meet the United States Pharmacopoeia requirements for medical or breathing oxygen; and

(ii) Compressed breathing air shall meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:

(A) Oxygen content (v/v) of 19.5-23.5%;

(B) Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;

(C) Carbon monoxide (CO) content of 10 ppm or less;

(D) Carbon dioxide content of 1,000 ppm or less; and

(E) Lack of noticeable odor.

(2) The employer shall ensure that compressed oxygen is not used in atmosphere-supplying respirators that have previously used compressed air.

(3) The employer shall ensure that oxygen concentrations greater than 23.5% are used only in equipment designed for oxygen service or distribution.

(4) The employer shall ensure that cylinders used to supply breathing air

TITLE 180 CONTROL OF RADIATION

CHAPTER 5 RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS

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Copies of the Code of Federal Regulations (CFR) cited in this Chapter are available for inspection at the Department of Health and Human Services Regulation and Licensure, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska.

21 CFR 800 through 1299 (April 1, 2002)

Or at http://www.access.gpo.gov/nara/cfr/index.html

Or copies of CFR's can be ordered from:

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Or Call Order Desk in Washington, D.C. (202)512-1800

Or On the internet at http://www.bookstore.gpo.gov

TITLE 180 CONTROL OF RADIATION

CHAPTER 5 RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS

5-001 SCOPE AND AUTHORITY

5-001.01 180 NAC 5 prescribes requirements for the issuance of licenses or registrations for the industrial use of sources of radiation and radiation safety requirements for persons using these sources of radiation in industrial radiography. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

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5-001.02 The provisions and requirements of 180 NAC 5 are in addition to, and not in substitution for, other requirements of Title 180. In particular, the general requirements and provisions of 180 NAC 1, 2, 3, 4, 10, 13, 17 and 18 apply to applicants, licensees and registrants subject to 180 NAC 5. 180 NAC 3 and 13 apply to licensing and transportation of radioactive material and 180 NAC 2 applies to registration of radiation machines. Except for chapters which are applicable only to sealed radioactive source, radiation machines and sealed radioactive sources are both covered by 180 NAC 5. 180 NAC 5 does not apply to medical uses of sources of radiation which are addressed in 180 NAC 6, 7 and 9.

5-001.03 21 CFR as published on April 1, 2002 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Office of Radiological Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

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5-001.04 National Bureau of Standards Handbook 136 issued 1-1981 as referred to in this Chapter is herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Office of Radiological Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509

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5-002 DEFINITIONS: As used in 180 NAC 5, the following definitions apply:

Annual refresher safety training means a review conducted or provided by the licensee or registrant for its employees on radiation safety aspects of industrial radiography. The review must

include, as a minimum, any results of internal inspections, new procedures or equipment, new or revised regulations, and accidents or errors that have been observed. The review must also provide opportunities for employees to ask safety questions.

ANSI means the American National Standards Institute.

Associated equipment means equipment that is used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides, or comes in contact with the source.[1]

Cabinet radiography means industrial radiography conducted in an enclosure or cabinet so shielded that radiation levels at every location on the exterior meet the limitations specified in 180 NAC 4-013.01, 4-013.02, and 4-013.03.

Cabinet x-ray system means a x-ray system with the x-ray tube installed in an enclosure that is independent of existing architectural structures except the floor. The cabinet x-ray system is intended to contain at least that portion of a material being irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of radiation. Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities. A x-ray tube used within a shielded part of a building, or x-ray equipment which may temporarily or occasionally incorporate portable shielding is not considered a cabinet x-ray system.

Camera see Radiographic exposure device.

Certifiable cabinet x-ray system means an existing uncertified x-ray system that has been modified to meet the certification requirements specified in 21 CFR 1020.40.

Certified cabinet x-ray system means an x-ray system which has been certified in accordance with 21 CFR 1010.2 as being manufactured and assembled pursuant to the provisions of 21 CFR 1020.40.

Certifying entity means an independent certifying organization meeting the requirements in Appendix A of 180 NAC 5 or a state regulatory program meeting the requirements in Appendix A, Parts II and III of 180 NAC 5.

Collimator means a radiation shield that is placed on the end of the guide tube or directly onto a radiographic exposure device to restrict the size of the radiation beam when the sealed source is cranked into position to make a radiographic exposure.

Control cable (Drive cable) means the cable that is connected to the source assembly and used to drive the source to and from the exposure location.

Control drive mechanism means a device that enables the source assembly to be moved into and out of the exposure device.

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[1] e.g., guide tube, control tube, control (drive) cable, removable stop, "J" tube and collimator when used as an exposure head.

Control tube means a protective sheath for guiding the control cable. The control tube connects the control drive mechanism to the radiographic exposure device.

Drive cable see Control cable.

Exposure head means a device that locates the gamma radiography sealed source in the selected working position.[2]

Field station means a facility where sources of radiation may be stored or used and from which equipment is dispatched.

Guide tube (Projection sheath) means a flexible or rigid tube or "J" tube for guiding the source assembly and the attached control cable from the exposure device to the exposure head. The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head.

Hands-on experience means experience in all of those areas considered to be directly involved in the radiography process, and includes taking radiographs, calibration of survey instruments, operational and performance testing of survey instruments and devices, film development, posting of radiation areas, transportation of radiography equipment, posting of records and radiation area surveillance, etc., as applicable. Excessive time spent in only one or two of these areas, such as film development or radiation area surveillance, should not be counted toward the 2000 hours of hands-on experience required for an Radiation Safety Officer in 180 NAC 5-015.01, item 2 or the hands-on experience for a radiographer as required by 180 NAC 5-016.01.

Independent certifying organization means an independent organization that meets all of the criteria of Appendix A to 180 NAC 5.

Industrial radiography (Radiography) means the examination of the structure of materials by nondestructive methods using sources of ionizing radiation to produce radiographic images.

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Permanent radiographic installation means an enclosed shielded room, cell, or vault, not located at a temporary jobsite, in which radiography is performed.

Pigtail see Source assembly.

Pill see Sealed source.

Practical examination means a demonstration through application of the safety rules and principles in industrial radiography including use of all procedures and equipment to be used by radiographic personnel.

Projection sheath see Guide tube.

Projector see Radiographic exposure device.

[2]An exposure head is also known as a source stop.

Radiation Safety Officer for "industrial radiography" means an individual with the responsibility for the overall radiation safety protection program on behalf of the licensee or registrant and who meets the requirements of 180 NAC 5-015.

Radiographer means any individual who performs or who, in attendance at the site where the sources of radiation are being used, personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of the Department's regulations and the conditions of the license or registration.

Radiographer's assistant means any individual who under the direct supervision of a radiographer, uses radiographic exposure devices, sources of radiation, related handling tools, or radiation survey instruments in industrial radiography.

Radiographer certification means written approval received from a certifying entity stating that an individual has satisfactorily met the radiation safety, testing, and experience criteria in 180 NAC 15-016.

Radiographic exposure device (Camera or Projector) means any instrument containing a sealed source fastened or contained therein, in 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.

Radiographic operations means all activities performed with a radiographic exposure device, or with a radiation machine. Activities include using, transporting (except by common or contract carriers), or storing a temporary job site, performing surveys to confirm the adequacy of boundaries, setting up equipment, and any activity inside restricted area boundaries. Transporting a radiation machine is not considered a radiographic operation.

Radiography see Industrial radiography.

S-tube means a tube through which the radioactive source travels when inside a radiographic exposure device.

Sealed source see 180 NAC 1-002.

Shielded position means the location within the radiographic exposure device, source changer or storage container that, by manufacturer's design, is the proper location for storage of the sealed source.

Source assembly (Pigtail) means an assembly that consists of the sealed source and a connector that attaches the source to the control cable. The source assembly may include a ballstop to secure the source in the shielded position.

Source changer means a device designed and used for replacement of sealed sources in radiographic exposure devices. They may also be used for transporting and storing sealed source.

Storage area means any location, facility, or vehicle that is used to store and secure a radiographic exposure device, a radiation machine, sealed source, or a storage container, when it is not used for

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radiographic operations. Storage areas are locked or have a physical barrier to prevent accidental exposure, tampering, or unauthorized removal of the device, machine, or container.

Storage container means a device in which sealed sources or radiation machines are secured or stored.

Temporary job site means a location where radiographic operations are performed and where sources of radiation may be stored other than the location(s) of use authorized on the license or registration.

Underwater radiography means radiographic operations performed when the radiographic exposure device or radiation machine and/or related equipment are beneath the surface of the water.

5-003 EXEMPTIONS

5-003.01 Uses of certified and certifiable cabinet x-ray systems are exempt from the requirements of 180 NAC 5 except for the following:

1. For certified and certifiable cabinet x-ray systems, including those designed to allow admittance of individuals:

   a. No registrant may permit any individual to operate a cabinet x-ray system until the individual has received a copy of and instruction in the operating procedures for the unit. Records that demonstrate compliance with 180 NAC 5-003.01, item 1 must be maintained for Department inspection until disposal is authorized by the Department. Deleted: Agency Deleted: Agency
   b. Tests for proper operation of interlocks must be conducted and recorded at intervals not to exceed six months. Records of these tests must be maintained for Department inspection until disposal is authorized by the Department. Deleted: Agency Deleted: Agency
   c. The registrant must perform an evaluation of the radiation dose limits to determine compliance with 180 NAC 4-013.01, 4-013.02, and 4-013.03, and 21 CFR 1020.40, Cabinet X-ray Systems, at intervals not to exceed one year. Records of these evaluations must be maintained for Department inspection for two years after the evaluation. Deleted: Agency

5-003.02 Industrial uses of hand-held light intensified imaging devices are exempt from the requirements in 180 NAC 5 if the dose rate 18 inches from the source of radiation to any individual does not exceed 2 millirem per hour. Devices which exceed this limit must meet the applicable requirements of 180 NAC 5 and the licensing or registration requirements of 180 NAC 2 or 180 NAC 3, as applicable. Deleted: rules

5-004 LICENSING AND REGISTRATION REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHY OPERATIONS

5-004.01 The Department will approve an application for specific license for the use of licensed material or a registration for use of radiation machines if the applicant meets the following requirements and pays applicable fees specified in 180 NAC 18: Deleted: Agency

1. The applicant satisfies the general requirements specified in 180 NAC 2 for radiation machine facilities or 180 NAC 3 for radioactive material, as applicable, and any special requirements contained in 180 NAC 5;
2. The applicant submits an adequate program for training radiographers and radiographer's assistants that meets the requirements of 180 NAC 5-016:
3. The applicant submits procedures for verifying and documenting the certification status of radiographers and for ensuring that the certification of individuals acting as radiographers remains valid;
4. The applicant submits written operating and emergency procedures as described in 180 NAC 5-017;
5. The applicant submits a description of a program for inspections of the job performance of each radiographer and radiographer's assistant at intervals not to exceed six months as described in 180 NAC 5-016.05;
6. The applicant submits a description of the applicant's overall organizational structure as it applies to the radiation safety responsibilities in industrial radiography, including specified delegation of authority and responsibility;
7. The applicant submits the qualifications of the individual(s) designated as the radiation safety officer as described in 180 NAC 5-015.01;
8. If an applicant intends to perform leak testing of sealed sources or exposure devices containing depleted uranium (DU) shielding, the applicant must describe the procedures for performing the test and the qualifications of the persons(s) authorized to do the leak testing. If the applicant intends to analyze its own wipe samples, the application must include a description of the procedures to be followed. The description must include the:

    a. Methods of collecting the samples;
    b. Qualifications of the individual who analyzes the samples;
    c. Instruments to be used; and
    d. Methods of analyzing the samples

9. If the applicant intends to perform calibrations of survey instruments and alarming ratemeters, the applicant must describe methods to be used and the experience of the person(s) who will perform the calibrations. All calibrations must be performed according to the procedures described and at the intervals prescribed in 180 NAC 5-008 and 180 NAC 5-019.07, item 4.
10. The applicant identifies and describes the location(s) of all field stations and permanent radiographic installations.
11. The applicant identifies the location(s) where all records required by this and other Chapters of Title 180 will be maintained.
12. If an application includes underwater radiography, a description of:

    a. Radiation safety procedures and radiographer responsibilities unique to the performance of underwater radiography;
    b. Radiographic equipment and radiation safety equipment unique to underwater radiography; and
    c. Methods for gas-tight encapsulation of equipment.

5-005 PERFORMANCE REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHY EQUIPMENT:
Equipment used in industrial radiographic operations must meet the following minimum criteria:

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5-005.01 Each radiographic exposure device, source assembly or sealed source, and all associated equipment must meet the requirements specified in American National Standard Institute, N432-1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography," (published as NBS Handbook 136, issued January 1981). This publication has been incorporated herein by reference and is available for viewing at the Department of Health and Human Services, Office of Radiological Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

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5-005.02 In addition to the requirements specified in 180 NAC 5-005.01, the following requirements apply to radiographic exposure devices, source chargers, source assemblies and sealed sources;

1. The licensee must ensure that each radiographic exposure device has attached to it a durable, legible, clearly visible label bearing the:

   a. Chemical symbol and mass number of the radionuclide in the device;
   b. Activity and the date on which this activity was last measured;
   c. Model or product code and serial number of the sealed source;
   d. Name of the manufacturer of the sealed source; and
   e. Licensee's name, address, and telephone number.

2. Radiographic exposure devices intended for use as Type B packages must meet the applicable transportation requirements of 180 NAC 13.
3. Modification of radiographic exposure devices, source changers, and source assemblies and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system,

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5-005.03 In addition to the requirements specified in 180 NAC 5-005.01 and 5-005.02, the following requirements apply to radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the device for radiographic operations or to source changers;

1. The coupling between the source assembly and the control cable must be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling must be such that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.
2. The device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. This securing system may only be released by means of a deliberate operation on the exposure device.
3. The outlet fittings, lock box, and drive cable fittings on each radiographic exposure device must be equipped with safety plugs or covers which must be installed during storage and transportation to protect the source assembly from water, mud, sand or other foreign matter.
4. Each sealed source or source assembly must have attached to it or engraved on it, a durable, legible, visible label with the words:

"DANGER -- RADIOACTIVE"

The label may not interfere with the safe operation of the exposure device or associated equipment.

5. The guide tube must be able to withstand a crushing test that closely approximates the crushing forces that are likely to be encountered during use, and be able to withstand a kinking resistance test that closely approximates the kinking forces that are likely to be encountered during use.
6. Guide tubes must be used when moving the source out of the device.
7. An exposure head or similar device designed to prevent the source of assembly from passing out of the end of the guide tube must be attached to the outermost end of the guide tube during the industrial radiography operations.
8. The guide tube exposure head connection must be able to withstand the tensile test for control units specified in ANSI N432-1980.
9. Source changes must provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.

5-005.04 All radiographic exposure devices and associated equipment in use after January 10, 1996, must comply with the requirements of 180 NAC 5; and

5-005.05 As an exception to 180 NAC 5-005.01, equipment used in industrial radiographic operations need not comply with Section 8.9.2 (c) of the Endurance Test in American National Standards Institute N432-1980, if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment can reasonably exert on the lever or crankshaft of the drive mechanism.

5-006 LIMITS ON EXTERNAL RADIATION LEVELS FROM STORAGE CONTAINERS AND SOURCE CHANGERS: The maximum exposure rate limits for storage containers and source changers are 2 millisieverts (200 mrem) per hour at any exterior surface, and 0.1 millisieverts (10 mrem) per hour at 1 meter from any exterior surface with the sealed source in the shielded position.

5-007 LOCKING OF SOURCES OF RADIATION, STORAGE CONTAINERS AND SOURCE CHANGERS

5-007.01 Each radiographic exposure device must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The exposure device and/or its container must be kept locked (and if a keyed-lock, with the key removed at all times) when not under the direct surveillance of a radiographer or a radiographer's assistant except at permanent radiographic installations as stated in 180 NAC 5-021. In addition, during radiographic operations the sealed source assembly must be secured in a shielded position each time the source is returned to that position.

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5-007.02 Each sealed source storage container and source changer must have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers must be kept locked (and if a keyed-lock, with the key removed at all times) when containing sealed

sources except when under the direct surveillance of a radiographer or a radiographer's assistant.

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5-007.03 The control panel of each radiation machine must be equipped with a lock that will prevent the unauthorized use of a x-ray system or the accidental production of radiation. The radiation machine must be kept locked and the key removed at all times except when under the direct visual surveillance of a radiographer or a radiographer's assistant.

5-008 RADIATION SURVEY INSTRUMENTS

5-008.01 The licensee or registrant must keep sufficient calibrated and operable radiation survey instruments at each location where sources of radiation are present to make the radiation surveys required by 180 NAC 4 and 180 NAC 5 . Instrumentation required by 180 NAC 5 must be capable of measuring a range from 0.02 millisieverts (2 mrem) per hour through 0.01 sievert (1 rem) per hour.

5-008.02 The licensee or registrant must have each radiation survey instrument required under 180 NAC 5-008.01 calibrated:

1. At energies appropriate for use and at intervals not to exceed six months or after instrument servicing, except for battery changes;
2. For linear scale instruments, at two points located approximately one-third and two-thirds of full-scale on each scale; for logarithmic scale instruments, at mid-range of each decade, and at two points of at least one decade; and for digital instruments, at 3 points between 0.02 and 10 millisieverts (2 and 1000 mrem) per hour; and
3. So that an accuracy within plus or minus 20% of the true radiation dose rate can be demonstrated at each point checked.

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5-008.03 The licensee or registrant must maintain records of the results of the instrument calibrations in accordance with 180 NAC 5-025.

5-009 LEAK TESTING AND REPLACEMENT OF SEALED SOURCES

5-009.01 The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing of any sealed source must be performed by persons authorized to do so by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State.

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5-009.02 The opening, repair, or modification of any sealed source must be performed by persons specifically authorized to do so by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State.

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5-009.03 Testing and recordkeeping requirements.

1. Each licensee who uses a sealed source must have the source tested for leakage at intervals not to exceed six months. The leak testing of the sources must be performed using a method approved by the Department, the U.S. Nuclear

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Regulatory Commission, or by another Agreement State. The wipe sample should be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample must be analyzed for radioactive contamination. The analysis must be capable of detecting the presence of 185 becquerel (0.005 μCi) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State to perform the analysis.

2. The licensee must maintain records of the leak tests in accordance with 180 NAC 5-026.
3. Unless a sealed source is accompanied by a certificate from the transferor that shows that it has been leak tested within six months before the transfer, it may not be used by the licensee until tested for leakage. Sealed sources that are in storage and not in use do not require leak testing, but must be tested before use or transfer to another person if the interval of storage exceeds six months.

5-009.04 Any test conducted pursuant to 180 NAC 5-009.02 and 180 NAC 5-009.03 that reveals the presence of 185 becquerel (0.005 μCi) or more of removable radioactive material must be considered evidence that the sealed source is leaking. The licensee must immediately withdraw the equipment involved from use and must have it decontaminated and repaired or disposed of in accordance with Department regulations. A report must be filed with the Department within five days of any test with results that exceed the threshold in 180 NAC 5-009.04, describing the equipment involved, the test results, and the corrective action taken.

5-009.05 Each exposure device using depleted uranium (DU) shielding and an S-tube configuration must be tested for DU contamination at intervals not to exceed 12 months. The analysis must be capable of detecting the presence of 185 becquerel (0.005μCi) of radioactive material on the test sample and must be performed by a person specifically authorized by the Department, the U.S. Nuclear Regulatory Commission or another Agreement State to perform the analysis. Should such testing reveal the presence of 185 becquerel (0.005μCi) or more of DU contamination, the exposure device must be removed from use until an evaluation of the wear of the S-tube has been made. Should the evaluation reveal the S-tube is worn through, the device may not be used again. DU shielded devices do not have to be tested for DU contamination while not in use and in storage. Before using or transferring such a device, however, the device must be tested for DU contamination, if the interval of storage exceeds 12 months. A record of the DU leak-test must be made in accordance with 180 NAC 5-026.

5-010 QUARTERLY INVENTORY

5-010.01 Each licensee or registrant must conduct a quarterly physical inventory to account for all sources of radiation, and for devices containing depleted uranium received and possessed under the license.

5-010.02 The licensee or registrant must maintain records of the quarterly inventory in accordance with 180 NAC 5-027.

5-011 INSPECTION AND MAINTENANCE OF RADIATION MACHINES, RADIOGRAPHIC EXPOSURE DEVICES, TRANSPORT, AND STORAGE CONTAINERS, ASSOCIATED EQUIPMENT, SOURCE CHANGERS, AND SURVEY INSTRUMENTS

5-011.01 The licensee or registrant must perform visual and operability checks on survey meters, radiation machines, radiographic exposure devices, transport and storage containers, associated equipment and source changers before each day's use, or work shift, to ensure that:

1. The equipment is in good working condition;
2. The sources are adequately shielded; and
3. Required labeling is present.

5-011.02 Survey instrument operability must be performed using check sources or other appropriate means.

5-011.03 If equipment problems are found, the equipment must be removed from service until repaired.

5-011.04 Each licensee or registrant must have written procedures for and perform inspection and routine maintenance of radiation machines, radiographic exposure devices, source changers, associated equipment, transport and storage containers, and survey instruments at intervals not to exceed three months or before the first use thereafter to ensure the proper functioning of components important to safety. If equipment problems are found, the equipment must be removed from service until repaired.

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5-011.05 The licensee's inspection and maintenance program must include procedures to assure that Type B packages are shipped and maintained in accordance with the certificate of compliance or other approval.

5-011.06 Records of equipment problems and of any maintenance performed under 180 NAC 5-011 must be made in accordance with 180 NAC 5-029.

5-011.07 A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of 180 NAC 5-011 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirement, is deemed to satisfy the requirements of 180 NAC 13-007 and 180 NAC 13-021.

5-012 PERMANENT RADIOGRAPHIC INSTALLATIONS

5-012.01 Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation must have either:

1. An entrance control of the type described in 180 NAC 4-023.01, item 1 that causes the radiation level upon entry into the area to be reduced; or

2. Both conspicuous visible and audible warning signals to warn of the presence of radiation. The visible sign must be actuated by radiation whenever the source is

exposed or the machine is energized. The audible signal must be actuated when an attempt is made to enter the installation while the source is exposed or the machine is energized.

5-012.02 The alarm system must be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test must include a check of both the visible and audible signals. Entrance control devices that reduce the radiation level upon entry as designated in 180 NAC 5-012.01, item 1 must be tested monthly. If an entrance control device or an alarm is operating improperly, it must be immediately labeled as defective and repaired within 7 calendar days. The facility may continue to be used during this seven day period, provided the licensee or registrant implements the continuous surveillance requirements of 180 NAC 5-021 and uses an alarming ratemeter. Test records for entrance controls and audible and visual alarms must be maintained in accordance with 180 NAC 5-030.

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5-013 LABELING, STORAGE, AND TRANSPORTATION

5-013.01 The licensee may not use a source changer or a container to store radioactive material unless the source changer or the storage container has securely attached to it a durable, legible, and clearly visible label bearing the standard trefoil radiation caution symbol conventional colors, that is, magenta, purple or black on a yellow background, having a minimum diameter of 25 mm, and the wording:

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CAUTION*
RADIOACTIVE MATERIAL
NOTIFY CIVIL AUTHORITIES (or "NAME OF COMPANY")
* or "DANGER"

5-013.02 The licensee may not transport radioactive material unless the material is packaged, and the package is labeled, marked, and accompanied with appropriate shipping papers in accordance with 180 NAC 13.

5-013.03 Radiographic exposure devices, source changers, storage containers, and radiation machines, must be physically secured to prevent tampering or removal by unauthorized personnel. The licensee must store radioactive material in a manner that will minimize danger from explosion or fire.

5-013.04 The licensee must lock and physically secure the transport package containing radioactive material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal.

5-013.05 The licensee's or registrant's name and city or town where the main business office is located must be prominently displayed with a durable, clearly visible label(s) on both sides of all vehicles used to transport radioactive material or radiation machines for temporary job site use.

5-014 CONDUCTING INDUSTRIAL RADIOGRAPHIC OPERATIONS

5-014.01 Whenever radiography is performed at a location other than a permanent radiographic installation, the radiographer must be accompanied by at least one other qualified radiographer or an individual who has at a minimum met the requirements of 180 NAC 5-016.03. The additional qualified individual must observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one qualified individual is present.

5-014.02 All radiographic operations must be conducted in a permanent radiographic installation unless otherwise specifically authorized by the Department. Deleted: Agency

5-014.03 Except when physically impossible, collimators must be used in industrial radiographic operations that use radiographic exposure devices that allow the source to be moved out of the device.

5-014.04 A licensee or registrant may conduct underwater radiography only if procedures have been approved by the Department, the U.S. Nuclear Regulatory Commission, or by another Agreement State. Deleted: Agency

5-015 RADIATION SAFETY OFFICER: The Radiation Safety Officer must ensure that radiation safety activities are being performed in accordance with approved procedures and regulatory requirements in the daily operation of the licensee's or registrant's program.

5-015.01 The minimum qualifications, training, and experience for Radiation Safety Officers for industrial radiography are as follows:

1. Completion of the training and testing requirements of 180 NAC 5-016.01
2. 2000 hours of hands-on experience as a qualified radiographer in industrial radiographic operations; and
3. Formal training in the establishment and maintenance of a radiation safety protection program.

5-015.02 The Department will consider alternatives when the Radiation Safety Officer has appropriate training and experience in the field of ionizing radiation, and in addition, has adequate formal training with respect to the establishment and maintenance of a radiation safety protection program. Deleted: Agency

5-015.03 The specific duties and authorities of the Radiation Safety Officer include:

1. Establishing and overseeing all operating, emergency, and ALARA procedures as required by 180 NAC 4 and reviewing them regularly to ensure that they conform to Department regulations and the license or registration conditions; Deleted: Agency
2. Overseeing and approving the training program for radiographic personnel to ensure that appropriate and effective radiation protection practices are taught;
3. Ensuring that required radiation surveys and leak tests are performed and documented in accordance with the regulations, including any corrective measures when levels of radiation exceed established limits;

4. Ensuring that personnel monitoring devices are calibrated, if applicable, and used properly; that records are kept of the monitoring results; and that timely notifications are made as required by 180 NAC 4; and
5. Ensuring that operations are conducted safely and for implementing corrective actions including terminating operations.

5-016 TRAINING

5-016.01 The licensee or registrant may not permit any individual to act as a radiographer until the individual:

1. Has received at least 40 hours of training in the subjects outlined in 5-016.07, in addition to on the job training consisting of hands-on experience under the supervision of a radiographer, and is certified through a radiographer certification program by a certifying entity in accordance with the criteria specified in Appendix A of 180 NAC 5. The on the job training must include a minimum of two months (320 hours) of active participation in the performance of industrial radiography utilizing radioactive material and/or one month (160 hours) of active participation in the performance of industrial radiography utilizing radiation machines. Individuals performing industrial radiography utilizing radioactive materials and radiation machines must complete both segments of the on the job training (three months or 480 hours).

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5-016.02 In addition, the licensee or registrant may not permit any individual to act as a radiographer until the individual:

1. Has received copies and instruction in the requirements described in the regulations contained in 180 NAC 5, and applicable chapters of 180 NAC 4, 10, and 13, in the license or registration under which the radiographer will perform industrial radiography, and the licensee's or registrant's operating and emergency procedures;
2. Has demonstrated an understanding of items in 180 NAC 5-016.02, item 1 by successful completion of a written or oral examination;
3. Has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure devices, sealed sources, in the daily inspection of devices and associated equipment, and in the use of radiation survey instruments; and
4. Has demonstrated understanding of the use of the equipment described in 180 NAC 5-016.02, item 3 by successful completion of a practical examination.

5-016.03 The licensee or registrant may not permit any individual to act as a radiographer's assistant until the individual:

1. Has received copies of and instruction in the requirements described in the regulations contained in 180 NAC 5, and applicable 180 NAC 4, 10, and 13, in the license or registration under which the radiographer's assistant will perform industrial radiography, and the licensee's or registrant's operating and emergency procedures;
2. Has demonstrated an understanding of items 180 NAC 5-016.03, item 1 by successful completion of a written or oral examination;

3. Under the personal supervision of a radiographer, has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure devices and sealed sources, in the daily inspection of devices and associated equipment, and in the use of radiation survey instruments; and
4. Has demonstrated understanding of the use of the equipment described in 180 NAC 5-016.03, item 3 by successful completion of a practical examination.

5-016.04 The licensee or registrant must provide annual refresher safety training for each radiographer and radiographer's assistant at intervals not to exceed 12 months.

5-016.05 Except as provided in 180 NAC 5-016.05, item 4, the Radiation Safety Officer or designee must conduct an inspection program of the job performance of each radiographer and radiographer's assistant to ensure that the Department's regulations, license or registration requirements, and the applicant's operating and emergency procedures are followed. The inspection program must:

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1. Include observation of the performance of each radiographer and radiographer's assistant during an actual industrial radiographic operation, at intervals not to exceed six months; and

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2. Provide that, if a radiographer or a radiographer's assistant has not participated in an industrial radiographic operation for more than six months since the last inspection, the radiographer must demonstrate knowledge of the training requirements of 180 NAC 5-016.02, item 3 and the radiographer's assistant must demonstrate knowledge of the training requirement of 180 NAC 5-016.03, item 3, by a practical examination before these individuals can next participate in a radiographic operation.

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3. The Department may consider alternatives in those situations where the individual serves as both radiographer and Radiation Safety Officer.

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4. In those operations where a single individual serves as both radiographer and Radiation Safety Officer, and performs all radiography operations, an inspection program is not required.

5-016.06 The licensee or registrant must maintain records of the above training to include certification documents, written, oral and practical examinations, refresher safety training and inspections of job performance in accordance with 180 NAC 5-031.

5-016.07 The licensee or registrant must include the following subjects required in 180 NAC 5-016.01:

1. Fundamentals of radiation safety including:

   a. Characteristics of gamma and x-radiation;
   b. Units of radiation dose and quantity of radioactivity;
   c. Hazards of exposure to radiation;
   d. Levels of radiation from sources of radiation; and
   e. Methods of controlling radiation dose (time, distance, and shielding);

2. Radiation detection instruments including:

a. Use, operation, calibration, and limitations of radiation survey instruments;
b. Survey techniques; and
c. Use of personnel monitoring equipment;

3. Equipment to be used including:

a. Operation and control of radiographic exposure equipment, remote handling equipment, and storage containers, including pictures or models of source assemblies (pigtails);
b. Operation and control of radiation machines;
c. Storage, control, and disposal of sources of radiation; and
d. Inspection and maintenance of equipment.

4. The requirements of pertinent state and federal regulations; and
5. Case histories of accidents in radiography.

5-016.08 Records of radiographer certification maintained in accordance with 180 NAC 5-031.01 provide appropriate affirmation of certification requirements specified in180 NAC 005-016.01, item 1.

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5-017 OPERATING AND EMERGENCY PROCEDURES

5-017.01 Operating and emergency procedures must include, as a minimum, instructions in the following:

1. Appropriate handling and use of sources of radiation so that no person is likely to be exposed to radiation doses in excess of the limits established in 180 NAC 4.;
2. Methods and occasions for conducting radiation surveys;
3. Methods of posting and controlling access to radiographic areas;
4. Methods and occasions for locking and securing sources of radiation;
5. Personnel monitoring and the use of personnel monitoring equipment;
6. Transporting equipment to field locations, including packing of radiographic exposure devices and storage containers in the vehicles, placarding of vehicles when needed, and control of the equipment during transportation as described in 180 NAC 13;
7. The inspection, maintenance, and operability checks of radiographic exposure , devices, radiation machines, survey instruments, alarming ratemeters, transport containers, and storage containers;
8. Steps that must be taken immediately by radiography personnel in the event a pocket dosimeter is found to be off-scale or an alarming ratemeter alarms unexpectedly;
9. The procedure(s) for identifying and reporting defects and noncompliance, as required by 180 NAC 5-037;
10. The procedure for notifying proper persons in the event of an accident or incident;
11. Minimizing exposure of persons in the event of an accident or incident, including a source disconnect, a transport accident, or loss of a source of radiation;
12. Source recovery procedure if licensee will perform source recoveries; and
13. Maintenance of records.

5-017.02 The licensee or registrant must maintain copies of current operating and emergency procedures in accordance with 180 NAC 5-032 and180 NAC 5-036.

5-018 SUPERVISION OF RADIOGRAPHERS' ASSISTANTS

5-018.01 The radiographer's assistant must be under the personal supervision of a radiographer when using sources of radiation or conducting radiation surveys required by 180 NAC 5-020.02 to determine that the sealed source has returned to the shielded position or the radiation machine is off after an exposure. The personal supervision must include:

1. The radiographer's physical presence at the site where the sources of radiation are being used;
2. The availability of the radiographer to give immediate assistance if required; and
3. The radiographer's direct observation of the assistant's performance of the operations referred to in 180 NAC 5-018.01.

5-019 PERSONNEL MONITORING

5-019.01 The licensee or registrant may not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each individual wears, on the trunk of the body, a direct reading dosimeter, an operating alarming ratemeter, and a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor. At permanent radiography installations where other appropriate alarming or warning devices are in routine use, the use of an alarming ratemeter is not required.

1. Pocket dosimeters must have a range from zero to 2 millisieverts (200 mrem) and must be recharged at the start of each shift. Electronic personal dosimeters may only be used in place of ion-chamber pocket dosimeters.
2. Each personnel dosimeter must be assigned to and worn by only one individual;
3. Film badges must be replaced at periods not to exceed one month and other personnel dosimeters processed and evaluated by an accredited NVLAP processor must be replaced at periods not to exceed three months.
4. After replacement, each personnel dosimeter must be processed as soon as possible.

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5-019.02 Direct reading dosimeters such as pocket dosimeters or electronic personal dosimeters, must be read and the exposures recorded at the beginning and end of each shift, and records must be maintained in accordance with180 NAC 5-033.

5-019.03 Pocket dosimeters, or electronic personal dosimeters, must be checked at periods not to exceed 12 months for correct response to radiation, and records must be maintained in accordance with 180 NAC 5-033. Acceptable dosimeters must read within plus or minus 20% of the true radiation exposure.

5-019.04 If an individual's pocket dosimeter is found to be off-scale, or if his/her electronic personal dosimeter reads greater than 2 millisieverts (200 mrem), and the possibility of radiation exposure cannot be ruled out as the cause, the individual's personnel dosimeter must be sent for processing within 24 hours. In addition, the individual may not resume work

associated with source of radiation until a determination of the individual's radiation exposure has been made. This determination must be made by the Radiation Safety Officer or the Radiation Safety Officer's designee. The results of this determination must be included in the records maintained in accordance with180 NAC 5-033.

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5-019.05 If the personnel dosimeter that is required by 180 NAC 5-019 is lost or damaged, the worker must cease work immediately until a replacement personnel dosimeter meeting the requirements of 180 NAC 5-019 is provided and the exposure is calculated for the time period from issuance to loss or damage of the personnel dosimeter. The results of the calculated exposure and the time period for which the personnel dosimeter was lost or damaged must be included in the records maintained in accordance with 180 NAC 5-033.

5-019.06 Dosimetry reports received from the accredited NVLAP personnel dosimeter processor must be retained in accordance with 180 NAC 5-033.

5-019.07 Each alarming ratemeter must:

1. Be checked to ensure that the alarm functions properly before using at the start of each shift;
2. Be set to give an alarm signal at a preset dose rate of 5 millisieverts per hour (500 mrem/hr); with an accuracy of plus or minus 20% of the true radiation dose rate;
3. Require special means to change the preset alarm function; and
4. Be calibrated at periods not to exceed 12 months for correct response to radiation. The licensee must maintain records of alarming ratemeter calibrations in accordance with 180 NAC 5-033.

5-020 RADIATION SURVEYS: The licensee or registrant must:

5-020.01 Conduct all surveys with a calibrated and operable radiation survey instrument that meets the requirements of 180 NAC 5-008;

5-020.02 Conduct a survey of the radiographic exposure device and guide tube after each exposure when approaching the device or the guide tube. The survey must determine that a sealed source has returned to its shielded position before exchanging films, repositioning the exposure head, or dismantling equipment. Radiation machines must be surveyed after each exposure to determine that the machine is off;

5-020.03 Conduct a survey of the radiographic exposure device whenever the source is exchanged and whenever a radiographic exposure devices is placed in a storage area as defined in 180 NAC 5-002, to ensure that the sealed source is in its shielded position; and

5-020.04 Maintain records in accordance with 180 NAC 5-034.

5-021 SURVEILLANCE: During each radiographic operation, the radiographer must ensure continuous direct visual surveillance of the operation to protect against unauthorized entry into a radiation area or a high radiation area, as defined in 180 NAC 1 except at permanent radiographic installations where all entryways are locked and the requirements of 180 NAC 5-012 are met.

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5-022 POSTING: All areas in which industrial radiography is being performed must be conspicuously posted as required by 180 NAC 4-034. The exceptions listed in 180 NAC 4-035 do not apply to industrial radiographic operations.

RECORDKEEPING REQUIREMENTS

5-023 RECORDS FOR INDUSTRIAL RADIOGRAPHY: Each licensee or registrant must maintain a copy of its license or registration, documents incorporated by reference, and amendments to each of these items until superseded by new documents approved by the Department, or until the Department terminates the license or registration.

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5-024 RECORDS OF RECEIPT AND TRANSFER OF SOURCES OF RADIATION

5-024.01 Each licensee or registrant must maintain records showing the receipts and transfers of sealed sources, devices for using DU for shielding, and radiation machines, and retain each record for three years after it is made.

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5-024.02 These records must include the date, the name of the individual making the record, radionuclide, number of becquerels (curies) or mass (for DU), and manufacturer, model, and serial number of each source of radiation and/or device, as appropriate.

5-025 RECORDS OF RADIATION SURVEY INSTRUMENTS: Each licensee or registrant must maintain records of the calibrations of its radiation survey instruments that are required under 180 NAC 5-008 and retain each record for three years after it is made.

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5-026 RECORDS OF LEAK TESTING OF SEALED SOURCES AND DEVICES CONTAINING DU: Each licensee must maintain records of leak test results for sealed sources and for devices containing DU. The results must be stated in units of becquerels (μCi). The licensee must retain each record for three years after it is made or until the source in storage is removed.

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5-027 RECORDS OF QUARTERLY INVENTORY

5-027.01 Each licensee or registrant must maintain records of the quarterly inventory of sources of radiation, including devices containing depleted uranium as required by 180 NAC 5-010, and retain each record for three years from the date of inventory.

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5-027.02 The record must include the date of the inventory, name of the individual conducting the inventory, radionuclide, number of becquerels (curies) or mass (for DU) in each device, location of sources of radiation and/or devices, and manufacturer, model, and serial number of each source of radiation and/or device, as appropriate.

5-028 UTILIZATION LOGS

5-028.01 Each licensee or registrant must maintain utilization logs showing for each source of radiation the following information:

1. A description, including the make, model, and serial number of the radiation machine or the radiographic exposure device, transport, or storage container in which the sealed source is located;
2. The identity and signature of the radiographer to whom assigned;
3. The location and dates of use, including the dates removed and returned to storage; and
4. For permanent radiographic installations, the dates each radiation machine is energized.

5-028.02 The licensee or registrant must retain the logs required by 180 NAC 5-028.01 for three years after the log is made. Deleted: 3

5-029 RECORDS OF INSPECTION AND MAINTENANCE OF RADIATION MACHINES, RADIOGRAPHIC EXPOSURE DEVICES, TRANSPORT, AND STORAGE CONTAINERS, ASSOCIATED EQUIPMENT, SOURCE CHANGERS, AND SURVEY INSTRUMENTS

5-029.01 Each licensee or registrant must maintain records specified in 180 NAC 5-011 of equipment problems found in daily checks and quarterly inspections of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments; and retain each record for three years after it is made. Deleted: 3

5-029.02 The record must include the date of check or inspection, name of inspector, equipment involved, any problems found, and what repair and/or maintenance, if any, was performed.

5-030 RECORDS OF ALARM SYSTEM AND ENTRANCE CONTROL CHECKS AT PERMANENT RADIOGRAPHIC INSTALLATIONS: Each licensee or registrant must maintain records of alarm systems and entrance control device tests required by 180 NAC 5-012 and retain each record for three years after the record is made. Deleted: 3

5-031 RECORDS OF TRAINING AND CERTIFICATION

5-031.01 Each licensee or registrant must maintain the following records for three years: Deleted: 3

1. Records of training of each radiographer and each radiographer's assistant. The record must include radiographer certification documents and verification of certification status, copies of written tests, dates of oral and practical examinations, names of individuals conducting and receiving the oral and practical examinations, and a list of items tested and the results of the oral and practical examinations; and
2. Records of annual refresher safety training and semi-annual inspections of job performance for each radiographer and each radiographer's assistant. The records must list the topics discussed during the refresher safety training, the dates the annual refresher safety training was conducted, and names of the instructors and attendees. For inspections of job performance, the records must also include a list showing the items checked and any non-compliance observed by the Radiation Safety Officer or designee.

5-032 COPIES OF OPERATING AND EMERGENCY PROCEDURES: Each licensee or registrant must maintain a copy of current operating and emergency procedures until the Department terminates the license or registration. Superseded material must be retained for three years after the changes is made.

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5-033 RECORDS OF PERSONNEL MONITORING

5-033.01 Each licensee or registrant must maintain the following exposure records specified in 180 NAC 5-019:

1. Direct reading dosimeter readings and yearly operability checks required by 180 NAC 5-019.02 and 5-019.03 for three years after the record is made;
2. Records of alarming ratemeter calibrations three years after the record is made;
3. Personnel dosimeter results received from the accredited NVLAP processor until the Department terminates the license or registration; and
4. Records of estimates of exposures as a result of off-scale personal direct reading dosimeters, or lost of damaged personnel dosimeters until the Department terminates the license or registration.

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5-034 RECORDS OF RADIATION SURVEYS: Each licensee must maintain a record of each exposure device survey conducted before the device is placed in storage as specified in 180 NAC 5-020.03. Each record must be maintained for three years after the record is made.

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5-035 FORM OF RECORDS: Each record required by 180 NAC 5 must be legible throughout the specified retention period. The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of reproducing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability of producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials and signatures. The licensee or registrant must maintain adequate safeguards against tampering with and the loss of records.

5-036 LOCATION OF DOCUMENTS AND RECORDS

5-036.01 Each licensee or registrant must maintain copies of records required by 180 NAC 5 and other applicable Chapters of Title 180 at the location specified in 180 NAC 5-004.01, item 11.

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5-036.02 Each licensee or registrant must also maintain current copies of the following documents and records sufficient to demonstrate compliance at each applicable field station and each temporary jobsite;

1. The license or registration authorizing the use of sources of radiation;
2. A copy of 180 NAC 1, 4, 5, and 10 ;
3. Utilization logs for each source of radiation dispatched from the location as required by 180 NAC 5-028;
4. Records of equipment problems identified in daily checks of equipment as required by 180 NAC 5-029.01;

5. Records of alarm system and entrance control checks required by 180 NAC 5-030, if applicable;
6. Records of dosimeter readings as required by 180 NAC 5-033;
7. Operating and emergency procedures required by 180 NAC 5-032;
8. Evidence of the latest calibrations and of radiation survey instruments in use at the site, as required by 180 NAC 5-025;
9. Evidence of the latest calibrations of alarming ratemeters and operability checks of dosimeters as required by 180 NAC 5-033
10. Survey records as required by 180 NAC 5-034 and 180 NAC 4-049 as applicable, for the period of operation at that site;
11. The shipping papers for the transportation of radioactive materials required by 180 NAC 013 and;
12. When operating under reciprocity pursuant to 180 NAC 3 or registration pursuant to 180 NAC 2, a copy of the applicable State license or registration, or U.S. Nuclear Regulatory Commission license authorizing the use of sources of radiation.

NOTIFICATIONS

5-037 NOTIFICATIONS

5-037.01 In addition to the reporting requirements specified in 180 NAC 3-026 and 180 NAC 4, each licensee or registrant must provide a written report to the Department within 30 days of the occurrence of any of the following incidents involving radiographic equipment:

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1. Unintentional disconnection of the source assembly from the control cable;
2. Inability to retract the source assembly to its fully shielded position and secure it in this position;
3. Failure of any component, which is critical to safe operation of the device, to properly perform its intended function; or
4. An indicator on a radiation machine fails to show that radiation is being produced, an exposure switch fails to terminate production of radiation when turned to the off position, or a safety interlock fails to terminate x-ray production.

5-037.02 The licensee or registrant must include the following information in each report submitted under 180 NAC 5-037.01, and in each report of overexposure submitted under 180 NAC 4-060 which involves failure of safety components of radiography equipment:

1. Description of the equipment problem;
2. Cause of each incident, if known;
3. Name of the manufacturer and model number of equipment involved in the incident;
4. Place, date, and time of the incident;
5. Actions taken to establish normal operations;
6. Corrective actions taken or planned to prevent recurrence; and
7. Names and qualifications of personnel involved in the incident.

5-037.03 Any licensee or registrant conducting radiographic operations or storing sources of radiation at any location not listed on the license or registration for a period in excess of 180 days in a calendar year, must notify the Department prior to exceeding the 180 days.

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5-038 RECIPROCITY

5-038.01 All reciprocal recognition of licenses by the Department will be granted in accordance with 180 NAC 3-028. Deleted: Agency

5-038.02 Reciprocal recognition by the Department of an individual radiographer certification will be granted provided that: Deleted: Agency

1. The individual holds a valid certification in the appropriate category issued by a certifying entity, as defined in 180 NAC 5-002;
2. The requirements and procedures of the certifying entity issuing the certification affords the same or comparable certification standards as those afforded by 180 NAC 5-016.01;
3. The applicant presents the certification to the Department prior to the entry into the state; and Deleted: Agency
4. No escalated enforcement action is pending with the U.S. Nuclear Regulatory Commission or in any other State.

5-038.03 Certified individuals who are granted reciprocity by the Department must maintain the certification upon which the reciprocal recognition was granted, or prior to the expiration of such certification, must met the requirements of 180 NAC 5-016.01. Deleted: Agency

5-039 SPECIFIC REQUIREMENTS FOR RADIOGRAPHIC PERSONNEL PERFORMING INDUSTRIAL RADIOGRAPHY

5-039.01 At a job site, the following must be supplied by the licensee or registrant:

1. At least one operable, calibrated survey instrument for each exposure device or radiation machine in use;
2. A current whole body personnel monitor (film badge, TLD or OSLD) for each person performing radiographic operations;
3. An operable, calibrated pocket dosimeter with a range of zero to 200 milliroentgens for each person performing radiographic operations;
4. An operable, calibrated, alarming ratemeter for each person performing radiographic operations using a radiographic exposure device; and
5. The appropriate barrier ropes and signs.

5-039.02 Each radiographer at a job site must have on his/her person a valid certification ID card issued by a certifying entity.

5-039.03 Industrial radiographic operations must not be performed if any of the items in 180 NAC 5-039.01 and 5-039.02 are not available at the job site or are inoperable.

5-039.04 During an inspection, the Department may terminate an operation if any of the items in 180 NAC 5-039.01 and 180 NAC 5-039.02 are not available or operable, or if the required number of radiographic personnel are not present. Operations must not be resumed until all required conditions are met. Deleted: Agency

APPENDIX A

I. Requirements for an Independent Certifying Organization

An independent certifying organization must:

1. Be an organization such as a society or association, whose members participate in, or have an interest in, the field of industrial radiography;

2. Make its membership available to the general public nationwide. Membership must not be restricted because of race, color, religion, sex, age, national origin or disability;

3. Have a certification program open to nonmembers, as well as members;

4. Be an incorporated, nationally recognized organization, that is involved in setting national standards of practice within its field of expertise;

5. Have an adequate staff, a viable system for financing its operations, and a policy and decision-making review board;

6. Have a set of written organizational by-laws and policies that provide adequate assurance of lack of conflict of interest and a system for monitoring and enforcing those by-laws and policies;

7. Have a committee, whose members can carry out their responsibilities impartially, to review and approve the certification guidelines and procedures, and to advise the organization's staff in implementing the certification program;

8. Have a committee, whose members can carry out their responsibilities impartially, to review complaints against certified individuals and to determine appropriate sanctions;

9. Have written procedures describing all aspects of its certification program, maintain records of the current status of each individual's certification and the administration of its certification program;

10. Have procedures to ensure that certified individuals are provided due process with respect to the administration of its certification program, including the process of becoming certified and any sanctions imposed against certified individuals;

11. Have procedures for proctoring examinations, including qualifications for proctors. These procedures must ensure that the individuals proctoring each examination are not employed by the same company or corporation (or a wholly-owned subsidiary of such company or corporation) as any of the examinees;

12. Exchange information about certified individuals with the U.S. Nuclear Regulatory Commission and other independent certifying organizations and/or Agreement States and allow periodic review of its certification program and related records; and

13. Provide a description to the U.S. Nuclear Regulatory Commission, of its procedures for choosing examination sites and for providing an appropriate examination environment.

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II. Requirements for Certification Programs

All certification programs must:

1. Require applicants for certification to
   a. Receive training in the topics set forth in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission regulations, and
   b. Satisfactorily complete a written examination covering these topics;

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2. Require applicants for certification to provide documentation that demonstrates that the applicant has:

   a. Received training in the topics set forth in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission regulations;

   b. Satisfactorily completed a minimum period of on-the-job training as specified in180 NAC 5-016.01 and

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   c. Received verification by an Agreement State licensee or registrant or an U.S. Nuclear Regulatory Regulation licensee that the applicant has demonstrated the capability of independently working as a radiographer.

3. Include procedures to ensure that all examination questions are protected from disclosure;

4. Include procedures for denying an application and revoking, suspending, and reinstating a certification;

5. Provide a certification period of not less than three years nor more than five years;

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6. Include procedures for renewing certifications and, if the procedures allow renewals without examination, require evidence of recent full-time employment and annual refresher training; and

7. Provide a timely response to inquiries, by telephone or letter, from members of the public, about an individual's certification status.

III. Requirements for Written Examinations

All examinations must be:

1. Designed to test an individual's knowledge and understanding of the topics listed in 180 NAC 5-016.07 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements;

2. Written in multiple-choice format;

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3. Have test items drawn from a question bank containing psychometrically valid questions based on the material in180 NAC 5-016.07.

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CHAPTER 7 MEDICAL USE OF RADIOACTIVE MATERIAL

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Form NRH-7A Medical Use Training and Experience and Preceptor Attestation

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TITLE 180 CONTROL OF RADIATION

CHAPTER 7 MEDICAL USE OF RADIOACTIVE MATERIAL

GENERAL INFORMATION

7-001 SCOPE AND AUTHORITY: 180 NAC 7 establishes requirements and provisions for the production, preparation, compounding and use of radionuclides in the healing arts and for issuance of licenses authorizing these activities. These requirements and provisions provide for the radiation safety of workers, the general public, patients, and human research subjects. The requirements and provisions of 180 NAC 7 are in addition to, and not in substitution for, others in Title 180. The requirements and provisions of 180 NAC 1, 3, 4, 10, 13, 15, 17, and 18 apply to applicants and licensees subject to 180 NAC 7 unless specifically exempted. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

7-002 DEFINITIONS: As used in 180 NAC 7, the following definitions apply:

Accredited institution means a teaching facility for nuclear medicine technology or radiation therapy technology whose standards are accepted by the United States Department of Education.

Address of use means the building or buildings that are identified on the license and where radioactive material may be produced, prepared, received, used, or stored.

Area of use means a portion of an address of use that has been set aside for the purpose of receiving, using, or storing radioactive material.

Authorized medical physicist means an individual who:

1. Meets the requirements in 180 NAC 7-023.01 and 7-027; or

2. Is identified as an authorized medical physicist on a specific license or equivalent permit issued by the Department, Nuclear Regulatory Commission or Agreement State; or

3. Is identified as an authorized medical physicist on a permit issued by an Department, Nuclear Regulatory Commission or Agreement State specific medical use license of broad scope that is authorized to permit the use of radioactive material.

Authorized nuclear pharmacist means a pharmacist who:

1. Meets the requirements of 180 NAC 7-024.01 and 7-027; or
2. Is identified as an authorized nuclear pharmacist on a specific license or equivalent permit that authorizes medical use, the practice of nuclear pharmacy, commercial

nuclear pharmacy or the manufacture and distribution of radiopharmaceuticals issued by the Department, Nuclear Regulatory Commission or Agreement State; or

3. Is identified as an authorized nuclear pharmacist on a permit issued by the Department, Nuclear Regulatory Commission or Agreement State specific medical use license of broad scope that is authorized to permit the use of radioactive material.

Authorized user means a physician who:

1. Meets the requirements in 180 NAC 7-027 and 7-043.01, 7-047.01, 7-052.01, 7-053.01, 7-054.01, 7-063.01, 7-066.01 or 7-084.01; or
2. Is identified as an authorized user on a specific license or equivalent permit issued by the Department, Nuclear Regulatory Commission or Agreement State; or
3. Is identified as an authorized user on a permit issued by an Department, Nuclear Regulatory Commission or Agreement State specific license of broad scope that is authorized to permit the medical use of radioactive material.

Brachytherapy means a method of radiation therapy in which plated, embedded, activated, or sealed sources are utilized to deliver a radiation dose at a distance of up to a few centimeters, by surface, intracavitary, intraluminal, or interstitial application.

Brachytherapy source means a radioactive source or a manufacturer-assembled source train or a combination of these sources that is designed to deliver a therapeutic dose within a distance of a few centimeters.

Client's address means the address of use or a temporary job site for the purpose of providing mobile medical service in accordance with 180 NAC 7-038.

Dedicated check source means a radioactive source that is used to assure the consistent response of a radiation detection or measurement device over several months or years.

Diagnostic clinical procedures manual means a collection of written procedures that describes each method (and other instructions and precautions) by which the licensee performs diagnostic clinical procedures; where each diagnostic clinical procedure has been approved by the authorized user and includes the radiopharmaceutical, dosage, and route of administration, or in the case of sealed sources for diagnosis, the procedure.

High dose-rate remote afterloader (HDR) means a device that remotely delivers a dose rate in excess of 12 gray (1200 rads) per hour at the treatment site.

Low dose-rate remote afterloader (LDR), means a device that remotely delivers a dose rate of less than or equal to 2 gray (200 rads) per hour at the treatment site.

Management means the individual having the authority to manage, direct, or administer the licensee's activities, or that persons' designee(s).

Manual brachytherapy means a type of therapy in which the brachytherapy sources (e.g., seeds, ribbons) are manually applied or inserted.

Medical institution means an organization in which several medical disciplines are practiced.

Medical use means the intentional internal or external administration of radioactive material, or the radiation from radioactive material to patients or human research subjects under the supervision of an authorized user.

Medium dose-rate remote afterloader (MDR) means a device that remotely delivers a dose rate of greater that 2 gray (200 rads), but less than 12 gray (1200 rads) per hour at the treatment site.

Misadministration means an event that meets the criteria in 180 NAC 7-115.

Mobile medicine service means the transportation of radioactive material and\or its medical use at the client's address.

Nuclear medicine technologist means an individual who meets the requirements of 180 NAC 7-025.01 and is under the supervision of an authorized user, to prepare or administer radioactive drugs to patients or human research subjects, or perform *in vivo* or *in vitro* measurements for medical purposes.

Nuclear medicine technology means the science and art of *in vivo* or *in vitro* detection and measurement of radioactivity and the administration of radioactive drugs to patients or human research subjects for diagnostic and therapeutic purposes.

Output means the exposure rate, dose rate, or a quantity related in a known manner to these rates from a brachytherapy source or a teletherapy, remote afterloader, or gamma stereotactic radiosurgery unit for a specified set of exposure conditions.

Patient intervention means actions by the patient or human research subject, whether intentional or unintentional, such as dislodging or removing treatment devices or prematurely terminating the administration.

Preceptor means an individual who provides, directs, or verifies training and experience required for an individual to become an authorized user, an authorized medical physicist, an authorized nuclear pharmacist, a nuclear medicine technologist, a radiation therapy technologist or a Radiation Safety Officer.

Prescribed dosage means the specified activity or range of activity of radioactive drug as documented:

1. In a written directive as specified in 180 NAC 7-019; or
2. In accordance with the directions of the authorized user for procedures performed per 180 NAC 7-041, 7-044 and 7-048.

Prescribed dose means:

1. For gamma stereotactic radiosurgery, the total dose as documented in the written directive;
2. For teletherapy, the total dose and dose per fraction as documented in the written directive;
3. For manual brachytherapy, either the total source strength and exposure time or the total dose as documented in the written directive; or

4. For remote brachytherapy afterloaders, the total dose and dose per fraction as documented in the written directive.

Pulsed dose-rate remote afterloader (PDR) means a special type of remote afterloading device that uses a single source capable of delivering dose rates in the "high dose-rate" range, but:

1. Is approximately one-tenth of the activity of typical high dose-rate remote afterloader sources; and;
2. Is used to simulate the radiobiology of a low dose-rate treatment by inserting the source for a given fraction of each hour.

Radiation Safety Officer (RSO) means an individual who:

1. Meets the requirements in 180 NAC 7-022.01 and 7-026;
2. Is identified as a Radiation Safety Officer on a Nuclear Regulatory Commission or Agreement State license or other equivalent permit or license recognized by the Department for similar types and uses of radioactive material.

Radiation therapist means an individual who meets the requirements of 180 NAC 7-025.02 and is under the supervision of an authorized user to perform procedures and apply radiation emitted from sealed radioactive sources to human beings for therapeutic purposes.

Radiation therapy technology means the science and art of applying radiation emitted from sealed radioactive sources to patients or human research subjects for therapeutic purposes.

Radioactive drug means any chemical compound containing radioactive material that may be used on or administered to patients or human research subjects as an aid in the diagnosis, treatment, or prevention of disease or other abnormal condition.

Sealed Source and Device Registry means the national registry that contains all the registration certificates maintained by the Nuclear Regulatory Commission, that summarize the radiation safety information for the sealed sources and devices and describe the licensing and use conditions approved for the product.

Stereotactic radiosurgery means the use of external radiation in conjunction with a stereotactic guidance device to precisely deliver a dose to a treatment site.

Structured education program means an educational program designed to impart particular knowledge and practical education through interrelated studies and supervised training.

Teletherapy means a method of radiation therapy in which collimated gamma rays are delivered at a distance from the patient or human research subject.

Temporary job site means a location where mobile medical services are conducted other than those location(s) of use authorized on the license.

Therapeutic dosage means a radiation dosage of unsealed radioactive material that is intended to deliver a radiation dose to a patient or human research subject for palliative or curative treatment.

Therapeutic dose means a radiation dose delivered from a source containing radioactive material to a patient or human research subject for palliative or curative treatment.

Treatment site means the anatomical description of the tissue intended to receive a radiation dose, as described in a written directive.

Type of use means use of radioactive material as specified in 180 NAC 7-041, 7-044, 7-048, 7-055, 7-065, 7-067 or 7-085.

Unit dosage means a dosage that:

1. Is obtained or prepared in accordance with the regulations for uses described in 180 NAC 7-041, 7-044, or 7-048; and
2. Is to be administered as a single dosage to patient or human research subject without any further manipulation of the dosage after it is initially prepared.

Written directive means an authorized user's written order for the administration of a radioactive material or radiation from radioactive material to a specific patient or human research subject, as specified in 180 NAC 7-019.

7-003 MAINTENANCE OF RECORDS: Each record required by this 180 NAC 7 must be legible throughout the retention period specified by Title180. The record may be the original, a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures. The licensee must maintain adequate safeguards against tampering with and loss of records.

7-004 PROVISIONS FOR RESEARCH INVOLVING HUMAN SUBJECTS: A licensee may conduct research involving human subjects using radioactive material provided:

7-004.01 That the research is conducted, funded, supported, or regulated by a Federal agency which has implemented the Federal Policy for the Protection of Human Subjects. Otherwise, a licensee may apply for and receive approval of a specific amendment to its Department license before conducting such research. Both types of licensees must, at a minimum, obtain prior informed consent from the human subjects and obtain prior review and approval of the research activities by an "Institutional Review Board" in accordance with the meaning of these terms as defined and described in the Federal Policy for the Protection of Human Subjects;

7-004.02 The research involving human subjects authorized in 180 NAC 7-004.01 maybe conducted using radioactive material authorized for medical use in the license; and

7-004.03 Nothing in 180 NAC 7-004 relieves the licensee from complying with the requirements in 180 NAC 7.

7-005 U.S. FOOD AND DRUG ADMINISTRATION (FDA), FEDERAL AND STATE REQUIREMENTS: Nothing in this 180 NAC 7 relieves the licensee from complying with applicable FDA, Federal, and State requirements governing radioactive drugs or devices.

7-006 IMPLEMENTATION:

7-006.01 A licensee must implement the provisions in 180 NAC 7 on [the effective date of these regulations, with the exception of requirements listed in 180 NAC 7-006.02.

7-006.02 When a requirement of 180 NAC 7 differs from the requirement in an existing license condition, the requirement in 180 NAC 7 will govern.

7-006.02 Any existing license condition that is not affected by a requirement in 180 NAC 7 remains in effect until there is a license amendment or license renewal.

7-006.03 If a license condition exempted a licensee from a provision of 180 NAC 7, it will continue to exempt a licensee from the corresponding provision in 180 NAC 7.

7-006.04 If a license condition cites provisions in 180 NAC 7 that has been deleted , then the license condition remains in effect until there is a license amendment or renewal that modifies or removes the license condition.

7-006.05 Licensees must continue to comply with any license condition that requires it to implement procedures required by 180 NAC 7-070, 7-076, 7-077 and 7-078 until there is a license amendment or renewal that modifies the license condition.

GENERAL REGULATORY REQUIREMENTS

7-007 LICENSE REQUIRED

7-007.01 A person may only manufacture, produce, prepare, acquire, receive, possess, use, or transfer radioactive material for medical use in accordance with a specific license issued by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State, or as allowed by 180 NAC 7-007.02 or 7-007.03.

7-007.02 An individual may receive, possess, use or transfer radioactive material in accordance with 180 NAC 7 under the supervision of an authorized user as provided in 180 NAC 7-018, unless prohibited by license condition.

7-007.03 An individual may prepare unsealed radioactive material for medical use in accordance with the regulations in 180 NAC 7 under the supervision of an authorized nuclear pharmacist or authorized user as provided in 180 NAC 7-018, unless prohibited by license condition.

7-008 APPLICATION FOR LICENSE, AMENDMENT, OR RENEWAL

7-008.01 An application must be signed by the applicant's or licensee's management.

7-008.02 An application for a license for medical use of radioactive material as described in 180 NAC 7-041, 7-044, 7-048, 7-055, 7-065, 7-067 and 7-085 must be made by filing an original of Form NRH-7 and 7A (Medical), "Application for Radioactive Material License - Medical". For guidance in completing the form, refer to the instructions in the most current versions of the appropriate Regulatory Guides.

7-008.03 A request for a license amendment or renewal may be submitted as an original in letter format. For guidance in completing the form, refer to the instructions in the most current version of the appropriate Regulatory Guide.

7-008.04 In addition to the requirements of 180 NAC 7-008.02 and 7-008.03, an application for a license or amendment for medical use of radioactive material as described in 180 NAC 7-085 must also include information regarding any radiation safety aspects of the medical use of the material that is not addressed in 180 NAC 7-001 through 7-040, as well as any specific information on:

1. Radiation safety precautions and instructions;
2. Training and experience of proposed users;
3. Methodology for measurement of dosages or doses to be administered to patients or human research subjects; and
4. Calibration, maintenance, and repair of instruments and equipment necessary for radiation safety.

7-008.05 An applicant or licensee must also provide any other information requested by the Department that has been determined to be reasonable and necessary for the review of the application.

7-008.06 An applicant that satisfies the requirements specified in 180 NAC 3-013.02 may apply for a Type A specific license of broad scope.

7-009 MOBILE MEDICAL SERVICE ADMINISTRATIVE REQUIREMENTS

7-009.01 The mobile medical service must be licensed if the service receives, uses or possesses radioactive material. The client of the mobile medical service must be licensed if the client receives or possesses radioactive material to be used by a mobile medical service.

7-009.02 Mobile medical service licensees must obtain a letter signed by the management of each location where services are rendered that authorizes use of radioactive material at the client's address of use. This letter must clearly delineate the authority and responsibility of both the client and the mobile medical service. If the client is licensed, the letters must document procedures for notification, receipt, storage and documentation of transfer of radioactive material delivered to the client's address for use by the mobile medical service.

7-009.03 A mobile medical service must not have radioactive material delivered directly from the manufacturer or the distributor to the client, unless the client has a license allowing possession of the radioactive material. Radioactive material delivered to the client must be received and handled in conformance with the client's license.

7-009.04 A mobile medical service must inform the authorized user identified in 180 NAC 7-018.03 at each client's address of use at a time prior to the radioactive material being administered.

7-009.05 A licensee providing mobile medical services must retain the letter required in 180 NAC 7-009.02 in accordance with 180 NAC 7-097.

7-009.06 A mobile medical service licensee must, at a minimum, maintain the following documents on each mobile unit:

1. The current operating and emergency procedures;
2. A copy of the license;
3. Copies of the letter required by 180 NAC 7-009.02;
4. Current calibration records for each survey instrument, diagnostic equipment, and dose calibration systems in use;
5. Quality control tests and records of quality control required by 180 NAC 7-028; and
6. Survey records covering uses associated with the mobile unit during, at a minimum, the preceding 30 calendar days.

7-009.07 A mobile medical service licensee must maintain all records required by 180 NAC 4 and 7 at a location within the Department's jurisdiction that is:

1. A single address of use:

   a. Identified as the records retention location; and
   b. Staffed at all reasonable hours by individual(s) authorized to provide the Department with access for purposes of inspection; or

2. On the mobile unit:

   a. Identified in the license; and
   b. Whose current client's address schedule and location is reported to the Department.

7-010 LICENSE AMENDMENTS: A licensee must apply for and receive a license amendment before:

7-010.01 Receiving, preparing or using radioactive material for a type of use that is permitted under 180 NAC 7-007, but that is not authorized on the licensee's current license issued under 180 NAC 7;

7-010.02 Permitting anyone to work as an authorized user, authorized nuclear pharmacist, or authorized medical physicist under the license, except an individual who is:

1. An authorized user, who meets the requirements in 180 NAC 7-027 and 7-043.01, 7-047.01, 7-051.01, 7-052.01, 7-053.01, 7-063.01, 7-066.01,and 7-084.01;
2. An authorized nuclear pharmacist, who meets the requirements in 180 NAC 7-024 and 7-027;
3. An authorized medical physicist, an individual who meets the requirements in 180 NAC 7-027 and 7-023.01 and 7-023.04; ;
4. Identified as an authorized user, authorized nuclear pharmacist or authorized medical physicist on a U.S. Nuclear Regulatory Commission or Agreement State or other equivalent permit or license recognized by the Department that authorizes the use of radioactive material in medical use or in the practice of nuclear pharmacy, respectively;

5. Identified as an authorized user on a permit that authorized nuclear pharmacist, or authorized medical physicist on a permit by a Nuclear Regulatory Commission or Agreement State specific license of broad scope that authorize the use of radioactive material in medical use or in the practice of nuclear pharmacy, respectively.

7-010.03 Changing a Radiation Safety Officer, except as provided in 180 NAC 7-015.05;

7-010.04 Receives radioactive material in excess of the amount or in a different physical or chemical form, than is authorized on the license;

7-010.05 Adding to or changing the areas of use identified in the application or on the license;

7-010.06 Changing the address(s) of use identified in the application or on the license;

7-010.07 Changing statements, representations, and procedures which are incorporated into the license; and

7-010.08 Releasing licensed facilities for unrestricted use.

7-011 NOTIFICATIONS

7-011.01 A licensee must provide to the Department a copy of the board certification and the written attestation(s), signed by a preceptor, the U.S. Nuclear Regulatory Commission or Agreement State license, the permit issued by a U.S. Nuclear Regulatory Commission master material licensee, the permit issued by a U.S. Nuclear Regulatory Commission or Agreement State licensee of a broad scope, or the permit issued by a U.S. Nuclear Regulatory Commission master material license broad scope permittee for each individual no later than 30 days after the date that the licensee permits the individual to work as an authorized user, an authorized nuclear pharmacist, or an authorized medical physicist, pursuant to 180 NAC 7-010.02. For individuals permitted to work under 180 NAC 7-010.02, items within the same 30 day time frame, the licensee must also provide as appropriate, verification of completion of:

1. Any additional case experience required in 180 NAC 7-051.02, item 1.b.(6) for an authorized user under 180 NAC 7-048;
2. Any additional training required in 180 NAC 7-084.04 for an authorized user under 180 NAC 7-067; and
3. Any additional training required in 180 NAC 7-023.04 for an authorized medical physicist.

7-011.02 A licensee must notify the Department by letter no later than 30 days after:

1. An authorized user, an authorized nuclear pharmacist, Radiation Safety Officer, or an authorized medical physicist permanently discontinues performance of duties under the license or has a name change; or
2. The licensee's mailing address changes; or
3. The licensee's name changes, but the name change does not constitute a transfer of control of the license as described in 180 NAC 3-017.02; or

7-011.03 The licensee must mail documents required in 180 NAC 7-010 to the appropriate address identified in 180 NAC 1-002.

7-012 EXEMPTIONS REGARDING TYPE A SPECIFIC LICENSE OF BROAD SCOPE: A licensee possessing a Type A specific license of broad scope for medical use, issued under 180 NAC 03-013 is exempt from:

7-012.01 The provisions of 180 NAC 7-008.04 regarding the need to file an amendment to the license for medical use of radioactive material as described in 180 NAC 7-085.

7-012.02 The provisions of 180 NAC 7-010.02 regarding the need to file an amendment before permitting anyone to work as an authorized user, an authorized nuclear pharmacist or an authorized medical physicist under the license;

7-012.03 The provisions of 180 NAC 7-010.05 regarding additions to or changes in the areas of use at the addresses specified in the license;

7-012.04 The provisions of 180 NAC 7-011.01 regarding notification to the Department for new authorized users, new authorized nuclear pharmacists and new authorized medical physicists;

7-012.05 The provisions of 180 NAC 7-021.01 regarding supplier for sealed sources.

7-013 LICENSE ISSUANCE

7-013.01 The Department will issue a license for the medical use of radioactive material if:

1. The applicant has filed NRH-5A (Medical), "Application for Radioactive Material License – Medical" in accordance with instructions in 180 NAC 7-008.
2. The applicant has paid any applicable fee as provided in 180 NAC 18;
3. The applicant meets the requirements of 180 NAC 3; and
4. The Department finds the applicant equipped and committed to observe the safety standards established by the Department in 180 NAC for the protection of public health and safety.

7-013.02 The Department will issue a license for mobile medical service if the applicant:

1. Meets the requirements in 180 NAC 7-013.01; and
2. Assures that individuals to whom radioactive drugs or radiation from implants containing radioactive material will be administered may be released following treatment in accordance with 180 NAC 7-037.

7-014 SPECIFIC EXEMPTIONS: The Department may, upon application or upon its own initiative, grant such exemptions from the requirements of 180 NAC as it determines are authorized by law and will not results in undue hazard to public health and safety or property.

GENERAL ADMINISTRATIVE REQUIREMENTS

7-015 RADIATION PROTECTION PROGRAM

7-015.01 The program must include notice to workers of the program's existence and workers responsibility to help keep dose equivalents ALARA, a review of the summaries of the types and amounts of radioactive material used, occupational doses, changes in radiation safety measures, and continuing education and training for all personnel who work with or in the vicinity of radioactive material. The purpose of the review is to ensure that licensees make every reasonable effort to maintain individual and collective occupational doses ALARA.

7-015.02 The licensee must retain a current written description of the ALARA program for the duration of the license. The written description must include:

1. A commitment by management to keep occupational doses as low as reasonably achievable;
2. A requirement that the Radiation Safety Officer brief management once each year on the radiation safety program; and
3. Personnel exposure investigational levels that, when exceeded, will initiate a prompt investigation by the Radiation Safety Officer of the cause of the exposure and a consideration of actions that might be taken to reduce the probability of recurrence.

7-015.03 In addition to the radiation protection program requirements of 180 NAC 4-004, a licensee's management will approve in writing: Requests for a license application, renewal, or amendment before submittal to the Department;

1. Any individual before allowing that individual to work as an authorized user, authorized nuclear pharmacist, or authorized medical physicist; and
2. Radiation protection program changes that do not require a license amendment and are permitted under 180 NAC 7-016;

7-015.04 A licensee's management must appoint a Radiation Safety Officer, who agrees, in writing, to be responsible for implementing the radiation protection program. The licensee, through the Radiation Safety Officer, must ensure that radiation safety activities are being performed in accordance with licensee-approved procedures and regulatory requirements.

7-015.05 For up to 60 days each year, a licensee may permit an authorized user or an individual qualified to be a Radiation Safety Officer (RSO) to function as a temporary Radiation Safety Officer and perform the functions of a Radiation Safety Officer, as provided in 180 NAC 7-015.07, provided the licensee takes the actions required in 180 NAC 7-015.02, 7-015.06, 7-015.07 and 7-015.010. A licensee may simultaneously appoint more than one temporary RSO, if needed, to ensure that the licensee has a temporary RSO that satisfies the requirements to be an RSO for each of the different uses of radioactive material permitted by the license.

7-015.06 A licensee must establish in writing the authority, duties, and responsibilities of the Radiation Safety Officer.

7-015.07 A licensee must provide the Radiation Safety Officer sufficient authority, organizational freedom, time, resources and management prerogative to:

1. Identify radiation safety problems;
2. Initiate, recommend, or provide corrective actions;
3. Stop unsafe operations; and,
4. Verify implementation of corrective actions.

7-015.08 Licensees that are authorized for one or more different types of use under 180 NAC 7-048, 7-055, 7-067 and 7-085, or one or more types of units under 180 NAC 7-067, will establish a Radiation Safety Committee to oversee all uses of radioactive material permitted by the license. The Committee must include an authorized user of 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, and may include other members the licensee deems appropriate.

7-015.09 A licensee's Radiation Safety committee will meet as necessary, but at a minimum will meet at intervals not the exceed 6 Months. The licensee will maintain minutes of each meeting in accordance with 180 NAC 7-086.

7-015.10 A licensee must retain a record of actions taken under 180 NAC 7-015.01, 7-015.02 and 7-015.05 in accordance with 180 NAC 7-086.

7-016 RADIATION PROTECTION PROGRAM CHANGES

7-016.01 A licensee may revise its radiation protection program without Department approval if:

1. The revision does not require a license amendment under 180 NAC 7-010;
2. The revision is in compliance with the regulations and the license;
3. The revision has been reviewed and approved by the Radiation Safety Officer, licensee management and licensee's Radiation Safety Committee (if applicable); and
4. The affected individuals are instructed on the revised program before the changes are implemented.

7-016.02 A licensee must retain a record of each change in accordance with 180 NAC 087.

7-017 DUTIES OF AUTHORIZED USER AND AUTHORIZED MEDICAL PHYSICIST

7-017.01 Only authorized users for the type of radioactive material used can:

1. Prescribe the radiopharmaceutical dosage and/or dose to be administered through the issuance of a written directive or reference to the diagnostic clinical procedures manual; and
2. Direct, as specified in 180 NAC 7-018 and 7-019, or in license conditions, the administration of radioactive material for medical use to patients or human research subjects;
3. Prepare and administer, or supervise the preparation and administration of radioactive material for medical use, in accordance with 180 NAC 7-007.02, 7-007.03 and 7-018;
4. Perform the final interpretation of the results of tests, studies, or treatments.

7-017.02 Only authorized medical physicists can perform, as applicable:

1. Full calibration measurement as described in 180 NAC 7-073, 7-074, and 7-075;and
2. Radiation surveys as described in 180 NAC 7-080.

7-018 SUPERVISION

7-018.01 A licensee permitting the receipt, possession, use, or transfer of radioactive material by an individual under the supervision of an authorized user as allowed by 180 NAC 7-007.02, must:

1. In addition to the requirements of 180 NAC 10-003, instruct the supervised individual in the licensee's written radiation protection procedures, written directive procedures, regulations of 180 NAC 7, and the license conditions with respect to the use of radioactive material; and
2. Require the supervised individual to follow the instructions of the supervising authorized user for medical uses of radioactive material, written radiation protection procedures, written directive procedures, regulations of 180 NAC 7, and license conditions with respect to the medical use of radioactive material.
3. Require that only those individuals specifically trained, and designated by the authorized user, be permitted to administer radionuclides or radiation to patients or human research subjects.
4. Require the authorized user to audit the performance of each supervised individual initially and at least annually. The audit must include verification that the supervised individual is meeting the requirements of 180 NAC 7-018.01, item 2 and physical observation of the individual performing the duties the authorized user has delegated to them.

7-018.02 A licensee permitting the preparation of radioactive material for medical use by an individual under the supervision of an authorized nuclear pharmacist or physician who is an authorized user, as allowed by 180 NAC 7-007.03, must:

1. Train and instruct the supervised individual in the preparation of radioactive material for medical use, as appropriate to that individual's involvement with radioactive material; and
2. Require the supervised individual to follow the instructions of the supervising authorized user or authorized nuclear pharmacist regarding the preparation of radioactive material for medical use, the written radiation protection procedures, the regulations of 180 NAC 7, and license conditions.

7-018.03 Unless physical presence as described in other sections of 180 NAC 7 is required, a licensee who permits supervised activities under 180 NAC 7-018.01 and 7-018.02 must require an authorized user to be immediately available (by telephone within ten minutes) to communicate with the supervised individual, and

7-018.04 A licensee that permits supervised activities under 180 NAC 7-018.01 and 7-018.02 is responsible for the acts and omissions of the supervised individual.

7-019 WRITTEN DIRECTIVES

7-019.01 A written directive must be dated and signed by an authorized user prior to administration of I-131 sodium iodide greater than 1.11 Megabecquerels (MBq) (30 microcuries (μCi)), any therapeutic dosage of unsealed radioactive material or any therapeutic dose of radiation from radioactive material.

1. If, because of the emergent nature of the patient's condition, a delay in order to provide a written directive would jeopardize the patient's health, an oral directive is acceptable, provided that the information contained in the oral directive is documented as soon as possible in writing in the patient's record and a written directive is prepared within 48 hours of the oral directive.

7-019.02 The written directive must contain the patient or human research subject's name and the following information:

1. For any administration of dosage of radioactive drug containing radioactive material, the radioactive drug containing radioactive material, dosage, and the route of administration;
2. For gamma stereotactic radiosurgery, the total dose, treatment site, and number of target coordinate settings per treatment for each anatomically distinct treatment site;
3. For teletherapy, the total dose, dose per fraction, number of fractions, and treatment site;
4. For high dose-rate remote afterloading brachytherapy: the radionuclide, treatment site, dose per fraction, number of fractions, and total dose; or
5. For all other brachytherapy, including low, medium, and pulsed dose rate remote afterloaders:

    a. Prior to implantation: treatment site, the radionuclide, and dose; and
    b. After implantation but prior to completion of the procedure: the radioisotope, treatment site, number of sources, and total source strength and exposure time (or the total dose).

7-019.03 A written revision to an existing written directive may be made provided that the revision is dated and signed by an authorized user prior to the administration of the dosage of radioactive drug containing radioactive material, the brachytherapy dose, the gamma stereotactic radiosurgery dose, the teletherapy dose, or the next fractional dose.

1. If, because of the patient's condition, a delay in order to provide a written revision to an existing written directive would jeopardize the patient's health, an oral revision to an existing written directive will be acceptable, provided that the oral revision is documented as soon as possible in the patient's record and a revised written directive is signed by the authorized user within 48 hours of the oral revision.

7-019.04 The licensee must retain a copy of the written directive in accordance with 180 NAC 7-088.

7-020 PROCEDURES FOR ADMINISTRATIONS REQUIRING A WRITTEN DIRECTIVE

7-020.01 For any administration requiring a written directive, the licensee will develop, implement, and maintain written procedures to provide high confidence that:

1. The patient's or human research subject's identity is verified before each administration; and
2. Each administration is in accordance with the written directive.

7-020.02 The procedures required by 180 NAC 7-020.01 must, at a minimum, address the following items that are applicable to the licensee's use of radioactive material:

1. Verifying the identity of the patient or human research subject:
2. Verifying that the specific details of the administration is in accordance with the treatment plan, if applicable, and the written directive.
3. Checking both manual and computer-generated dose calculations; and
4. Verifying that any computer-generated dose calculations are correctly transferred into the consoles of therapeutic medical units authorized by 180 NAC 7-067.

7-021 SUPPLIERS FOR SEALED SOURCES OR DEVICES FOR MEDICAL USE: For medical use, a licensee may only use:

7-021.01 Sealed sources or devices initially manufactured, labeled, packaged, and distributed in accordance with a license issued pursuant to 180 NAC 3 or the equivalent regulations of the U.S. Nuclear Regulatory Commission, or another Agreement State;

7-021.02 Teletherapy sources manufactured and distributed in accordance with a license issued pursuant to 180 NAC 3, or the equivalent regulations of the U.S. Nuclear Regulatory Commission or another Agreement State.

7-022 TRAINING FOR RADIATION SAFETY OFFICER Except as provided in 180 NAC 7-026, the licensee must require an individual fulfilling the responsibilities of the Radiation Safety Officer as provided in 180 NAC 7-015 to be:

7-022.01 An individual who is certified by a specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission and who meets the requirements in 180 NAC 7-022.04 and 7-022.05. (The names of board certifications which have been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State will be posted on the NRC's web page.)

1. To have its certification process recognized, a specialty board will require all candidates for certification to:

   a. Hold a bachelor's or graduate degree from an accredited college or university in physical science or engineering or biological science with a minimum of 20 college credits in physical science;
   b. Have five or more years of professional experience in health physics (graduate training may be substituted for no more than two years of the required experience) including at least three years in applied health physics; and
   c. Pass an examination administered by diplomats of the specialty board, which evaluates knowledge and competence in radiation physics and

instrumentation, radiation protection, mathematics pertaining to the use and measurement of radioactivity, radiation biology, and radiation dosimetry; or

2. Require all candidates for certification to:

a. Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university;

b. Have two years of full-time practical training and/or supervised experience in medical physics:

(1) Under the supervision of a medical physicist who is certified in medical physicist by a specialty board recognized by an agreement state of the U.S. Nuclear Regulatory Commission.

(2) In clinical nuclear medicine facilities providing diagnostic and/or therapeutic services under the direction of physicians who meet the requirements or for authorized users in 180 NAC 7-047 or 7-052; and

c. Pass an examination, administered by diplomats of the specialty board, that assesses knowledge and competence in clinical diagnostic radiological or nuclear medicine physics and in radiation safety; or

7-022.02 An individual who:

1. Has completed a structured educational program consisting of both:

a. 200 hours of classroom and laboratory training in the following areas:

(1) Radiation physics and instrumentation;
(2) Radiation protection;
(3) Mathematics pertaining to the use and measurement of radioactivity;
(4) Radiation biology; and
(5) Radiation dosimetry; and

b. One year of full-time radiation safety experience under the supervision of the individual identified as the Radiation Safety Officer on a U.S. Nuclear Regulatory Commission or Agreement State license or permit issued by the a U.S. Nuclear Regulatory Commission master material licensee that authorizes similar type(s) of use(s) of radioactive material involving the following:

(1) Shipping, receiving, and performing related radiation surveys;
(2) Using and performing checks for proper operation of dose calibrators, survey meters, and instruments used to measure radionuclides;
(3) Securing and controlling radioactive material;
(4) Using administrative controls to avoid mistakes in the administration of radioactive material;
(5) Using procedures to prevent or minimize radioactive contamination

and using proper decontamination procedures;
(6) Using emergency procedures to control radioactive material; and
(7) Disposing of radioactive material; and

2. Meets the requirements in 180 NAC 7-022.04 and 7-022.05; or 7-022.03

7-022.03 The individual who is a:

1. Medical physicist who has been certified by a specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State in 180 NAC 7-023.01 and has experience in radiation safety for similar types of use of radioactive material for which the licensee is seeking the approval of the individual as Radiation Safety Officer and who meets the requirement in 180 NAC 7-022.04 and 7-022.05; or

2. Is an authorized user, authorized medical physicist, or authorized nuclear pharmacist identified on the licensee's license and has experience with the radiation safety aspects of similar types of use of radioactive material for which the individual has Radiation Safety Officer responsibilities and who meets the requirements in 180 NAC 7-022.04 and 7-022.05.

7-022.04 An individual who has obtained written attestation, signed by a preceptor Radiation Safety Officer, that the individual has satisfactorily completed the requirements in 180 NAC 7-022.05 and in 180 NAC 7-022.01, item 1.a. and b. or 180 NAC 7-022.01, item 2.a. and b, or 180 NAC 7-022.02 item 1 or 180 NAC 7-022.03 and has achieved a level of radiation safety knowledge sufficient to function independently as a Radiation Safety Officer for a medical use licensee.

7-022.05 An individual who has training in the radiation safety, regulatory issues and emergency procedures for the types of use for which a licensee seeks approval. This training requirement may be satisfied by completing training that is supervised by a radiation safety officer, authorized medical physicist, authorized nuclear pharmacist, or authorized user as appropriate, who is authorized for the type(s) of use for which the licensee is seeking approval.

7-023 TRAINING FOR AN AUTHORIZED MEDICAL PHYSICIST The licensee must require the authorized medical physicist to be:

7-023.01 An individual who is certified by a specialty board whose certification process has been recognized by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State and who meets the requirements of 180 NAC 7-023.03 and 7-023.04. (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to:

1. Hold a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university;
2. Have two years of full-time practical training and/or supervision experience in

medical physics:

a. Under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission, or
b. In a clinical radiation facilities providing high energy, external beam therapy (photons and electrons with energies greater than or equal to one million electron volts) and brachytherapy services under the direction of physicians who meet the requirements for authorized users in 180 NAC 7-063 or 7-084; and

3. Pass an examination, administered by diplomats of the specialty board, which assesses knowledge and competence in clinical radiation therapy, radiation safety, calibration, quality assurance, and treatment planning for external beam therapy, brachytherapy, and stereotactic radiosurgery; or

7-023.02 An individual who:

1. Holds a master's or doctor's degree in physics, medical physics, other physical science, engineering, or applied mathematics from an accredited college or university; and has completed one year of full-time training in medical physics and an additional year of full-time work experience under the supervision of an individual who meets the requirements for an authorized medical physicist for the types(s) of use for which the individual is seeking authorization. This training and work experience must be conducted in clinical radiation facilities that provide high energy, external beam therapy (photons and electrons with energies greater than or equal to one million electron volts) and brachytherapy services and must include:

a. Performing sealed source leak tests and inventories;
b. Performing decay corrections;
c. Performing full calibration and periodic spot checks of external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable; and
d. Conducting radiation surveys around external beam treatment units, stereotactic radiosurgery units, and remote afterloading units as applicable, and

2. Meets the requirements of 180 NAC 7-023.03. and 7-023.04.

7-023.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-023.04 and 180 NAC 7-023.01, item 1 and 2, or 180 NAC 7-023.02, item 1 and 180 NAC 7-023.04, and has achieved a level of competency sufficient to function independently as an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status. The written attestation must be signed by a preceptor authorized medical physicist who meets the requirements in 180 NAC 7-023, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements for an authorized medical physicist for each type of therapeutic medical unit for which the individual is requesting authorized medical physicist status.

7-023.04 Has training for the type(s) of use for which authorization is sought that includes hands-on device operation, safety procedures, clinical use, and the operation of a treatment planning system. This training requirement may be satisfied by satisfactorily completing either a training program provided by the vendor or by training supervised by an authorized medical physicist authorized for the type(s) of use for which the individual is seeking authorization.

7-024 TRAINING FOR AN AUTHORIZED NUCLEAR PHARMACIST The licensee will require the authorized nuclear pharmacist to be a pharmacist who:

7-024.01 Is certified by a specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission who meets the requirements of 180 NAC 7-024.03. (The names of the board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) will be posted on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to:

1. Have graduated from a pharmacy program accredited by the American Council on Pharmaceutical Education (ACPE) or have passed the Foreign Pharmacy Graduate Examination Committee (FPGEC) examination;
2. Hold a current, active license to practice pharmacy;
3. Provide evidence of having acquired at least 4,000 hours of training/experience in nuclear pharmacy practice. Academic training may be substituted for no more than 2,000 hours of the required training and experience;
4. Pass an examination in nuclear pharmacy administered by diplomats of the specialty board, which assesses knowledge and competency in procurement, compounding, quality assurance, dispensing, distribution, health and safety, radiation safety, provision of information and consultation, monitoring patient outcomes, research and development; or.

7-024.02 Completed all of the following requirements:

1. 700 hours in a structured educational program consisting of both:

   a. 200 hours of classroom and laboratory training in the following areas:

      (1) Radiation physics and instrumentation;
      (2) Radiation protection;
      (3) Mathematics pertaining to the use and measurement of radioactivity;
      (4) Chemistry of radioactive material for medical use; and
      (5) Radiation biology; and

   b. Supervised practical experience in nuclear pharmacy involving:

      (1) Shipping, receiving, and performing related radiation surveys;
      (2) Using and performing checks for proper operation of instruments used to determine the activity of dosages, survey meters, and, if appropriate, instruments used to measure alpha- or beta-emitting radionuclides;

(3) Calculating, assaying, and safely preparing dosages for patients or human research subjects;
(4) Using administrative controls to avoid medical events in the administration of radioactive material; and
(5) Using procedures to prevent or minimize radioactive contamination and using proper decontamination procedures; and

2. Meets the requirement of 180 NAC 7-024.03.

7-024.03 Has obtained written attestation, signed by a preceptor authorized nuclear pharmacist, that the individual has satisfactorily completed the requirements of 180 NAC 7-024.01, item 1, 2, and 3 or 7-024.02 and has achieved a level of competency sufficient to function independently as an authorized nuclear pharmacist.

7-025 TRAINING AND TECHNICAL REQUIREMENT FOR NUCLEAR MEDICINE TECHNOLOGISTS AND RADIATION THERAPISTS

7-025.01 The licensee will require a individual performing nuclear medicine technology under the supervision of an authorized user to be an individual who:

1. Is certified in;

   a. Nuclear Medicine by the Nuclear Medicine Technology Certification Board (NNTCB);
   b. Nuclear Medicine by the American Registry of Radiologic Technologists (ARRT) with competency in Nuclear Medicine; or,

2. Be board eligible to take the NNTCB or ARRT(N) examinations; or,
3. Has successfully completed a training program in nuclear medicine which has resulted in certificate, associate degree, or baccalaureate degree in a nuclear medicine technology program from an accredited institution; or,
4. Has training and experience in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material that includes:

   a. 200 hours of classroom and laboratory training in the following areas:

      (1) Radiation Physics and instrumentation;
      (2) Radiation protection;
      (3) Mathematics pertaining to the use and measurement of radioactivity;
      (4) Chemistry of radioactive material for medical use; and
      (5) Radiation biology;
      (6) Imaging Technology; and

   b. Work experience, under the supervision of an authorized user involving:

      (1) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
      (2) Quality Control checking of instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;

(3) Calculating, measuring, and safely preparing patient or human research subject dosages;
(4) Using administrative controls to prevent a misadministration involving the use of unsealed radioactive material;
(5) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and

c. Supervised clinical experience under the supervision of an authorized user that includes:

(1) Reviewing the case histories of individuals to determine their suitability for radioisotope diagnosis, limitations, or contraindications;
(2) Identifying radiopharmaceuticals for clinical procedures and calculating and measuring the dosages;
(3) Administering dosages to individuals and using syringe radiation shields; and
(4) Acquiring and manipulating diagnostic data.

d. Has obtained written certification, signed by a preceptor authorized user that the individual has satisfactorily completed the requirements of 180 NAC 7-025.01, item 4.a. and b. and has achieved a level of radiation safety competency sufficient to independently function as a nuclear medicine technologist.

7-025.02 The licensee must require a radiation therapist using radioactive materials under the supervision of an authorized user to be an individual who:

1. Is certified in Radiation Therapy by the American Registry of Radiologic Technologists (ARRT(T)); or
2. Be board eligible to take the ARRT(T) examination; or,
3. Has successfully completed a training program in radiation therapy which has resulted in a certificate, associate degree, or baccalaureate degree in a radiologic technology program that complies with the requirements of the Joint Review Committee on Education in Radiologic Technology,[1] or,
4. Has completed 200 hours of training and experience in basic radionuclide handling techniques applicable to the medical use of radioactive material that includes:

a. 200 hours of classroom and laboratory training in the following areas:

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

b. Work experience, under the supervision of an authorized user involving:

[1] "Essentials and guidelines of an Accredited Education Program for the Radiation Therapy Technologist", Joint Review Committee on Education in Radiologic Technology, January 1, 2002.

(1) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
(2) Assisting the authorized user in simulating the patient for treatment;
(3) Preparing the patient for treatment;
(4) Implementing treatment plans as prescribed by the authorized user;
(5) Providing written documentation of treatment setup and patient treatments;
(6) Quality control checks to determine that devices used to deliver the radiation doses are in compliance with institutional standards and performing checks for proper operation of survey meters;
(7) Preparing or assisting in the preparation of sources, and implantation and removal of sealed sources;
(8) Delivering doses to patients or human research subjects under the supervision of the authorized user;
(9) Maintaining running inventories of radioactive material on hand;
(10) Using administrative controls to prevent a misadministration involving the use of radioactive material; and,
(11) Properly implementing emergency procedures; and

d. Has obtained written certification, signed by a preceptor authorized user that the individual has satisfactorily completed the requirements of 180 NAC 7-025.02 item 4.a. and 4.b. and has achieved a level of radiation safety competency sufficient to independently function as a radiation therapist.

7-025.03 The licensee must maintain records of the above training as specified in 180 NAC 7-100.

7-026 PROVISIONS FOR EXPERIENCED RADIATION SAFETY OFFICER, TELETHERAPY OR MEDICAL PHYSICIST, AUTHORIZED MEDICAL PHYSICIST, AUTHORIZED USER, NUCLEAR PHARMACIST AND AUTHORIZED NUCLEAR PHARMACIST

7-026.01 An individual identified as a Radiation Safety Officer, a teletherapy or medical physicist, or a nuclear pharmacist on a U.S. Nuclear Regulatory Commission, an Agreement State license or on a permit issued by a U.S. Nuclear Regulatory Commission or Agreement State broad scope licensee or master material license permit or by a master material permittee of broad scope that authorizes medical use or practice of nuclear pharmacy, before the effective date of these regulations need not comply with the training requirements of 180 NAC 7-022 through 7-024.

7-026.02 Physicians identified as authorized users for the medical, use of radioactive material on a license issued by the U.S. Nuclear Regulatory Commission or Agreement State, a permit issued by a U.S. Nuclear Regulatory Commission master material licensee, a permit issued by a U.S. Nuclear Regulatory Commission or Agreement State broad scope licensee, or on a permit issued by a U.S. Nuclear Regulatory Commission master material license broad scope permittee before the effective date of these regulations who perform only those medical uses for which they were authorized on that date need not comply with the training requirements 180 NAC 7-041 through 7-084 .

7-027 RECENTNESS OF TRAINING The training and experience specified in 180 NAC 7 must have been obtained within seven years preceding the date of license application or the individual

must have had related continuing education and experience since the required training and experience was completed.

GENERAL TECHNICAL REQUIREMENTS

7-028 QUALITY CONTROL OF DIAGNOSTIC EQUIPMENT Each licensee must establish written quality control procedures for all diagnostic equipment used for radionuclide studies. As a minimum, quality control procedures and frequencies must be those recommended by equipment manufacturers or procedures, which have been approved by the Department. The licensee must conduct quality control procedures in accordance with written procedures.

7-029 POSSESSION, USE, AND CALIBRATION OF INSTRUMENTS USED TO MEASURE THE ACTIVITY OF UNSEALED RADIOACTIVE MATERIAL

7-029.01 For direct measurements performed in accordance with 180 NAC 7-031, a licensee must possess and use instrumentation to measure the activity of unsealed radioactive material prior to administration to each patient or human research subject.

7-029.02 A licensee must test the instrumentation required in 180 NAC 7-029.01 in accordance with nationally recognized standards or the manufacturer's instructions.

7-029.03 The tests required in 180 NAC 7-029.02 must at minimum include tests for constancy, linearity, accuracy and geometry dependence, as appropriate to demonstrate proper operation of the instrument.

7-029.04 A licensee will must a record of each instrument test required by 180 NAC 7-029 in accordance with 180 NAC 7-091.

7-030 CALIBRATION OF SURVEY INSTRUMENTS

7-030.01 A licensee must ensure that the survey instruments used to show compliance with 180 NAC 7 and 180 NAC 4 have been calibrated before first use, annually and following any repair that affects the calibration.

7-030.02 To satisfy the requirements of 180 NAC 7-030.01, the licensee must:

1. Calibrate all required scale readings up to 10 mSv (1000 mrem) per hour with a radiation source;
2. Have each radiation survey instrument calibrated:

    a. At energies appropriate for use and at annual intervals or after servicing instrument except for battery changes;
    b. For linear scale instruments at two points located approximately one-third and two-thirds of full-scale on each scale; for logarithmic scale instruments, at mid-range and each decade, and at two points of at least one decade; and for digital instruments, at three points between 0.02 and 10 mSv (2 and 1,000 mrem) per hour; and
    c. For dose rate instruments, so that an accuracy within plus or minus 20% of the true radiation dose rate can be demonstrated at each point checked.

3. Conspicuously note on the instrument the date of calibration.

7-030.03 The licensee may not use survey instruments if the difference between the indicated exposure rate and the calculated exposure rate is more than 20%.

7-030.04 A licensee must check each survey instrument for consistent response with a dedicated check source before each use. The licensee is not required to keep records of these checks.

7-030.05 A licensee must maintain a record of each survey instrument calibration in accordance with 180 NAC 7-092.

7-031 DETERMINATION OF DOSAGES OF RADIOACTIVE MATERIAL FOR MEDICAL USE

7-031.01 A licensee must determine and record the activity of each dosage prior to medical use.

7-031.02 For unit dosages not requiring a written directive, this determination must be made by either direct measurement of radioactivity or by a decay calculation, based on the measurements made by a manufacturer or preparer licensed pursuant to 180 NAC 3 or equivalent provision of the U.S. Nuclear Regulatory Commission or Agreement State.

7-031.03 For unit dosages requiring a written directive this determination must be made by direct measurement of radioactivity in accordance with 180 NAC 7-029.

7-031.04 For other than unit dosages not requiring a written directive, this determination must be made by direct measurement of radioactivity or by a combination of measurements of radioactivity and mathematical calculations or combination of volumetric measurements and mathematical calculations, based on the measurement made by a manufacturer or preparer licensed pursuant to 180 NAC 3 or equivalent provision of the U.S. Nuclear Regulatory Commission or Agreement State.

7-031.05 For other than unit dosages requiring a written directive this must be made by direct measurement of radioactivity in accordance with 180 NAC 7-029.

7-031.06 A licensee may not use a dosage if the dosage differs from the prescribed dosage by more than 20%.

7-031.07 A licensee must retain a record of the dosage determination required by 180 NAC 7 in accordance with 180 NAC 7-093.

7-032 AUTHORIZATION FOR CALIBRATION, TRANSMISSION AND REFERENCE SOURCES: Any person authorized by 180 NAC 7-007 for medical use of radioactive material may receive, possess, and use the following radioactive material for check, calibration, and reference use:

7-032.01 Sealed sources manufactured and distributed by persons specifically licensed pursuant to 180 NAC 3 or equivalent provisions of the U.S. Nuclear Regulatory Commission, or Agreement State and that do not exceed 1.11 GBq (30 mCi) each;

7-032.02 Any radioactive material with a half-life of 120 days or less in individual amounts not to exceed 555 MBq (15 mCi);

7-032.03 Any radioactive material with a half-life greater than 120 days in individual amounts not to exceed the smaller of:

1. 7.4 MBq (200 μCi); or
2. 1000 times the quantities in Appendix B of 180 NAC 3 and

7-032.04 Technetium-99m in amounts as needed.

7-033 REQUIREMENTS FOR POSSESSION OF SEALED SOURCES AND BRACHYTHERAPY SOURCES

7-033.01 A licensee in possession of any sealed source or brachytherapy source must follow the radiation safety and handling instructions supplied by the manufacturer, or equivalent instructions approved by the Department.

7-033.02 A licensee in possession of a sealed source must:

1. Test the source for leakage in accordance with 180 NAC 1-011; and.
2. Test the source for leakage at intervals not to exceed six months or at intervals approved by the Department, another Agreement State, or the U.S. Nuclear Regulatory Commission in the Sealed Source and Device Registry.

7-033.03 If the leak test reveals the presence of 185 Bq (0.005 μCi) or more of removable contamination, the licensee must:

1. Immediately withdraw the sealed source from use and store, dispose, or cause it to be repaired in accordance with the requirements of 180 NAC 1-011.06 and 180 NAC 4; and
2. File a report within five days of the leak test in accordance with 180 NAC 7-118.

7-033.04 A licensee in possession of a sealed source or brachytherapy source, except for gamma stereotatic radiosurgery sources, must conduct a semi-annual physical inventory of all such sources. The licensee must retain each inventory record in accordance with 180 NAC 7-094

7-034 LABELS: Each syringe and vial that contains a radioactive drug must be labeled to identify the radioactive drug.

7-035 VIAL SHIELDS AND SYRINGE SHIELD

7-035.01 A licensee must require each individual preparing or handling a vial that contains a radioactive drug to keep the vial in a vial radiation shield.

7-035.02 A licensee must keep syringes that contain radioactive material to be administered in a radiation shield.

7-035.03 A licensee must require each individual who prepares or administers radioactive drugs to use a syringe radiation shield unless the use of the shield is contraindicated for that patient or human research subject.

7-036 SURVEYS FOR AMBIENT RADIATION DOSE RATE AND CONTAMINATION

7-036.01 Except as provided in 180 NAC 7-036.02 a licensee must survey with a radiation detection survey instrument at the end of each day of use all areas where radioactive drugs containing radioactive material requiring a written directive were prepared for use or administered.

7-036.02 A licensee must survey with a radiation detection survey instrument at least once each week all areas where radioactive drugs or radioactive wastes are stored.

7-036.03 A licensee must conduct the surveys required by 180 NAC 7-036.01 and 7-036.02 so as to be able to measure dose rates as low as 1 μSv (0.1 mrem) per hour.

7-036.04 A licensee must establish dose rate action levels for the surveys required by 180 NAC 7-036.01 and 7-036.02 and must require that the individual performing the survey immediately notify the Radiation Safety Officer if a dose rate exceeds an action level.

7-036.05 A licensee must survey for:

1. Removable contamination once each day all areas where generators and bulk radioactive drugs are prepared for use or administered.
2. Removable contamination once each week where unsealed radioactive materials are stored.

7-036.06 A licensee must conduct the surveys required by 180 NAC 7-036.05 so as to be able to detect contamination on each wipe sample of 33.3 Bq (2000 dpm).

7-036.07 A licensee must establish removable contamination action levels for the surveys required by 180 NAC 7-036.05 and must require that the individual performing the survey immediately notify the Radiation Safety Officer if contamination exceeds action levels.

7-036.08 A licensee must retain a record of each survey in accordance with 180 NAC 7-095.

7-037 RELEASE OF INDIVIDUALS CONTAINING RADIOACTIVE DRUGS OR IMPLANTS

7-037.01 A licensee may authorize the release from its control of any individual who has been administered radioactive drugs or implants containing radioactive material if the total effective dose equivalent to any other individual from exposure to the released individual is not likely to exceed 5 mSv (0.5 rem).[2]

[2]U.S. Nuclear Regulatory Commission's - Regulatory Guide 7.1, "Release of Patients Administered Radioactive Materials," describes methods for calculating doses to other individuals and contains tables of activities not likely to cause doses exceeding 5 mSv (0.5 rem).

7-037.02 For patients administered radioactive material for which a written directive is required, a licensee must provide the released individual, or individual's parent or guardian with oral and written instructions on actions recommended to maintain doses to other individuals as low as is reasonably achievable if the total effective dose equivalent to any other individual is likely to exceed 1 mSv (0.1 rem). If the dose to a breast-feeding infant or child could exceed 1 mSv (0.1 rem) assuming there were no interruption of breast-feeding, the instructions must also include:

1. Guidance on the interruption or discontinuation of breast-feeding and
2. Information on the potential consequences, if any, of failure to follow the guidance.

7-037.03 Release of the patient must be approved by an individual listed as an authorized user on the Department license or an approved individual who is operating directly under the supervision of the authorized user and that authorized user is approved for the type of radioactive material use for which the patient being released has received.

7-037.04 The licensee must maintain a record of the basis for authorizing the release of an individual in accordance with 180 NAC 7-096.

7-037.05 The licensee must maintain a record of instructions provided to a breast-feeding female in accordance with 180 NAC 7-096.

7-037.06 The licensee must notify the Department in accordance with 180 NAC 7-119:

1. When they are aware that a patient containing radioactive material and who has been released in accordance with 180 NAC 7-037 dies; and,
2. If it is possible that any individual could receive exposures in excess of 5 mSV (500 mrem) as a results of the deceased's body.

7-038 MOBILE MEDICINE SERVICE TECHNICAL REQUIREMENTS: A licensee providing mobile nuclear medicine service must:

7-038.01 Transport to each address of use only syringes or vials containing prepared drugs or radioactive materials that are intended for reconstitution of radioactive drug kits;

7-038.02 Bring into each location of use all radioactive material to be used and, before leaving, remove all unused radioactive material and associated radioactive waste;

7-038.03 Secure or keep under constant surveillance and immediate control all radioactive material when in transit or at an address of use;

7-038.04 Check instruments used to measure the activity of unsealed radioactive material for proper function before medical use at each address of use or on each day of use, whichever is more frequent. At a minimum, the check for proper function must include a constancy check;

7-038.05 Check survey instruments for consistent response with a dedicated check source before use at each client's address;

7-038.06 Prior to leaving a client's address of use, perform area surveys and survey for removable contamination in all areas of use, to ensure compliance with the requirements in 180 NAC 4.

7-038.07 Use radioactive gases only in areas of use and under conditions which have been evaluated and approved by the Department for compliance with airborne release standards; and,

7-038.08 Retain a record of each survey required by 180 NAC 7-038.05 in accordance with 180 NAC 7-097.

7-039 STORAGE AND CONTROL OF VOLATILES AND GASES

7-039.01 A licensee must store volatile radioactive material and radioactive gases in a radiation shield and container.

7-039.02 A licensee must store and use a multi-dose container in a properly functioning fume hood.

7-039.03 A licensee who administers radioactive aerosols or gases must do so with a system that will keep airborne concentrations within the limits prescribed in 180 NAC 4.

7-039.04 The system must either be directly vented to the atmosphere through an air exhaust or provide for collection and decay or disposal of the aerosol or gas in a shielded container.

7-039.05 A licensee must check the operation of collection systems monthly and measure the ventilation rates in areas of use at intervals not to exceed six months. Records of these checks and measurements must be maintained for three years.

7-039.06 A licensee must only administer radioactive gases in rooms that are at negative pressure compared to surrounding rooms.

7-039.07 Before receiving, using, or storing a radioactive gas, the licensee must calculate the amount of time needed after a release to reduce the concentration in the area of use to the occupational limit listed in Appendix 4-B of 180 NAC 4. The calculation must be based on the highest activity of gas handled in a single container, the air volume of the room, and the measured available air exhaust rate.

7-039.08 A licensee must post the time calculated in 180 NAC 7-039.07 at the area of use and requires that, in case of a gas spill, individuals evacuate the room until the posted time has elapsed.

7-039.09 A copy of the calculations required in 180 NAC 7-039.07 must be recorded and retained for the duration of the license.

7-040 DECAY-IN-STORAGE: See 180 NAC 4-039.03 for decay-in-storage requirements.

UNSEALED RADIOACTIVE MATERIAL – WRITTEN DIRECTIVE NOT REQUIRED

7-041 USE OF UNSEALED RADIOACTIVE MATERIAL FOR UPTAKE, DILUTION, AND EXCRETION STUDIES FOR WHICH A WRITTEN DIRECTIVE IS NOT REQUIRED: A licensee may use any unsealed radioactive material, in quantities that do not require a written directive, for diagnostic use involving measurements of uptake, dilution, or excretion that is:

7-041.01 Obtained from a manufacturer or preparer licensed pursuant to 180 NAC 3-014.10 or equivalent regulations of the U.S. Nuclear Regulatory Commission or Agreement State; or

7-041.02 Prepared by:

1. An authorized nuclear pharmacist;
2. A physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047 or 7-051 and 7-047.03, item 1.b.(7); or
3. An individual under the supervision, as specified in 180 NAC 7-018, of the authorized nuclear pharmacist in 180 NAC 7-041.02, item 1 or the physician who is authorized user in 180 NAC 7-041.02, item 2; or

7-041.03 Obtained from and prepared by an A U.S. Nuclear Regulatory Commission or Agreement State licensee for use in research in accordance with a Radioactive Drug Research Committee-approved protocol or an Investigational New Drug (IND) protocol accepted by FDA; or

7-041.04 Prepared by the licensee in accordance with a Radioactive Drug Research Committee-approved application or an Investigational New Drug (IND) protocol accepted by FDA for use in research.

7-042 POSSESSION OF SURVEY INSTRUMENT: A licensee authorized to use radioactive material for uptake, dilution, and excretion studies must possess a portable radiation detection survey instrument capable of detecting dose rates over the range of 1 μSv (0.1 mrems) per hour to 1000 μSv (100 mrems) per hour. The instrument must be operable and calibrated in accordance with 180 NAC 7-030.

7-043 TRAINING FOR UPTAKE, DILUTION, AND EXCRETION STUDIES: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of unsealed radioactive material for the uses authorized in 180 NAC 7-041 to be a physician who:

7-043.01 Is certified by a medical specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State and who meets the requirements in 180 NAC 7-043.04. (The names of board certifications which have been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board must require all candidates for certification to:

1. Complete 60 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies that includes the topics listed in 180 NAC 7-043.03, item 1.and 2 and 7-043.04; and
2. Pass an examination, administered by diplomats of the specialty board, that assesses knowledge and competence in radiation safety, radionuclide handling,

and quality control; or

7-043.02 Is an authorized user under 180 NAC 7-047 or 7-051 or equivalent U.S. Nuclear Regulatory or Agreement State requirements; or

7-043.03 Has completed 60 hours of training and experience, including a minimum of eight hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for uptake, dilution, and excretion studies. The training and experience must include:

1. Classroom and laboratory training in the following areas:

    a. Radiation physics and instrumentation;
    b. Radiation protection;
    c. Mathematics pertaining to the use and measurement of radioactivity;
    d. Chemistry of byproduct material for medical use; and
    e. Radiation biology; and

2. Work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-043, 7-047 or 7-051 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, involving:

    a. Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
    b. Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters
    c. Calculating, measuring, and safely preparing patient or human research subject dosages;
    d. Using administrative controls to prevent a medical event involving the use of unsealed radioactive material;
    e. Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and
    f. Administering dosages of radioactive drugs to patients or human research subjects; and

3. Meet the requirements of 180 NAC 7-043.04.

7-043.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-043, 7-047, or 7-051, or equivalent Agreement State requirements, that the individual has satisfactorily completed the requirement in 180 NAC 7-043.01, item 1 or 7-043.03, item 1 and 2 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized in 180 NAC 7-041.

SPECIFIC REQUIREMENTS FOR THE USE OF UNSEALED RADIOACTIVE MATERIAL – WRITTEN DIRECTIVE NOT REQUIRED

7-044 USE OF UNSEALED RADIOACTIVE MATERIAL FOR IMAGING AND LOCALIZATION STUDIES FOR WHICH A WRITTEN DIRECTIVE IS NOT REQUIRED: A licensee may use, for

imaging and localization studies, any radioactive material prepared for medical use, in quantities that do not require a written directive as described in 180 NAC 7-019 that is:

7-044.01 Obtained from a manufacturer or preparer licensed pursuant to 180 NAC 3-014.10 or equivalent U.S. Nuclear Regulatory Commission or Agreement State ; or

7-044.02 Prepared by:

1. An authorized nuclear pharmacist;
2. A physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7), or
3. An individual under the supervision, as specified in 180 NAC 7-018; of, the authorized nuclear pharmacist in paragraph 180 NAC 7-044.02, item 1 or the physician who is an authorized user in paragraph 180 NAC 7-044.02, item 2;

7-044.03 Obtained from and prepared by an U.S. Nuclear Regulatory Commission or Agreement State licensee for use in research in accordance with a Radioactive Drug Research Committee-approved protocol or an Investigational New Drug (IND) protocol accepted by FDA; or

7-044.04 Prepared by the licensee for use in research in accordance with a Radioactive Drug Research Committee-approved application or an Investigational New Drug (IND) protocol accepted by FDA.

7-045 RADIONUCLIDE CONTAMINANTS

7-045.01 A licensee must not administer to humans a radioactive drug containing:

1. More than 0.15 kBq of molybdenum-99 per MBq of technetium-99m (0.15 µCi of molybdenum-99 per mCi of technetium-99m).
2. More than 0.02 kBq of strontium-82 per MBq of rubidium-82 chloride injection (0.02 µCi of strontium-82 per mCi of rubidium-82 chloride injection).
3. More than 0.02 kBq of strontium-85 per MBq of rubidium-82 chloride injection (0.02 µCi of strontium-85 per mCi of rubidium-82 chloride injection).

7-045.02 To demonstrate compliance with 180 NAC 7-045, the licensee preparing radioactive drugs from radionuclide generators must:

1. Measure the concentration of radionuclide contaminant in the first eluate after receipt of a molybdenum-99/technetium-99m generator;
2. Measure the concentration of radionuclide contaminant in each eluate or extract, as appropriate for other generator systems.

7-045.03 A licensee who must measure radionuclide concentration must retain a record of each measurement in accordance with 180 NAC 7-099.

7-045.04 A licensee must report immediately to the Department each occurrence of molybdenum-99 concentration exceeding the limits specified in 180 NAC 7-045.01.

7-046 POSSESSION OF SURVEY INSTRUMENTS: A licensee authorized to use radioactive material for imaging and localization studies must possess a portable radiation detection survey instrument capable of detecting dose rates over the range of 1 μSv (0.1 mrem) per hour to 500 μSv (50 mrem) per hour. If generators (Mo99/Tc 99m or Sr82/Rb82) are utilized, a portable radiation measurement survey instrument capable of measuring dose rates over the range 10 μSv (1 mrem) per hour to 10 mSv (1000 mrem) per hour. The instruments must be operable and calibrated in accordance with 180 NAC 7-030.

7-047 TRAINING FOR IMAGING AND LOCALIZATION STUDIES: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of unsealed radioactive material for the uses authorized in 180 NAC 7-044 to be a physician who:

7-047.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) and who meets to requirement in 180 NAC 7-047.04. (The names of board certification which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) To have its certification process recognized, a specialty board must require all candidates for certification to:

1. Complete 700 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for imaging and localization studies that includes the topics listed in 180 NAC 7-047.03; and

2. Pass an examination, administered by diplomats of the specialty board, which assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or

7-047.02 Is an authorized user in 180 NAC 7-051 and meets the requirements in 180 NAC 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements; or

7-047.03 The physician:

1. Completed 700 hours of training and experience, including a minimum of 80 hours of classroom and laboratory training in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for imaging and localization studies. The training and experience must include at a minimum:

   a. Classroom and laboratory training in the following areas:

      (1) Radiation physics and instrumentation;
      (2) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;
      (3) Mathematics pertaining to the use and measurement of radioactivity;
      (4) Chemistry of radioactive material for medical use;
      (5) Radiation biology; and

b. Work experience, under the supervision of an authorized user, who meets the requirements in 180 NAC 7-047 or 7-47.03, item 1.b.(7) and 180 NAC 7-051 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, involving;

(1) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
(2) Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;
(3) Calculating, measuring, and safely preparing patient or human research subject dosages;
(4) Using administrative controls to prevent a misadministration involving the use of unsealed radioactive material;
(5) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures;
(6) Administering dosages of radioactive drugs to patients or human research subjects; and
(7) Eluting generator systems appropriate for preparation of radioactive drugs for imaging and localization studies, measuring and testing the eluate for radionuclide purity, and processing the eluate with reagent kits to prepare labeled radioactive drugs; and

2. Meets the requirement of 180 NAC 7-047.04.

7-047.04 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-047, or 7-051 and 7-047.03, item 1.b.(7) or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-047.01, item 1 or 180 NAC 7-047.03, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-041 and 7-044 .

UNSEALED RADIOACTIVE MATERIAL – WRITTEN DIRECTIVE REQUIRED

7-048 USE OF UNSEALED RADIOACTIVE MATERIAL FOR WHICH A WRITTEN DIRECTIVE IS REQUIRED: A licensee may use any unsealed radioactive material for diagnostic or therapeutic medical use for which a written directive is required that has been:

7-048.01 Obtained from a manufacturer or preparer licensed in 180 NAC 3; or

7-048.02 Prepared by an authorized nuclear pharmacist, a physician who is an authorized user and who meets the requirements specified in 180 NAC 7-047 or 7-051, or an individual under the supervision of either as specified in 180 NAC 7-018; or

7-048.03 Obtained from and prepared by the Department, U.S. Nuclear Regulatory Commission or Agreement State licensee in accordance with a Radioactive Drug Research Committee's approval protocol or an Investigational New Drug (IND) protocol accepted by FDA for use in research; or

7-048.04 Prepared by the licensee for use in research in accordance with an approved application or an Investigational New Drug (IND) protocol accepted by FDA for use in research.

7-049 SAFETY INSTRUCTION AND SAFETY PRECAUTIONS

7-049.01 In addition to the requirements of 180 NAC 10-003,

1. A licensee must provide radiation safety instruction to all personnel caring for patients or human research subjects that have received therapy with radioactive drug, and cannot be released in accordance with 180 NAC 7-037. The training must be provided initially and at least annually. The instruction must be appropriate to the personnel's assigned duties and include the following:

   a. Patient or human research subject control;
   b. Visitor control to include the following:

      (1) Routine visitation to hospitalized individuals in accordance with 180 NAC 4-013.01, item 1; and
      (2) Visitation authorized in accordance with 180 NAC 4-013.03.

   c, Contamination control;
   d. Waste control; and
   e. Notification of the Radiation Safety Officer or his/her designee and the authorized user if the patient or the human research subject has a medical emergency or dies.

2. A licensee must retain a record of individuals receiving instruction required by 180 NAC 7-101.

7-049.02 Safety Precautions

1. For each patient or human research subject receiving radiopharmaceutical therapy and hospitalized for compliance with 180 NAC 7-037, a licensee must:

   a. Quarter the patient or the human research subject either in:

      (1) A private room with a private sanitary facility; or
      (2) A room, with a private sanitary facility, with another individual who also has received similar radiopharmaceutical therapy and who also cannot be released under 180 NAC 7-037;

   b. Visibly post the patient's or the human research subject's door with a "Caution: Radioactive Materials" sign and note on the door or in the patient's or human research subject's chart where and how long visitors may stay in the patient's or human research subject's room; and

   c. Either:

      (1) Monitor material and items removed from the patient's or the human research subject's room to determine that their radioactivity cannot

be distinguished from the natural background radiation level with a radiation detection survey instrument set on its most sensitive scale and with no interposed shielding; or

(2) Handle such material and items as radioactive waste.

2. The Radiation Safety Officer, or his/her designee, and the authorized user must be notified immediately if the hospitalization patient dies or has a medical emergency. The licensee must also notify the Department in accordance with 180 NAC 7-119 if it is possible that any individual could receive exposures in excess of 180 NAC 4-013 as a result of the deceased's body.

3. Measure the thyroid burden of each individual who helped prepare or administer a liquid dosage of iodine-131 or in all cases where the patient's vomits or the capsule is compromised. The measurement must be done within three days after administering the dosage, and retain for the period required by 180 NAC 4-051.01 a record of each thyroid burden measurement, date of measurement, the name of the individual whose thyroid burden was measured, and the initials of the individual who made the measurements.

7-050 POSSESSION OF SURVEY INSTRUMENTS: A licensee authorized to use radioactive material for which a written directive is required must possess a portable radiation detection survey instrument capable of detecting dose rates over the range of 1 μSv (0.1 mrem) per hour to 1,000 μSv (100 mrems) per hour, and a portable radiation measurement survey instrument capable of measuring dose rates over the range of 10 μSv (1 mrem) per hour to 10 mSV (1000 mrems) per hour. The instruments must be operable and calibrated in accordance with 180 NAC 7-030.

7-051 TRAINING FOR USE OF UNSEALED RADIOACTIVE MATERIAL FOR WHICH A WRITTEN DIRECTIVE IS REQUIRED: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of unsealed radioactive material for the uses authorized under 180 NAC 7-048 to be a physician who:

7-051.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) who meets the requirements in 180 NAC 7-051.02, item 1.b.(6) and 7-051.03. (Specialty Boards whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) To be recognized, a specialty board must require all candidates for certification to:

1. Successfully complete a minimum of three years of residency training in a radiation therapy or nuclear medicine training program or a program in a related medical specialty. These residency training programs must include 700 hours of training and experience as described in 180 NAC 7-051.02, item 1.a. through 7-051.02, item 1.b.(5). Eligible training programs must be approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and

2. Pass an examination, administered by diplomats of the specialty board, which

tests knowledge and competence in radiation safety, radionuclide handling, quality assurance, and clinical use of unsealed radioactive material for which a written directive is required; or

7-051.02 The physician:

1. Has completed 700 hours of training and experience, including a minimum of 200 hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material requiring a written directive. The training and experience must include:

   a. Classroom and laboratory training in the following areas:

      (1) Radiation physics and instrumentation;
      (2) Radiation protection;
      (3) Mathematics pertaining to the use and measurement of radioactivity;
      (4) Chemistry of radioactive material for medical use; and
      (5) Radiation biology; and

   b. Work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory or Agreement State requirements. A supervising authorized user, who meets the requirements in 180 NAC 7-051.02, must also have experience in administering dosages in the same dosage category or categories (that is , 180 NAC 7-051.02, item 1., b.(6)) as the individual requesting authorized user status. The work experience must involve:

      (1) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
      (2) Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters;
      (3) Calculating, measuring, and safely preparing patient or human research subject dosages;
      (4) Using administrative controls to prevent a misadministration involving the use of unsealed radioactive material;
      (5) Using procedures to contain spilled radioactive material safely and using proper decontamination procedures;
      (6) Administering dosages of radioactive drugs to patients or human research subjects involving a minimum of three cases in each of the following categories for which the individual is requesting authorized user status:

         (a) Oral administration of less than or equal to 1.22 GBq (33 mCi) of sodium iodide I-131, for which a written directive is required;
         (b) Oral administration of greater than 1.22 GBq (33 mCi) of sodium iodide I-131[3];
         (c) Parenteral administration of any beta emitter or a photon-

[3]Experience with at least 3 cases in 180 NAC 7-051.02, item 1.b. (6) (b) also satisfies the requirement in 180 NAC 7-051.02, item 1.b.(6)(a).

emitting radionuclide with a photon energy less than 150 keV, for which a written directive is required; and/or

(d) Parenteral administration of any beta emitter, or a photon-emitting radionuclide with a photon energy less than 150 kev, for which a written directive is required; and/or

2. Meets the requirements of 180 NAC 7-051.03.

7-051.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-051.01, item 1 and 7-051.02, item 1.b.(6) or 7-051.02, item 1 and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. The preceptor authorized user, who meets the requirement in 180 NAC 7-051.02 must have experience in administering dosages in the same dosage category or categories (that is, 180 NAC 7-051.02, item 1.b.(6)) as the individual requesting authorized user status.

7-052 TRAINING FOR THE ORAL ADMINISTRATION OF SODIUM IODIDE I-131 IN QUANTITIES LESS THAN OR EQUAL TO 1.22 GIGABECQUERELS (33 MILLICURIES) FOR WHICH A WRITTEN DIRECTIVE IS REQUIRED: Except as provided in 180 NAC 7-026, the licensee must require an authorized user for the oral administration of sodium iodide I-131 in quantities less than or equal to 1.22 GBq (33 mCi), for which a directive is required, to be a physician who:

7-052.01 Is certified by a medical specialty board whose certification process includes all of the requirements in 180 NAC 7-052.03, item 1. and 2. and whose certification has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission who meets the requirements of 180 NAC 7-052.04. (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's Web page.) or

7-052.02 Is an authorized user under 180 NAC 7-051.01, 7-051.02 for uses listed in 180 NAC 7-051.02, item 1.b.(6)(a) or (b), 180 NAC 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements; or

7-052.03 The physician:

1. Has successfully completed 80 hours of classroom and laboratory training, applicable to the medical use of sodium iodide I-131 for procedures requiring a written directive. The training must include:

   a. Radiation physics and instrumentation;
   b. Radiation protection;
   c. Mathematics pertaining to the use and measurement of radioactivity;
   d. Chemistry of radioactive material for medical use; and
   e. Radiation biology; and

2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051.01, 7-051.02, 7-052, 7-053, or equivalent U.S.

Nuclear Regulatory Commission or Agreement State requirements. A supervising authorized user who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(a) or (b). The work experience must involve:

a. Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
b. Performing quality control procedures on instruments used to determine the activity of dosages and performing check for proper operation of survey meters;
c. Calculating, measuring, and safely preparing patient or human research subject dosages;
d. Using administrative controls to prevent a misadministration involving the use of radioactive material;
e. Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and
f. Administering dosages to patients or human research subjects, that includes at least three cases involving the oral administration of less than or equal to 1.22 GBq (33 mCi) of sodium iodide I-131; and

3. Meets the requirements of 180 NAC 7-052.04.

7-052.04 Has obtained written attestation that the individual has satisfactorily completed the requirements in180 NAC 7-052.03, item 1. and 2. and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized under 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, 7-052, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A preceptor authorized user, who meets the requirement in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(a) or (b).

7-053 TRAINING FOR THE ORAL ADMINISTRATION OF SODIUM IODIDE 1-131 IN QUANTITIES GREATER THAN 1.22 GIGABECQUERELS (33 MILLICURIES) FOR WHICH A WRITTEN DIRECTIVE IS REQUIRED: Except as provided in 180 NAC 7-026, the licensee must require an authorized user for the oral administration of sodium iodide 1-131 in quantities greater than 1.22 GBq (33 mCi), to be a physician who:

7-053.01 Is certified by a medical specialty board whose certification process includes all of the requirements in 180 NAC 7-053.03, item 1. and 2. and whose certification has been recognized an Agreement State or the U.S. Nuclear Regulatory Commission (NRC)and who meets the requirements in 180 NAC 7-053.04. (The name of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's Web page.) or

7-053.02 Is an authorized user under 180 NAC 7-051, for uses listed in 180 NAC 7-051.02, item 1.b.(6)(b), or equivalent Agreement State, or U.S. Nuclear Regulatory Commission requirements; or

7-053.03 The physician:

1. Has successfully completed 80 hours of classroom and laboratory training, applicable to the medical use of sodium iodide I-131 for procedures requiring a written directive; the training must include:

   a. Radiation physics and instrumentation;
   b. Radiation protection;
   c. Mathematics pertaining to the use and measurement of radioactivity;
   d. Chemistry of radioactive material for medical use; and
   e. Radiation biology; and

2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051, 7-053, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements. A supervising authorized user, who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(b). The work experience must involve:

   a. Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
   b. Performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;
   c. Calculating, measuring, and safely preparing patient or human research subject dosages;
   d. Using administrative controls to prevent a misadministration event involving the use of radioactive material;
   e. Using procedures to contain spilled radioactive material safely and using proper decontamination procedures; and
   f. Administering dosages to patients or human research subjects, that includes at least three cases involving the oral administration of greater than 1.22 GBq (33 mCi) of sodium iodide I-131; and

3. Meets the requirement of 180 NAC 7-053.04.

7-053.04 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-053.03, item 1. and 2. and has achieved a level of competency sufficient to function independently as an authorized user for medical uses authorized in 180 NAC 7-048. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051 or, 7-053, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in 180 NAC 7-051.02, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.(6)(b).

7-054 TRAINING FOR THE PARENTERAL ADMINISTRATION OF UNSEALED RADIOACTIVE MATERIAL REQUIRING A WRITTEN DIRECTIVE Except as provided in 180 NAC 7-026, the licensee must require an authorized user for the parenteral administration requiring a written directive, to be a physician who:

7-054.01 Is an authorized user under 180 NAC 7-051 for uses listed in 7-051.02, item 1.b. (6)(c) or (d),or equivalent Agreement State requirements; or

7-054.02 Is an authorized user under 180 NAC 7-063 or 7-084, or equivalent Agreement State requirements and who meets the requirements in 180 NAC 7-054.04; or

7-054.03 Is certified by a medical specialty board whose certification process has been recognized by the U.S. Nuclear Regulatory Commission or an Agreement State under 180 NAC 7-063 or 7-084; and who meets the requirements in 180 NAC 7-054.04.

7-054.04 The physician:

1. Has successfully completed 80 hours of classroom and laboratory training, applicable to parenteral administrations, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training must include:

    (1) Radiation physics and instrumentation;
    (2) Radiation protection;
    (3) Mathematics pertaining to the use and measurement of radioactivity;
    (4) Chemistry of radioactive material for medical use; and
    (5) Radiation biology; and

2. Has work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-051 or 7-054, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, in the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements in 180 NAC 7-051, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d). The work experience must involve:

    a. Ordering, receiving, and unpacking radioactive materials safely, and performing the related radiation surveys;
    b. Performing quality control procedures on instruments used to determine the activity of dosages, and performing checks for proper operation of survey meters;
    c. Calculating, measuring, and safely preparing patient or human research subject dosages;
    d. Using administrative controls to prevent a medical event involving the use of unsealed radioactive material;
    e Using procedures to contain spilled radioactive material safely, and using proper decontamination procedures; and
    f. Administering dosages to patients or human research subjects, that include at least three cases involving the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV and/or at least three cases involving the parenteral administration of any other radionuclide, for which a written directive is required; and

3. Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-054.02 or 7-054.03, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed radioactive material requiring a written directive. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-051, or 7-054, or equivalent Agreement State requirements. A preceptor authorized user, who meets the requirements in 180 NAC 7-051, must have experience in administering dosages as specified in 180 NAC 7-051.02, item 1.b.(6)(c) and/or (d).

MANUAL BRACHYTHERAPY

7-055 USE OF SOURCES FOR MANUAL BRACHYTHERAPY: A licensee must use only brachytherapy sources for therapeutic medical uses:

7-055.01 As approved in the Sealed Source and Device Registry; or

7-055.02 For research in accordance with an active Investigational Device Exemption (IDE) application that has been accepted by the FDA, provided the requirements of 180 NAC 7-021.01 are met.

7-056 SURVEYS AFTER SOURCE IMPLANT AND REMOVAL

7-056.01 Immediately after implanting sources in a patient or a human research subject, the licensee must make a survey to locate and account for all sources that have not been implanted.

7-056.02 Immediately after removing the last temporary implant source from a patient or a human research subject, the licensee must make a survey of the patient or the human research subject with a radiation detection survey instrument to confirm that all sources have been removed.

7-056.03 A licensee must retain a record of the surveys in accordance with 180 NAC 7-102.

7-057 BRACHYTHERAPY SOURCES INVENTORY

7-057.01 A licensee must maintain accountability at all times for all brachytherapy sources in storage or use.

7-057.02 Promptly after removing sources from a patient or a human research subject, a licensee must return brachytherapy sources to a secure storage area.

7-057.03 A licensee must maintain a record of the brachytherapy source accountability in accordance with 180 NAC 7-103.

7-058 SAFETY INSTRUCTION: In addition to the requirements of 180 NAC 10-003,

7-058.01 The licensee must provide radiation safety instruction, initially and at least annually, to personnel caring for a patient or human research subjects that are undergoing

implant therapy and can not be released under 180 NAC 7-037. The instruction must be commensurated with the duties of the personnel and will include the following:

1. Size and appearance of the brachytherapy sources;
2. Safe handling and shielding instructions;
3. Patient or human research subject control;
4. Visitor control, including both:

    a. Routine visitation of hospitalized individual in accordance with 180 NAC 4-013.01 and
    b. Visitation authorized in accordance with 180 NAC 4-013.01; and

5. Notification of the Radiation Safety Officer or his/her designee, and authorized user if the patient or the human research subject dies or has a medical emergency. The licensee will also notify the Department in accordance with 180 NAC 7-119 if it is possible that any individual could receive exposures in excess of 5 mSv (500 mrem) as a result of the deceased's body.

7-058.02 A licensee must retain a record of individuals receiving instruction required by 180 NAC 7-101.

7-059 SAFETY PRECAUTIONS FOR PATIENTS OR HUMAN RESEARCH SUBJECTS RECEIVING BRACHYTHERAPY

7-059.01 For each patient or human research subject that is receiving brachytherapy that cannot be released pursuant to 180 NAC 7-037 a licensee must:

1. Not quarter the patient or the human research subject in the same room as an individual who is not receiving radiation therapy;
2. Visibly post the patient's or human research subject's door with a "Caution: Radioactive Materials" sign; and note on the door or the patient's or human research subject's chart where and how long visitors may stay in the patient's or human research subject's room.

7-059.02 A licensee must have radiological emergency response equipment available near each treatment room to respond to a source that inadvertently becomes:

1. Dislodged from the patient; and
2. Lodged within the patient following removal of the source applicators.

7-059.03 The Radiation Safety Officer, or his/her designee, and authorized user must be notified immediately if the hospitalized patient or human research subject has a medical emergency or dies.

7-060 CALIBRATION MEASUREMENTS OF BRACHYTHERAPY SOURCES

7-060.01 Prior to the first medical use of a brachytherapy source on or after [the effective date of these regulations], a licensee must have performed the following:

1. Determine the source output or activity using a dosimetry system that meets the

requirements of 180 NAC 7-072.01;

2. Determine source positioning accuracy within applicators; and
3. Use published protocols currently accepted by nationally recognized bodies to meet the requirements of 180 NAC 7-060.01, item 1. and 2.

7-060.02 A licensee may use measurements provided by the source manufacturer or by a calibration laboratory accredited by the American Association of Physicists in Medicine that are made in accordance with 180 NAC 7-060.01.

7-060.03 A licensee must mathematically correct the outputs or activities determined in 180 NAC 7-060.01 for physical decay at intervals consistent with one percent physical decay.

7-060.04 An authorized medical physicist must perform or review the calculation measurements made pursuant to 180 NAC 7-060.01, 7-060.02, or 7-060.03.

7-060.05 Only an authorized medical physicist must calculate the activity of each strontium-90 source that is used to determine the treatment times for ophthalmic treatments. The decay must be based on the activity determined in accordance with 180 NAC 7-060.01, 7-060.02, or 7-060.03.

7-060.06 A licensee must retain a record of each calibration in accordance with 180 NAC 7-104.

7-060.07 A licensee must retain a record of decay calculations required by 180 NAC 7-060.5 in accordance with 180 NAC 7-105.

7-061 THERAPY-RELATED COMPUTER SYSTEMS: The licensee must perform acceptance testing on the treatment planning system of therapy-related computer systems in accordance with published protocols accepted by nationally recognized bodies. At a minimum, the acceptance testing must include, as applicable, verification of:

7-061.01 The source-specific input parameters required by the dose calculation algorithm;

7-061.02 The accuracy of dose, dwell time, and treatment time calculations at representative points;

7-061.03 The accuracy of isodose plots and graphic displays; and

7-061.04 The accuracy of the software used to determine sealed source positions from radiographic images.

7-062 POSSESSION OF SURVEY INSTRUMENT: A licensee authorized to use manual brachytherapy sources must possess a portable radiation detection survey instrument capable of detecting dose rates over the range of 1 μSv (0.1 mrem) per hour to 1,000 μSv (100 mrems) per hour, and a portable radiation measurement survey instrument capable of measuring dose rates over the range of 10 μSv (1 mrem) per hour to 10 mSv (1000 mrems) per hour. The instruments must be operable and calibrated in accordance with 180 NAC 7-030.

7-063 TRAINING FOR USE OF MANUAL BRACHYTHERAPY SOURCES: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of a manual brachytherapy source for

the uses authorized under 180 NAC 7-055 to be a physician who:

7-063.01 Is certified by a medical specialty board whose certification has been recognized by the Department, an Agreement State or the U.S. Nuclear Regulatory Commission (NRC), and who meets to requirements of 180 NAC 7-063.03. (The names of board certifications which have been recognized an Agreement State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's web page.) To have its certification process recognized, a specialty board must require all candidates for certification to:

1. Successfully complete a minimum of three years of residency training in a radiation oncology program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and
2. Pass an examination, administered by diplomats of the specialty board, that tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use manual brachytherapy; or

7-063.02 The physician:

1. Has completed a structured educational program in basic radionuclide handling techniques applicable to the use of manual brachytherapy sources that includes:

    a. 200 hours of classroom and laboratory training in the following areas:

        1. Radiation physics and instrumentation;
        2. Radiation protection;
        3. Mathematics pertaining to the use and measurement of radioactivity; and
        4. Radiation biology; and

    b. 500 hours of work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements at a medical institution, involving:

        1. Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
        2. Checking survey meters for proper operation;
        3. Preparing, implanting, and removing brachytherapy sources;
        4. Maintaining running inventories of material on hand;
        5. Using administrative controls to prevent a misadministration involving the use of radioactive material;
        6. Using emergency procedures to control radioactive material; and

2. Has completed three years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements in 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements, as a part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical

Education or the Royal College of Physicians and Surgeons of Canada or the Committee on Postdocutoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by 180 NAC 7-063.02, item 1.b.; and

3. Meet the requirements of 180 NAC 7-063.03.

7-063.03 Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-063, or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-063.01, item 1 or 7-063.02, item 2 and has achieved a level of competency sufficient to independently function as an authorized user of manual brachytherapy sources for the medical uses authorized under 180 NAC 7-055.

7-064 TRAINING FOR OPHTHALMIC USE OF STRONTIUM-90: Except as provided in 180 NAC 7-026, the licensee must require the authorized user of strontium-90 for ophthalmic uses authorized under 180 NAC 7-055 to be a physician who:

7-064.01 Is an authorized user under 180 NAC 7-063 or equivalent U.S. Nuclear Regulatory or Agreement State requirements; or

7-064.02 The physician:

1. Has completed 24 hours of classroom and laboratory training applicable to the medical use of strontium-90 for ophthalmic radiotherapy. The training must include:

   a. Radiation physics and instrumentation;
   b. Radiation protection;
   c. Mathematics pertaining to the use and measurement of radioactivity; and
   d. Radiation biology; and

2. Supervised clinical training in ophthalmic radiotherapy under the supervision of an authorized user at a medical institution, clinic, or private practice that includes the use of strontium-90 for the ophthalmic treatment of five individuals. This supervised clinical training must involve:

   a. Examination of each individual to be treated;
   b. Calculation of the dose to be administered;
   c. Administration of the dose; and
   d. Follow up and review of each individual's case history; and

3. Has obtained written attestation, signed by a preceptor authorized user who meets the requirements in 180 NAC 7-063 or 7-064 or equivalent U.S. Nuclear Regulatory Commission or Agreement State requirements, that the individual has satisfactorily completed the requirements in 180 NAC 7-064.01 and 7-064.02 and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use.

SEALED SOURCES FOR DIAGNOSIS

7-065 USE OF SEALED SOURCES FOR DIAGNOSIS: A licensee must use only sealed sources for diagnostic medical uses:

7-065.01 Approved in the U.S. Nuclear Regulatory Commission's Sealed Source and Device Registry; and

7-065.02 Handled in accordance with the manufacturer's radiation safety instructions.

7-066 TRAINING FOR USE OF SEALED SOURCES FOR DIAGNOSIS: Except as provided in 180 NAC 7-026, the licensee must require the authorized user of a diagnostic sealed source for use in a device authorized under 180 NAC 7-065 to be a physician who:

7-066.01 Is certified by a specialty board whose certification includes all of the requirements in 180 NAC 7-066.02 and 7-066.03 whose certification has been recognized by, an Agreement State or the U.S. Nuclear Regulatory Commission (NRC). (The names of board certifications which have been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission will be posted on the NRC's web page.); or

7-066.02 The physican:

1. Has completed eight hours of classroom and laboratory training in basic radionuclide handling techniques specifically applicable to the use of the device. The training must include:

    a. Radiation physics and instrumentation;
    b. Radiation protection;
    c. Mathematics pertaining to the use and measurement of radioactivity; and
    d. Radiation biology; and

7-066.03 Has completed training in the use of the device for the uses requested.

PHOTON EMITTING REMOTE AFTERLOADER UNITS, TELETHERAPHY UNITS, AND GAMMA STEREOTACTIC RADIOSURGERY UNITS

7-067 USE OF A SEALED SOURCE IN A REMOTE AFTERLOADER UNITS, TELETHERAPY UNITS, AND GAMMA STEREOTACTIC RADIOSURGERY UNIT: A licensee must use sealed sources in photon emitting remote afterloader units, or gamma stereotactic radiosurgery units for therapeutic medical uses:

7-067.01 As approved in the U.S. Nuclear Regulatory Commission Sealed Source and Device Registry; or

7-067.02 For research in accordance with an active Investigational Device Exemption (IDE) application that has been accepted by the FDA provided the requirements of 180 NAC 7-021.01 are met.

7-068 SURVEYS OF PATIENTS AND HUMAN RESEARCH SUBJECTS TREATED WITH A REMOTE AFTERLOADER UNIT

7-068.01 Before releasing a patient or a human research subject from licensee control, a licensee must make a survey of the patient or the human research subject and the remote afterloader unit with a portable radiation detection survey instrument to confirm that the source(s) has been removed from the patient or human research subject and returned to the shielded position.

7-068.02 A licensee must retain a record of surveys in accordance with 180 NAC 7-102.

7-069 INSTALLATION, MAINTENANCE, ADJUSTMENT, AND REPAIR

7-069.01 Only a person specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State may install, maintain, adjust, or repair a remote afterloader unit, teletherapy unit, or gamma stereotactic radiosurgery unit that involves work on the source(s) shielding, the source(s) driving unit, or other electronic or mechanical component that could expose the source(s), reduce the shielding around the source(s), or compromise the radiation safety of the unit or the source(s).

7-069.02 Except for low dose-rate remote afterloader units, only a person specifically licensed by the Department, the U.S. Nuclear Regulatory Commission or an Agreement State may install, replace, relocate, or remove a sealed source or source contained in other remote afterloader units, teletherapy units, or gamma stereotactic radiosurgery units.

7-069.03 For a low dose-rate remote afterloader unit, only a person specifically licensed by the Department, the U.S. Nuclear Regulatory Commission, an Agreement State or an authorized medical physicist may install, replace, relocate, or remove a sealed source(s) contained in the unit.

7-069.04 A licensee must retain a record of the installation, maintenance, adjustment, and repair of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units in accordance with 180 NAC 7-106.

7-070 SAFETY PROCEDURES AND INSTRUCTIONS FOR REMOTE AFTERLOADER UNITS, TELETHERAPHY UNITS, AND GAMMA STEREOSTACTIC RADIOSURGERY UNITS

7-070.01 A licensee must:

1. Secure the unit, the console, the console keys, and the treatment room when not in use or unattended;
2. Permit only individuals approved by the authorized user, Radiation Safety Officer, or authorized medical physicist to be present in the treatment room during treatment with the source(s);
3. Prevent dual operation of more than one radiation producing device in a treatment room if applicable; and
4. Develop, implement, and maintain written procedures for responding to an abnormal situation when the operator is unable to place the source(s) in the shielded position, or remove the patient or human research subject from the radiation field with controls from outside the treatment room. These procedures must include:

a. Instructions for responding to equipment failures and the names of the individuals responsible for implementing corrective actions;
b. The process for restricting access to and posting of the treatment area to minimize the risk of inadvertent exposure; and
c. The names and telephone numbers of the authorized users, the authorized medical physicist, and the Radiation Safety Officer to be contacted if the unit or console operates abnormally.

7-070.02 A copy of the procedures required by 180 NAC 7-070.01, item 4 must be physically located at the unit console.

7-070.03 A licensee must post instructions at the unit console to inform the operator of:

1. The location of the procedures required by 180 NAC 7-70.01, item 4; and
2. The names and telephone numbers of the authorized users, the authorized medical physicist, and the Radiation Safety Officer to be contacted if the unit or console operates abnormally.

7-070.04 A licensee must provide instruction, initially and at least annually, to all individuals who operate the unit, as appropriate to the individual's assigned duties, in:

1. The procedures identified in 180 NAC 7-070.01, item 4; and
2. The operating procedures for the unit.

7-070.05 A licensee must ensure that operators, authorized medical physicists, and authorized users participate in drills of the emergency procedures, initially and at least annually.

7-070.06 A licensee must retain a record of individuals receiving instruction required by 180 NAC 7-070.04, in accordance with 180 NAC 7-101.

7-071 SAFETY PRECAUTIONS FOR REMOTE AFTERLOADER UNITS, TELETHERAPY UNITS, AND GAMMA STEREOTACTIC RADIOSURGERY UNITS

7-071.01 A licensee must control access to the treatment room by a door at each entrance.

7-071.02 A licensee must equip each entrance to the treatment room with an electrical interlock system that will:

1. Prevent the operator from initiating the treatment cycle unless each treatment room entrance door is closed;
2. Cause the source(s) to be shielded promptly when an entrance door is opened; and
3. Prevent the source(s) from being exposed following an interlock interruption until all treatment room entrance doors are closed and the source(s) on-off control is reset at the console.

7-071.03 A licensee must require any individual entering the treatment room to assure, through the use of appropriate radiation monitors, that radiation levels have returned to ambient levels.

7-071.04 Except for low-dose remote afterloader units, a licensee will construct or equip each treatment room with viewing and intercom systems to permit continuous observation of the patient or the human research subject from the treatment console during irradiation.

7-071.05 For licensed activities where sources are placed within the patient's or human research subject's body, a licensee shall only conduct treatments which allow for expeditious removal of a decoupled or jammed source.

7-071.06 In addition to the requirements specified in 180 NAC 7-071.01 through 7-071.05, a licensee must:

1. For low dose-rate, medium dose-rate and pulsed dose-rate remote afterloader units, require:

   a. An authorized medical physicist and either an authorized user or a physician, under the supervision of an authorized user, who has been trained in the operation and emergency response for the unit to be physically present during the initiation of all patient treatments involving the unit; and
   b. An authorized medical physicist and either an authorized user or an individual, under the supervision of an authorized user, who has been trained to remove the source applicator(s) in the event of an emergency involving the unit, to be immediately available during continuation of all patient treatments involving the unit.

2. For high dose-rate remote afterloader units, require:

   a. An authorized user and an authorized medical physicist to be physically present during the initiation of all patient treatments involving the unit; and
   b. An authorized medical physicist and either an authorized user or a physician, under the supervision of an authorized user, who has been trained in the operation and emergency response for the unit, to be physically present during continuation of all patient treatments involving the unit.

3. For gamma stereotactic radiosurgery units, require an authorized user and an authorized medical physicist to be physically present throughout all patient treatments involving the unit.

4. Notify the Radiation Safety Officer, or his/her designee, and an authorized user as soon as possible if the patient or human research subject has a medical emergency and immediately if the patient dies.

7-071.07 A licensee must have applicable radiological emergency response equipment available near each treatment room to respond to a source that inadvertently:

1. Remains in the unshielded position; or
2. Lodges within the patient following completion of the treatment.

7-072 DOSIMETRY EQUIPMENT

7-072.01 Except for low dose-rate remote afterloader sources where the source output or activity is determined by the manufacturer, a licensee must have a calibrated dosimetry system available for use. To satisfy this requirement, one of the following conditions must be met.

1. The system must have been calibrated using a system or source traceable to the National Institute of Science and Technology (NIST) and published protocols accepted by nationally recognized bodies; or by a calibration laboratory accredited by the American Association of Physicists in Medicine (AAPM). The calibration must have been performed within the previous two years and after any servicing that may have affected system calibration; or
2. The system must have been calibrated within the previous four years. Within 18 to 30 months after that calibration, the system must have been intercompared with another dosimetry system that was calibrated within the past 24 months by NIST or by a calibration laboratory accredited by the AAPM. The results of the intercomparison must have indicated that the calibration factor of the licensee's system had not changed by more than 2%. The licensee may not use the intercomparison result to change the calibration factor. When intercomparing dosimetry systems to be used for calibrating sealed sources for therapeutic units, the licensee must use a comparable unit with beam attenuators or collimators, as applicable, and sources of the same radionuclide as the source used at the licensee's facility.

7-072.02 The licensee must have available for use a dosimetry system for spot-check output measurements, if applicable. To satisfy this requirement, the system may be compared with a system that has been calibrated in accordance with 180 NAC 7-072.01. This comparison must have been performed within the previous year and after each servicing that may have affected system calibration. The spot-check system may be the same system used to meet the requirement in 180 NAC 7-072.01.

7-072.03 The licensee must retain a record of each calibration, intercomparison, and comparison in accordance with 180 NAC 7-107.

7-073 FULL CALIBRATION MEASUREMENTS ON TELETHERAPY UNITS

7-073.01 A licensee authorized to use a teletherapy unit for medical use must perform full calibration measurements on each teletherapy unit:

1. Before the first medical use of the unit; and
2. Before medical use under the following conditions:

    a. Whenever spot-check measurements indicate that the output differs by more than 5% from the output obtained at the last full calibration corrected mathematically for radioactive decay;

b. Following replacement of the source or following reinstallation of the teletherapy unit in a new location; and
c. Following any repair of the teletherapy unit that includes removal of the source or major repair of the components associated with the source exposure assembly; and

3. At intervals not exceeding one year.

7-073.02 To satisfy the requirement of 180 NAC 7-073.01, full calibration measurements must include determination of:

1. The output within +/-3% for the range of field sizes and for the distance or range of distances used for medical use;
2. The coincidence of the radiation field and the field indicated by the light beam localizing device;
3. The uniformity of the radiation field and its dependence on the orientation of the useful beam;
4. Timer accuracy, and linearity over the range of use;
5. "On-off" error; and
6. The accuracy of all distance measuring and localization devices in medical use.

7-073.03 A licensee must use the dosimetry system described in 180 NAC 7-072.01 to measure the output for one set of exposure conditions. The remaining radiation measurements required by 7-073.02, item 1. may then be made using a dosimetry system that indicates relative dose rates.

7-073.04 A licensee must make full calibration measurements required by 180 NAC 7-073.01 in accordance with published protocols accepted by nationally recognized bodies.

7-073.05 A licensee must mathematically correct the outputs determined in 180 NAC 7-073.02, item 1, for physical decay for intervals not exceeding one month for cobalt-60, six months for cesium-137, or at intervals consistent with 1% decay for all other nuclides.

7-073.06 Full calibration measurements required by 180 NAC 7-073.01 and physical decay corrections required by 180 NAC 7-073.05 must be performed by a authorized medical physicist.

7-073.07 A licensee must maintain a record of each calibration in accordance with 180 NAC 7-108.

7-074 FULL CALIBRATION MEASUREMENTS ON REMOTE AFTERLOADER UNITS

7-074.01 A licensee authorized to use a remote afterloader unit for medical use must perform full calibration measurements on each unit:

1. Before the first medical use of the unit;
2. Before medical use under the following conditions:

   a. Following replacement of the source or following reinstallation of the unit in a new location outside the facility; and

b. Following any repair of the unit that includes removal of the source or major repair of the components associated with the source exposure assembly; and

3. At intervals not exceeding one calendar quarter for high dose-rate, medium dose-rate, and pulsed dose-rate remote afterloader units with sources whose half-life exceeds 75 days; and
4. At intervals not exceeding one year for low dose-rate remote afterloader units.

7-074.02 To satisfy the requirement of 7-074.01, full calibration measurements must include, as applicable, determination of:

1. The output within ± 5%;
2. Source positioning accuracy to within ±1 millimeter;
3. Source retraction with backup battery upon power failure;
4. Length of the source transfer tubes;
5. Timer accuracy and linearity over the typical range of use;
6. Length of the applicators; and
7. Function of the source transfer tubes, applicators, and transfer tube-applicator interfaces.

7-074.03 In addition to the requirements for full calibration for low dose-rate remote afterloader units in 180 NAC 7-074.02, a licensee must perform an autoradiograph of the source(s) to verify inventory and source(s) arrangement at intervals not exceeding one calendar quarter.

7-074.04 A licensee must use the dosimetry system described in 180 NAC 7-072.01 to measure the output.

7-074.05 A licensee must make full calibration measurements required by 180 NAC 7-074.01 in accordance with published protocols accepted by nationally recognized bodies.

7-074.06 For low dose-rate remote afterloader units, a licensee may use measurements provided by the source manufacturer that are made in accordance with180 NAC 7-074.01 through 7-074.05.

7-074.07 A licensee must mathematically correct the outputs determined in 180 NAC 7-074.02, item 1 for physical decay at intervals consistent with one percent physical decay.

7-074.08 Full calibration measurements required by 180 NAC 7-074.01 and physical decay corrections required by 180 NAC 7-074.07 must be performed by the authorized medical physicist.

7-074.09 A licensee must retain a record of each calibration in accordance with 180 NAC 7-108.

7-075 FULL CALIBRATION MEASUREMENTS ON GAMMA STEREOTACTIC RADIOSURGERY UNITS

7-075.01 A licensee authorized to use a gamma stereotactic radiosurgery unit for medical

use must perform full calibration measurements on each unit:

1. Before the first medical use of the unit;
2. Before medical use under the following conditions:

    a. Whenever spot-check measurements indicate that the output differs by +/- 5% from the output obtained at the last full calibration corrected mathematically for radioactive decay;
    b. Following replacement of the sources or following reinstallation of the gamma stereotactic radiosurgery unit in a new location; and
    c. Following any repair of the gamma stereotactic radiosurgery unit that includes removal of the sources or major repair of the components associated with the source assembly; and

3. At intervals not exceeding one year, with the exception that relative helmet factors need only be determined before the first medical use of a helmet and following any damage to a helmet.

7-075.02 To satisfy the requirement of 180 NAC 7-075.01, full calibration measurements must include determination of:

1. The output within ±3%;
2. Relative helmet factors; (to verify that the helmet material provides the required shielding to the patient);
3. Isocenter coincidence; (to confirm the centering accuracy of the radiation beam relative to the alignment helmet openings);
4. Timer accuracy and linearity over the range of use;
5. On-off error;
6. Trunnion centricity; (to determine the rotational center of the source relative to the alignment helmet openings);
7. Treatment table retraction mechanism, using backup battery power or hydraulic backups with the unit off;
8. Helmet microswitches; (to determine if the switches terminate the radiation beam when);
9. Emergency timing circuits; and
10. Stereotactic frames and localizing devices (trunnions).

7-075.03 A licensee must use the dosimetry system described in 180 NAC 7-072.01 to measure the output for one set of exposure conditions. The remaining radiation measurements required in paragraph 180 NAC 7-075.02, item 1 may be made using a dosimetry system that indicates relative dose rates.

7-075.04 A licensee must make full calibration measurements required by 180 NAC 7-075.01 in accordance with published protocols accepted by nationally recognized bodies.

7-075.05 A licensee must mathematically correct the outputs determined in 180 NAC 7-075.02, item 1 at intervals not exceeding one month for cobalt-60 and at intervals consistent with 1% physical decay for all other radionuclides.

7-075.06 Full calibration measurements required by 180 NAC 7-075.01 and physical decay

corrections required by 180 NAC 7-075.05 must be performed by the authorized medical physicist.

7-075.07 A licensee must retain a record of each calibration in accordance with 180 NAC 7-108.

7-076 PERIODIC SPOT-CHECKS FOR TELETHERAPY UNITS

7-076.01 A licensee authorized to use teletherapy units for medical use must perform output spot-checks on each teletherapy unit once in each calendar month that include determination of:

1. Timer accuracy, and timer linearity over the range of use;
2. On-off error;
3. The coincidence of the radiation field and the field indicated by the light beam localizing device;
4. The accuracy of all distance measuring and localization devices used for medical use;
5. The output for one typical set of operating conditions measured with the dosimetry system described in 180 NAC 7-072.02; and
6. The difference between the measurement made in 180 NAC 7-076.01, item 5 and the anticipated output, expressed as a percentage of the anticipated output (i.e., the value obtained at last full calibration corrected mathematically for physical decay).

7-076.02 A licensee must perform measurements required by 180 NAC 7-076.01 in accordance with written procedures established by the authorized medical physicist. The authorized medical physicist need not actually perform the spot-check measurements.

7-076.03 A licensee must have the authorized medical physicist review and sign the results of each spot-check within 15 days. The authorized medical physicist must notify the licensee within 10 days in writing of the results of each spot-check.

7-076.04 A licensee authorized to use a teletherapy unit for medical use must perform safety spot-checks of each teletherapy facility once in each calendar month and after each source installation to assure proper operation of:

1. Electrical interlocks at each teletherapy room entrance;
2. Electrical or mechanical stops installed for the purpose of limiting use of the primary beam of radiation (restriction of source housing angulation or elevation, carriage or stand travel and operation of the beam on-off mechanism);
3. Source exposure indicator lights on the teletherapy unit, on the control console, and in the facility;
4. Viewing and intercom systems;
5. Treatment room doors from inside and outside the treatment room; and
6. Electrically assisted treatment room doors with the teletherapy unit electrical power turned off.

7-076.05 If the results of the checks required in 180 NAC 7-076.02 and 7-076.04 indicate the malfunction of any system, a licensee must lock the control console in the off position and not

use the unit except as may be necessary to repair, replace, or check the malfunctioning system.

7-076.06 A licensee must retain a record of each spot-check required by 180 NAC 7-076.01 and 7-076.04 and in accordance with 180 NAC 7-109.

7-077 PERIODIC SPOT-CHECKS FOR REMOTE AFTERLOADER UNITS

7-077.01 A licensee authorized to use a remote afterloader unit for medical use must perform spot-checks of each remote afterloader facility and on each unit:

1. At the beginning of each day of use of a high dose-rate, medium dose-rate, or pulsed dose-rate remote afterloader unit;
2. Prior to each patient treatment with a low dose-rate remote afterloader unit; and
3. After each source installation.

7-077.02 The licensee must have the authorized medical physicist establish written procedures for performing the spot-checks required in 180 NAC 7-077.01. The authorized medical physicist need not actually perform the spot-check measurements.

7-077.03 A licensee must have the authorized medical physicist review and sign the results of each spot-check within 15 days. The authorized medical physicist must notify the licensee within 10 days in writing of the results of each spot-check.

7-077.04 To satisfy the requirements of 180 NAC 7-077.01, spot-checks must, at a minimum, assure proper operation of:

1. Electrical interlocks at each remote afterloader unit room entrance;
2. Source exposure indicator lights on the remote afterloader unit, on the control console, and in the facility;
3. Viewing and intercom systems in each high dose-rate, medium dose-rate, and pulsed dose-rate remote afterloader facility;
4. Radiological emergency response equipment;
5. Radiation monitors used to indicate the source position;
6. Timer accuracy;
7. Clock (date and time) in the unit's computer; and
8. Decayed source(s) activity in the unit's computer.

7-077.05 If the results of the checks required in 180 NAC 7-077.04 indicate the malfunction of any system, a licensee must lock the control console in the off position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system.

7-077.06 A licensee must retain a record of each check required by 180 NAC 7-077.04 in accordance with 180 NAC 7-110.

7-078 PERIODIC SPOT-CHECKS FOR GAMMA STEREOTACTIC RADIOSURGERY UNITS

7-078.01 A licensee authorized to use a gamma stereotactic radiosurgery unit for medical use must perform spot-checks of each gamma stereotactic radiosurgery facility and on each unit:

1. Monthly;
2. Before the first use of the unit on a given day; and
3. After each source installation.

7-078.02 The licensee must have the authorized medical physicist:

1. Establish written procedures for performing the spot-checks required in 180 NAC 7-078.01; and
2. Review and sign the results of each spot-check required by 180 NAC 7-078.01 within 15 days of the check. The authorized medical physicist need not actually perform the spot-check measurements. The authorized medical physicist must notify the licensee within 10 days in writing of the results of the spot check.

7-078.03 To satisfy the requirements of 180 NAC 7-078.01, item 1, spot-checks must, at a minimum:

1. Assure proper operation of:

    a. Treatment table retraction mechanism, using backup battery power or hydraulic backups with the unit off;
    b. Helmet microswitches;
    c. Emergency timing circuits; and
    d. Stereotactic frames and localizing devices (trunnions).

2. Determine:

    a. The output for one typical set of operating conditions measured with the dosimetry system described in 180 NAC 7-072.02;
    b, The difference between the measurement made in 180 NAC 7-078.03, item b. and the anticipated output, expressed as a percentage of the anticipated output, (that is, the value obtained at last full calibration corrected mathematically for physical decay);
    c. Source output against computer calculation;
    d. Timer accuracy and linearity over the range of use;
    e. On-off error; and
    f. Trunnion centricity.

7-078.04 To satisfy the requirements of 180 NAC 7-078.01, item 2 and 3, spot-checks must assure proper operation of:

1. Electrical interlocks at each gamma stereotactic radiosurgery room entrance;
2. Source exposure indicator lights on the gamma stereotactic radiosurgery unit, on the control console, and in the facility;
3. Viewing and intercom systems;
4. Timer termination;
5. Radiation monitors used to indicate room exposures; and
6. Emergency off buttons.

7-078.05 A licensee must arrange for the repair of any system identified in 180 NAC 7-

078.03 that is not operating properly.

7-078.06 If the results of the checks required in 180 NAC 7-078.04 indicate the malfunction of any system, a licensee must lock the control console in the off position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system.

7-078.07 A licensee must retain a record of each check required by 180 NAC 7-078.03 and 7-078.04 and in accordance with 180 NAC 7-111.

7-079 ADDITIONAL TECHNICAL REQUIREMENTS FOR MOBILE REMOTE AFTERLOADER UNITS

7-079.01 A licensee providing mobile remote afterloader service must:

1. Check survey instruments for consistent response before medical use at each address of use or on each day of use, whichever is more frequent; and
2. Account for all sources before departure from a client's address of use.

7-079.02 In addition to the periodic spot-checks required by 180 NAC 7-077 a licensee authorized to use mobile afterloaders for medical use will perform checks on each remote afterloader unit before use at each address of use. At a minimum, checks must be made to verify the operation of:

1. Electrical interlocks on treatment area access points;
2. Source exposure indicator lights on the remote afterloader unit, on the control console, and in the facility;
3. Viewing and intercom systems;
4. Applicators, source transfer tubes, and transfer tube-applicator interfaces;
5. Radiation monitors used to indicate room exposures;
6. Source positioning (accuracy); and
7. Radiation monitors used to indicate whether the source has returned to a safe shielded position.

7-079.03 In addition to the requirements for checks 180 NAC 7-079.02, a licensee must ensure overall proper operation of the remote afterloader unit by conducting a simulated cycle of treatment before use at each address of use.

7-079.04 If the results of the checks required in 180 NAC 7-079.02 indicate the malfunction of any system, a licensee must lock the control console in the off position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system.

7-079.05 A licensee must retain a record of each check required by 180 NAC 7-079.02 in accordance with 180 NAC 7-112.

7-080 RADIATION SURVEYS

7-080.01 In addition to the survey requirement in 180 NAC 4-021, a person licensed to possess or a use remote afterloader, teletherapy or gamma stereotactic radiosurgery unit must perform surveys of the device and ensure the results of the surveys from the surface of the main source safe, with the sources in the shielded position, do not exceed the maximum

and average radiation levels listed in the sealed source and device registry.

7-080.02 The licensee must make the survey required by 180 NAC 7-080.01 upon installation of a new source and following repairs to the source(s) shielding, the source(s) driving unit, or other electronic or mechanical component that could expose the source, reduce the shielding around the source(s), or compromise the radiation safety of the unit or the source(s).

7-080.03 A licensee must retain a record of the radiation surveys required by 180 NAC 7-080.01 in accordance with 180 NAC 7-113.

7-081 FIVE-YEAR INSPECTION FOR TELETHERAPY AND GAMMA STEREOTACTIC RADIOSURGERY UNITS

7-081.01 A licensee must have each teletherapy unit and gamma stereotactic radiosurgery unit fully inspected and serviced during source replacement or at intervals not to exceed five years, whichever comes first, to assure proper functioning of the source exposure mechanism.

7-081.02 This inspection and servicing must only be performed by persons specifically licensed to do so by the Department, the U.S. Nuclear Regulatory Commission, or an Agreement State.

7-081.03 A licensee must maintain a record of the inspection and servicing in accordance with 180 NAC 7-114.

7-082 THERAPY-RELATED COMPUTER SYSTEMS: The licensee must perform acceptance testing on the treatment planning system in accordance with published protocols accepted by nationally recognized bodies. At a minimum, the acceptance testing must include, as applicable, verification of:

7-082.01 The source-specific input parameters required by the dose calculation algorithm;

7-082.02 The accuracy of dose, dwell time, and treatment time calculations at representative points;

7-082.03 The accuracy of isodose plots and graphic displays;

7-082.04 The accuracy of the software used to determine radioactive source positions from radiographic images; and

7-082.05 The accuracy of electronic transfer of the treatment delivery parameters to the treatment delivery unit from the treatment planning system.

7-083 POSSESSION OF SURVEY INSTRUMENTS: A licensee authorized to use radioactive material in remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units must possess a portable radiation detection survey instrument capable of detecting dose rates over the range of 1 μSv (0.1 mrem) per hour to 1,000 μSv (100 mrems) per hour, and a portable radiation measurement survey instrument capable of measuring dose rates over the range of 10 μSv(1 mrem)

per hour to 10 mSv (1000 mrems) per hour. The instruments must be operable and calibrated in accordance with 180 NAC 7-030.

7-084 TRAINING FOR USE OF REMOTE AFTERLOADER UNITS, TELETHERAPY UNITS, AND GAMMA STEREOTACTIC RADIOSURGERY UNITS: Except as provided in 180 NAC 7-026, the licensee must require an authorized user of a sealed source for a use authorized under 180 NAC 7-067 to be a physician who:

7-084.01 Is certified by a medical specialty board whose certification process has been recognized by an Agreement State or the U.S. Nuclear Regulatory Commission (NRC) and who meets the requirements of 180 NAC 7-084.03 and 7-084.04. (The names of board certifications which have been recognized the Department, an Agreement State or the U.S. Nuclear Regulatory Commission will be posed on the NRC's web page.) To be recognized, a specialty board must require all candidates for certification to:

1. Successfully complete a minimum of three years of residency training in a radiation therapy program approved by the Residency Review Committee of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Post-Graduate Training of the American Osteopathic Association; and

2. Pass an examination, administered by diplomats of the specialty board, which tests knowledge and competence in radiation safety, radionuclide handling, treatment planning, quality assurance, and clinical use of stereotactic radiosurgery, high and low dose-rate brachytherapy, and external beam therapy; or

7-084.02 The physician:

1. Has completed a structured educational program in basic radionuclide techniques applicable to the use of a sealed source in a therapeutic medical unit that includes:

   a. 200 hours of classroom and laboratory training in the following areas:

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

   b. 500 hours of work experience, under the supervision of an authorized user who meets the requirements in 180 NAC 7-084.01, 7-084.02 or equivalent U.S. Nuclear Regulatory or Agreement State requirements at a medical institution, involving:

      (1) Reviewing full calibration measurements and periodic spot-checks;
      (2) Preparing treatment plans and calculating treatment doses and times;
      (3) Using administrative controls to prevent a misadministration involving

the use of radioactive material;

(4) Implementing emergency procedures to be followed in the event of the abnormal operation of the medical unit or console;

(5) Checking and using survey meters; and

(6) Selecting the proper dose and how it is to be administered; and

2. Has completed three years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements in 180 NAC 7-084, or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education or Royal College of Physicians and Surgeons of Canada or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by 180 NAC 7-084.02, item 1.b.; and

3. Meets the requirements of 180 NAC 7-084.03 and 7-084.04.

7-084.03 Has obtained written attestation that the individual has satisfactorily completed the requirements in 180 NAC 7-084.01, item 1 or 7-084.02, item 1 and 2, and 7-084.04 has achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation must be signed by a preceptor authorized user who meets the requirements in 180 NAC 7-084 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and

7-084.04 Has received training in device operation, safety procedures, and clinical use of the type(s) of use for which authorization is sought. This training requirement may be satisfied by satisfactory completion of a training program provided by the vendor for new users or by receiving training supervised by an authorized user or authorized medical physicist, as appropriate, who is authorized for the type(s) of use for which the individual is seeking authorization.

OTHER MEDICAL USES OF RADIOACTIVE MATERIAL OR RADIATION FROM RADIOACTIVE MATERIAL

7-085 OTHER MEDICAL USES OF RADIOACTIVE MATERIAL OR RADIATION FROM RADIOACTIVE MATERIAL: A licensee may use radioactive material or radiation sources approved for medical use which is not specifically addressed in 180 NAC 7:

7-085.01 The applicant or licensee has submitted the information required by 180 NAC 7-008.02 through 7-008.04; and

7-085.02 The applicant or licensee has received written approval from the U.S. Nuclear Regulatory Commission or Agreement State in a license and uses the material in accordance with the regulations and specific conditions the U.S. Nuclear Regulatory Commission or Agreement State considers necessary for the medical use of the material.

RECORDS

7-086 RECORDS OF AUTHORITY AND RESPONSIBILITIES FOR RADIATION PROTECTION PROGRAMS

7-086.01 A licensee must retain a record of actions taken by the licensee's management in accordance with 180 NAC 7-015.02 and 7-015.03 for five years. The record must include a summary of the actions taken and a signature of licensee management.

7-086.02 The licensee must retain a current copy of the authorities, duties and responsibilities of the Radiation Safety Officer as required by 180 NAC 7-015.06, and a signed copy of the Radiation Safety Officer's agreement to be responsible for implementing the radiation safety program, as required by 180 NAC 7-015.04. The record must include the signature of the Radiation Safety Officer and licensee management.

7-086.03 The minutes of each Radiation Safety Committee meeting held in accordance with 180 NAC 7-015.09 must include:

1. The date of the meeting;
2. Members present;
3. Members absent; and
4. Summary of deliberations and discussions.

7-087 RECORDS OF RADIATION PROTECTION PROGRAM CHANGES: A licensee must retain a record of each radiation protection program made in accordance with 180 NAC 7-016.01 for five years. The record must include a copy of the old and new procedures; the effective date of the change; and the signature of the licensee management that reviewed and approved the change.

7-088 RECORDS OF WRITTEN DIRECTIVES: A licensee must retain a copy of each written directive as required by 180 NAC 7-019 for three years.

7-089 RECORDS OF MISADMINISTRATION: A licensee must retain a record of misadministration reported in accordance with 180 NAC 7-115 for three years. The record must contain the licensee's name; name of the individual involved; the social security number or other identification number; if one has been assigned, of the individual who is the subject of the misadministration; a brief description of the event; why it occurred; the effect, if any, on the individual; the actions, if any taken, or planned, to prevent recurrence; and whether the licensee notified the individual (or the individual's responsible relative or guardian): and, if not, whether such failure to notify was based on guidance from the referring physician.

7-090 RECORDS OF A DOSE TO AN EMBRYO/FETUS OR A NURSING CHILD: A licensee must retain a record of a dose to an embryo/fetus or a nursing child reported in accordance with 180 NAC 7-117 for three years. The record must contain the licensee's name; name of all the individuals involved; social security number or other identification number if one has been assigned to the pregnant individual or nursing child who is the subject of the event; a brief description of the event; why it occurred; the effect, if any, on the embryo/fetus or nursing child; the actions, if any, taken or planned, to prevent recurrence; and whether the licensee notified the pregnant individual or mother (or the mother's or child's responsible relative or guardian) and, if not, whether such failure to notify was based on guidance from the referring physician.

7-091 RECORDS OF CALIBRATION OF INSTRUMENTS USED TO MEASURE THE ACTVITY OF UNSEALED RADIOACTIVE MATERIAL: A licensee must maintain a record of instrument calibrations required by 180 NAC 7-029 for three years. The records must include the model and serial number of the instrument, the date of the calibration, the results of the calibration, and the name of the individual who performed the calibration.

7-092 RECORDS OF RADIATION SURVEY INSTRUMENT CALIBRATIONS: A licensee must maintain a record of radiation survey instrument calibration required by 180 NAC 7-030 for three years. The record must include the model and serial number of the instrument, the date of the calibration, the results of the calibration, and the name of the individual who performed the calibration.

7-093 RECORDS OF DOSAGES OF UNSEALED RADIOACTIVE MATERIAL FOR MEDICAL USE: A licensee must maintain a record of dosage determinations required by 180 NAC 7-031 for three years. The record must contain the radioactive drug; the patient's or human research subject's name, or identification number if one has been assigned; the prescribed dosage, the determined dosage, or a notation that the total activity is less than 1.1 MBq (30 μCi); the date and time of the dosage determination; and the name of the individual who determined the dosage.

7-094 RECORDS OF LEAKS TESTS AND INVENTORY OF SEALED SOURCES AND BRACHYTHERAPY SOURCES: A licensee must retain a record of the semi-annual physical inventory of sealed sources and brachytherapy sources required by 180 NAC 7-033.04 for three years. The inventory records must include the model number of each source, the serial number if one has been assigned, the identity of each source radionuclide and its nominal activity, the location of each source, and the name of the individual who performed the test.

7-095 RECORDS OF SURVEYS FOR AMBIENT RADIATION EXPOSURE RATE: A licensee must retain a record of each survey required by 180 NAC 7–036 for three years. The record must include the date of the survey, the results of the survey, the instrument used to make the survey, and the name of the individual who performed the survey.

7-096 RECORDS OF THE RELEASE OF INDIVIDUALS CONTAINING RADIOACTIVE DRUGS OR IMPLANTS CONTAINING RADIOACTIVE MATERIAL

7-096.01 A licensee must retain a record signed by the authorized user, or the basis for authorizing the release of an individual, for three years after the date of release.

7-096.02 A licensee must retain a record, for three years after the date of release, that the instructions required by 180 NAC 7-037.02 were provided to a breast-feeding woman if the radiation dose to the infant or child from continued breast-feeding could result in a total effective dose equivalent exceeding 5 mSv (0.5 rem).

7-096.03 A licensee must retain a record, for three years after the date of release, that the instructions required by 180 NAC 7-037.02 were provided to a breast-feeding woman.

7-097 RECORDS OF ADMINISTRATIVE AND TECHNICAL REQUIREMENTS THAT APPLY TO THE PROVISION OF MOBILE SERVICES

7-097.01 A licensee must retain a copy of each letter that permits the use of radioactive material at a client's address, as required by 180 NAC 7-09.02, for three years after the last

provision of service.

7-097.02 A licensee must retain the record of each survey required by 180 NAC 7-038.06, for three years. The record must include the date of the survey, the results of the survey, the instrument used to make the survey, and the name of the individual who performed the survey.

7-098 RECORDS OF DECAY-IN-STORAGE: See 180 NAC 4-054.02.

7-099 RECORDS OF RADIONUCLIDE PURITY: A licensee must maintain a record of the radionuclide contaminant concentration tests required by 180 NAC 7-045.02 for three years. The record must include, for each measured elution of radionuclide used to prepare a radioactive drug, the ratio of the measures expressed as kilobecquerel of contaminant per megabecquerel of desired radionuclide (microcuries/millicurie), or microgram of contaminant per megabecquerel of desired radionuclide (microgram/millicurie), the time and date of the measurement, and the name of the individual who made the measurement.

7-100 RECORDS OF TRAINING: A licensee must maintain records of training required by 180 NAC 7-025 for three years after the last date an individual was authorized to act as a nuclear medicine technologist or radiation therapist at the licensee's facility.

7-101 RECORDS OF SAFETY INSTRUCTION AND TRAINING: A licensee must maintain a record of safety instructions required by 180 NAC 7-049, 7-058 and 7-070 for three years. The record must include a list of topics covered, the date of the instruction, the name(s) of the attendee(s), and the name(s) of the individual(s) who provided the instruction.

7-102 RECORDS OF SURVEYS OF PATIENTS AND HUMAN RESEARCH SUBJECTS: A licensee must maintain a record of the surveys required by 180 NAC 7-056 and 7-068 for three years. Each record must include the date and the results of the survey, the specific survey instrument used, and the name of the individual who made the survey.

7-103 RECORDS OF BRACHYTHERAPY SOURCE INVENTORY

7-103.01 A licensee must maintain a record of brachytherapy source accountability required by 180 NAC 7-057 for three years.

7-103.02 For temporary implants, the record must include:

1 The number and activity of sources removed from storage, the time and date they were removed from storage, the name of the individual who removed them from storage, and the location of use; and

2. The number and activity of sources returned to storage, the time and date they were returned to storage, and the name of the individual who returned them to storage.

7-103.03 For permanent implants, the record must include:

1. The number and activity of sources removed from storage, the date they were removed from storage, and the name of the individual who removed them from storage;

2. The number and activity of sources not implanted, the date they were returned to storage, and the name of the individual who returned them to storage; and
3. The number and activity of sources permanently implanted in the patient or human research subject.

7-104 RECORDS OF CALIBRATION MEASUREMENTS OF BRACHYTHERAPY SOURCES

7-104.01 A licensee must maintain a record of the calibrations of brachytherapy sources required by 180 NAC 7-060 for three years after the last use of the source. The record must include:

1. The date of the calibration;
2. The manufacturer's name, model number, and serial number for the source and the instruments used to calibrate the source;
3. The source output or activity;
4. The source positioning accuracy within the applicators; and
5. The signature of the authorized medical physicist.

7-105 RECORDS OF DECAY OF STRONTIUM-90 SOURCES FOR OPHTHALMIC TREATMENTS

7-105.01 A licensee must maintain a record of the activity of a strontium-90 source required by 180 NAC 7-060 for the life of the source.

7-105.02 The record must include:

1. The date and initial activity of the source as determined under 180 NAC 7-060; and
2. For each decay calculation, the date and the source activity as determined under 180 NAC 7-060.

7-106 RECORDS OF INSTALLATION, MAINTENANCE, ADJUSTMENT, AND REPAIR: A licensee must retain a record of the installation, maintenance, adjustment, and repair of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units as required by 180 NAC 7-069 for three years. For each installation, maintenance, adjustment and repair, the record must include the date, description of the service, and name(s) of the individual(s) who performed the work.

7-107 RECORDS OF DOSIMETRY EQUIPMENT

7-107.01 A licensee must retain a record of the calibration, intercomparison, and comparisons of its dosimetry equipment done in accordance with 180 NAC 7-072 for the duration of the license.

7-107.02 For each calibration, intercomparison, or comparison, the record must include:

1. The date;
2. The manufacturer's name, model numbers and serial numbers of the instruments that were calibrated, intercompared, or compared as required by 180 NAC 7-072.01 and 7-072.02;
3. The correction factor that was determined from the calibration or comparison or

the apparent correction factor that was determined from an intercomparison; and

4. The names of the individuals who performed the calibration, intercomparison, or comparison.

7-108 RECORDS OF TELETHERAPY, REMOTE AFTERLOADER, AND GAMMA STEREOTACTIC RADIOSURGERY FULL CALIBRATIONS

7-108.01 A licensee must maintain a record of the teletherapy unit, remote afterloader unit, and gamma stereotactic radiosurgery unit full calibrations required by 180 NAC 7-073 through 7-075 for three years.

7-108.02 The record must include:

1. The date of the calibration;
2. The manufacturer's name, model number, and serial number of the teletherapy, remote afterloader, and gamma stereotactic radiosurgery unit(s), the source(s), and the instruments used to calibrate the unit(s);
3. The results and an assessment of the full calibrations;
4. The results of the autoradiograph required for low dose-rate remote afterloader units; and
5. The signature of the authorized medical physicist who performed the full calibration.

7-109 RECORDS OF PERIODIC SPOT-CHECKS FOR TELETHERAPY UNITS

7-109.01 A licensee must retain a record of each periodic spot-check for teletherapy units required by 180 NAC 7-076 for three years.

7-109.02 The record must include:

1. The date of the spot-check;
2. The manufacturer's name, model number, and serial number of the teletherapy unit, source and instrument used to measure the output of the teletherapy unit;
3. An assessment of timer linearity and constancy;
4. The calculated on-off error;
5. A determination of the coincidence of the radiation field and the field indicated by the light beam localizing device;
6. The determined accuracy of each distance measuring and localization device;
7. The difference between the anticipated output and the measured output;
8. Notations indicating the operability of each entrance door electrical interlock, each electrical or mechanical stop, each source exposure indicator light, and the viewing and intercom system and doors; and
9. The name of the individual who performed the periodic spot-check and the signature of the authorized medical physicist who reviewed the record of the spot-check.

7-110 RECORDS OF PERIODIC SPOT-CHECKS FOR REMOTE AFTERLOADER UNITS

7-110.01 A licensee must retain a record of each spot-check for remote afterloader units required by 180 NAC 7-077 for three years.

7-110.02 The record must include, as applicable:

1. The date of the spot-check;
2. The manufacturer's name, model number, and serial number for the remote afterloader unit and source;
3. An assessment of timer accuracy;
4. Notations indicating the operability of each entrance door electrical interlock, radiation monitors, source exposure indicator lights, viewing and intercom systems, and clock and decayed source activity in the unit's computer; and
5. The name of the individual who performed the periodic spot-check and the signature of the authorized medical physicist who reviewed the record of the spot-check.

7-111 RECORDS OF PERIODIC SPOT-CHECKS FOR GAMMA STEREOTACTIC RADIOSURGERY UNITS

7-111.01 A licensee must retain a record of each spot-check for gamma stereotactic radiosurgery units required by 180 NAC 7-078 for three years.

7-111.02 The record must include:

1. The date of the spot-check;
2. The manufacturer's name, model number, and serial number for the gamma stereotactic radiosurgery unit and the instrument used to measure the output of the unit;
3. An assessment of timer linearity and accuracy;
4. The calculated on-off error;
5. A determination of trunnion centricity;
6. The difference between the anticipated output and the measured output;
7. An assessment of source output against computer calculations;
8. Notations indicating the operability of radiation monitors, helmet microswitches, emergency timing circuits, emergency off buttons, electrical interlocks, source exposure indicator lights, viewing and intercom systems, timer termination, treatment table retraction mechanism, and stereotactic frames and localizing devices (trunnions); and
9. The name of the individual who performed the periodic spot-check and the signature of the authorized medical physicist who reviewed the record of the spot-check.

7-112 RECORDS OF ADDITIONAL TECHNICAL REQUIREMENTS FOR MOBILE REMOTE AFTERLOADER UNITS

7-112.01 A licensee must retain a record of each check for mobile remote afterloader units required by 180 NAC 7-079 for three years.

7-112.02 The record must include:

1. The date of the check;
2. The manufacturer's name, model number, and serial number of the remote

afterloader unit;

3. Notations accounting for all sources before the licensee departs from a facility;
4. Notations indicating the operability of each entrance door electrical interlock, radiation monitors, source exposure indicator lights, viewing and intercom system, applicators, source transfer tubes, and transfer tube applicator interfaces, and source positioning accuracy; and
5. The signature of the individual who performed the check.

7-113 RECORDS OF SURVEYS OF THERAPEUTIC TREATMENT UNITS

7-113.01 A licensee must maintain a record of radiation surveys of treatment units made in accordance with 180 NAC 7-080 for the duration of use of the unit.

7-113.02 The record must include:

1. The date of the measurements;
2. The manufacturer's name, model number and serial number of the treatment unit, source, and instrument used to measure radiation levels;
3. Each dose rate measured around the source while the unit is in the off position and the average of all measurements; and
4. The signature of the individual who performed the test.

7-114 RECORDS OF FIVE YEAR INSPECTIONS FOR TELETHERAPY AND GAMMA STEREOTACTIC RADIOSURGERY UNITS

7-114.01 A licensee must maintain a record of the five year inspections for teletherapy and gamma stereotactic radiosurgery units required by 180 NAC 7-081 for the duration of use of the unit.

7-114.02 The record must contain:

1. The inspector's radioactive materials license number;
2. The date of inspection;
3. The manufacturer's name and model number and serial number of both the treatment unit and source;
4. A list of components inspected and serviced, and the type of service; and
5. The signature of the inspector.

REPORTS

7-115 REPORT AND NOTIFICATION OF MISADMINISTRATION

7-115.01 Other than events that result from intervention by a patient or human research subject, a licensee must report any event in which the administration of radioactive material or radiation from radioactive material results in:

1. A dose that differs from the prescribed dose by more than 0.05 Sv (5 rem) effective dose equivalent, 0.5 Sv (50 rem) to an organ or tissue, or 0.5 Sv (50 rem) shallow dose equivalent to the skin; and either

a. The total dose delivered differs from the prescribed dose by 20% or more; or
b. The total dosage delivered differs from the prescribed dosage by 20% or more or falls outside the prescribed dosage range; or
c. The fractionated dose delivered differs from the prescribed dose, for a single fraction, by 50% or more.

2. A dose that exceeds 0.05 Sv (5 rem) effective dose equivalent, 0.5 Sv (50 rem) to an organ or tissue, or 0.5 Sv (50 rem) shallow dose equivalent to the skin from any of the following:

a. An administration of a wrong radioactive drug;
b. An administration of a radioactive drug containing radioactive material by the wrong route of administration;
c. An administration of a dose or dosage to the wrong individual or human research subject;
d. An administration of a dose or dosage delivered by the wrong mode of treatment; or
e. A leaking sealed source.

3. A dose to the skin or an organ or tissue other than the treatment site that exceeds by 0.5 Sv (50 rem) to an organ or tissue and 50% or more of the dose expected from the administration defined in the written directive (excluding, for permanent implants, seeds that were implanted in the correct site but migrated outside the treatment site).

7-115.02 A licensee must report any event resulting from intervention of a patient or human research subject in which the administration of radioactive material or radiation from radioactive material results, or will result in, unintended permanent functional damage to an organ or a physiological system, as determined by a physician.

7-115.03 The licensee must notify the Department by telephone, no later than the next business day after the discovery of a misadministration.

7-115.04 The licensee must submit a written report to the Department within 15 days after discovery of the misadministration.

1. The written report must include:

a. The licensee's name;
b. The name of the prescribing physician;
c. A brief description of the event;
d. Why the event occurred;
e. The effect, if any, on the individual(s) who received the administration;
f. What actions, if any, have been taken or are planned to prevent recurrence; and
g. Certification that the licensee notified the individual (or the individual's responsible relative or guardian), and if not, why not.

2. The report can not contain the individual's name or any other information that

could lead to identification of the individual.

7-115.05 The licensee must provide notification of the misadministration to the referring physician and also notify the individual who is the subject of the misadministration no later than 24 hours after its discovery, unless the referring physician personally informs the licensee either that s/he will inform the individual or that, based on medical judgment, telling the individual would be harmful. The licensee is not required to notify the individual without first consulting the referring physician. If the referring physician or the affected individual cannot be reached within 24 hours, the licensee must make the appropriate notifications as soon as possible thereafter. The licensee may not delay any appropriate medical care for the individual, including any necessary remedial care as a result of the medical event, because of any delay in notification. To meet the requirements of 180 NAC 7-115.05, the notification of the individual who is the subject of the misadministration may be made instead to that individual's responsible relative or guardian. If a verbal notification is made, the licensee must inform the individual, or appropriate responsible relative or guardian, that a written description of the event can be obtained from the licensee upon request. The licensee must provide such a written description if requested.

7-115.06 Aside from the notification requirement, nothing in 180 NAC 7-115 affects any rights or duties of licensees and physicians in relation to each other, to individuals affected by the misadministration, or to that individual's responsible relatives or guardians.

7-115.07 A licensee must retain a record of a misadministration in accordance with 180 NAC 7-089. A copy of the record required under 180 NAC 7-089 must be provided to the referring physician if other than the licensee, within 15 days after discovery of the misadministration.

7-116 RECORDS OF SUPERVISION AUDITS: A licensee must maintain a record of audits required by 180 NAC 7-018.01, item 4 for three years. The record must include a list of items audited, the date of the audit, the name of the supervised individual, and the name and signature of the authorized user conducting the audit.

7-117 REPORT AND NOTIFICATION OF A DOSE TO AN EMBRYO/FETUS OR A NURSING CHILD

7-117.01 A licensee must report any dose to an embryo/fetus that is greater than 5 mSv (500 mrem) dose equivalent that is a result of an administration of radioactive material or radiation from radioactive material to a pregnant individual unless the dose to the embryo/fetus was specifically approved, in advance, by the authorized user.

7-117.02 A licensee must report any dose to a nursing child that was not specifically approved, in advance, by the authorized user; that is a result of an administration of radioactive material to a breast-feeding individual that:

1. Is greater than 5 mSv (500 mrem) total effective dose equivalent; or
2. Has resulted in unintended permanent functional damage to an organ or a physiological system of the child, as determined by a physician.

7-117.03 The licensee must notify by telephone the Department no later than the next calendar day after discovery of a dose to the embryo/fetus or nursing child that requires a

report in 180 NAC 7-117.01 or 7-117.02.

7-117.04 The licensee must submit a written report to the Department within 15 days after discovery of a dose to the embryo/fetus or nursing child that requires a report in 180 NAC 7-117.01 or 7-117.02.

1. The written report must include:

   a. The licensee's name;
   b. The name of the prescribing physician;
   c. A brief description of the event;
   d. Why the event occurred;
   e. The effect, if any, on the embryo/fetus or the nursing child;
   f. What actions, if any, have been taken or are planned to prevent recurrence; and
   g. Certification that the licensee notified the pregnant individual or mother (or the mother's or child's responsible relative or guardian), and if not, why not.

2. The report can not contain the individual's or child's name or any other information that could lead to identification of the individual or child.

7-117.05 The licensee must provide notification of the event to the referring physician and also notify the pregnant individual or mother, both hereafter referred to as the mother, no later than 24 hours after discovery of an event that would require reporting in 180 NAC 7-117.01 and 7-117.02, unless the referring physician personally informs the licensee either that s/he will inform the mother or that, based on medical judgment, telling the mother would be harmful. The licensee is not required to notify the mother without first consulting with the referring physician. If the referring physician or mother cannot be reached within 24 hours, the licensee must make the appropriate notifications as soon as possible thereafter. The licensee may not delay any appropriate medical care for the embryo/fetus or for the nursing child, including any necessary remedial care as a result of the event, because of any delay in notification. To meet the requirements of 180 NAC 7-117.05, the notification may be made to the mother's or child's responsible relative or guardian instead of the mother. If a verbal notification is made, the licensee must inform the mother, or the mother's or child's responsible relative or guardian, that a written description of the event can be obtained from the licensee upon request. The licensee must provide such a written description if requested.

7-117.06 A licensee must retain a record of a dose to an embryo/fetus or a nursing child in accordance with 180 NAC 7-090. A copy of the record required under 180 NAC 7-090 must be provided to the referring physician, if other than the licensee, within 15 days after the discovery of the event.

7-118 REPORTS OF LEAKING SOURCES A licensee must file a report within 5 days if a leak test required by 180 NAC 7-033 reveals the presence of 185 Bq (0.005 μCi) or more of removable contamination. The written report must include the model number and serial number if assigned, of the leaking source; the radionuclide and its estimated activity; the results of the test; the date of the test; and the action taken.

7-119 NOTIFICATION OF DECEASED PATIENT OR HUMAN RESEARCH SUBJECTS CONTAINING RADIOACTIVE MATERIAL

7-119.01 The licensee must notify the Department by telephone immediately upon discovery that a patient or human research subject containing radioactive material has died, and it is possible that any individual could receive exposures in excess of 180 NAC 4-013 as a result of the deceased's body.

7-119.02 The licensee must submit a written report to the Department within 30 days after discovery that the patient or human research subject reference in 180 NAC 7-119.01 has died. The written report must include:

1. The licensee's name;
2. The date of death;
3. The radionuclide, chemical and physical form and calculated activity at time of death;
4. The names (or titles) and address(es) of known individuals who might have received exposures exceeding 5 mSv (500 mrem).

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
RADIOACTIVE MATERIALS PROGRAM

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE - Medical

INSTRUCTIONS - (Use additional sheets where necessary.)
Retain one copy for your files and submit original application to: Department of Health and Human Services Regulation and Licensure, Division of Public Health, 301 Centennial Mall South, P.O. Box 95026, Lincoln, NE 68509-5026.
Upon approval of this application, the applicant will receive a Radioactive Material License, issued in accordance with the requirements contained in Title 180, Regulations for Control of Radiation and the Nebraska Radiation Control Act.

1.a Legal Name and Street address of Applicant (Institution, Firm, Hospital, Person, etc.)

Applicant Name: _____

Address: _____

_____

City, State Zip +4: _____

Telephone #: _____

FAX #: _____

e-Mail Address: _____

1.b Street address(es) at which Radioactive Material will be used. (If different than 1.a)

(1) Permanent Address: _____

_____

City, State Zip +4: _____

(2) Temporary Job Sites Throughout Nebraska? ☐ Yes ☐ No

2. Person to Contact Regarding this Application

_____

Telephone #: _____

3. This is an application for:

☐ New License

☐ Amendment to License No. _____

☐ Renewal of License No. _____

☐ **Table C-2 "Checklist for Items 4-6 of NRH -7" of Regulatory Guide 7.0 (RG 7.0) Appendix C is attached and completed for Items 4-6 of this application instead of completing the items on this form or equivalent pages.** (check if used and attached.) **RG 7.0 Revision** _____ **Date** _____

4. Individual User(s) (Check two)

☐ Name and Title of individual(s) who will use or directly supervise use of, Radioactive Materials is listed below. **OR**

☐ A Equivalent list is attached on 8½" x 11" paper

AND

☐ Complete a NRH-7A for each individual listed below.

First Name + Middle Initial	Last Name	Title	Place a checkmark for each use of material in 180 NAC						
			7-041	7-044	7-048	7-055	7-065	7-067	7-085

5. Radiation Safety

5.A. Radiation Safety Officer (RSO)
(Name and Title of Individual designated as Radiation Safety Officer)

_____

Telephone #: _____
Complete a NRH-7A for the RSO.

5.B Radiation Safety Committee(If required by 180 NAC 7-015.08)

☐ A description of the Radiation Committee is attached.

Department Use Only

Date Received Stamp

6. Radioactive Material Data

6.A. Radioactive Material for Medical Use

(Can be completed on additional 8½" x 11" paper or use Appendix C of Regulatory Guide 7.0)

Radioactive Material (Elements and mass number)	**Chemical/Physical Form** (Make & Model if sealed source)	**Maximum Activity Requested** (Expressed as Curies, Millicuries, or Micorcuries)	**Use of Each Form** (If sealed source, also give Make and Model Number of the storage and/or device in which the sealed source will be stored and/or used)
Title 180 NAC 3-008.09			For In Vitro Studies
Title 180 NAC 7-041			
Title 180 NAC 7-044			
Title 180 NAC 7-048			
Title 180 NAC 7-055			
Title 180 NAC 7-065			
Title 180 NAC 7-067			
Title 180 NAC 7-085			

6.B. Radioactive Material for Uses not Listed in Item 6.a.

6.b.(1) Element and Mass Number	6.b.(2) Chemical or Physical Form (Make and Model if sealed source)	6.b.(3) Maximum Activity Requested (Expressed as Curies, Millicuries, or Microcuries)	6.b.(4) Use of Each Form (If sealed source, also give Make and Model Number of the storage and/or device in which sealed source will be stored and/or used)

6.C All licensees are required to maintain records important to decommissioning. Licensees authorized to possess licensed material in excess of the limits specified in 180 NAC 3-018 must provide evidence of financial assurance for decommissioning.

☐ **Table C-3 "Checklist for Items 7-9 of NRH -7" of Regulatory Guide 7.0 (RG 7.0) Appendix C is attached and completed for Items 7-9 of this application instead of completing the items on this form or equivalent pages.** (check if used and attached.)
RG 7.0 Revision _____ **Date** _____

OR

The type and scope of information to be provided for items 7 through 9 is described in "Regulatory Guide 7.0 - Radioactive Material Guidance for Medical Use Programs" (RG 7.0)

The information required of the applicant can be submitted on separate sheets for each item. Identify the item number and date of the application in the lower right hand corner of each page OR the information can be submitted on the appropriate pages from the most recent revision of Regulatory Guide 7.0 (RG 7.0). Revision _____ Date_____. (Please indicate the most recent revision and date of RG 7.0 used to complete this application.)

7. FACILITIES AND EQUIPMENT

7.A. Facility Diagram (check two)
- ☐ Facility Diagrams are attached
- ☐ Facility Descriptions are attached

7.B. Instrumentation (check one)
- ☐ Part 1 of Appendix G of RG 7.0 is attached and will use Appendix G of RG 7.0; **OR**
- ☐ Part 1 of Appendix G of RG 7.0 is attached and Equivalent Procedures are attached

7.C. Dose Calibrator and Other Equipment Used to Measure Dosages of Unsealed Radioactive Material (check one)
- ☐ Appendix H of RG 7.0 will be used **OR**
- ☐ Equivalent Procedures are attached **OR**
- ☐ Not applicable. (No unsealed radioactive material will be used.)

7.D. Therapy Unit – Calibration and Use (check one)
- ☐ Procedures are attached (For HDR, Gamma Stereotactic Radiosurgery Unit, Teletherapy or Brachytherapy Use) **OR**
- ☐ Not applicable.

7.E. Other Equipment and Facilities (check one)
- ☐ Appendix X is attached **OR**
- ☐ Not applicable.

8. Radiation Protection Program

8.A. Safety Procedures and Instructions (check one)
- ☐ Attached Safety Procedures and Instructions per 180 NAC 7-070 (For Remote Afterloader Units, Teletherapy Units and Gamma Stereotactic Radiosurgery Units) **OR**
- ☐ Not applicable

8.B. Safety Instructions for Individuals Working in or Frequenting Restricted Areas) (check one)
- ☐ Appendix I of R.G. 7.0 will be used; **OR**
- ☐ Equivalent Procedures are attached and will be used

8.C. Operating and Emergency Procedures (check three)
- ☐ Attach Operating and Emergency procedures

AND
- ☐ Appendix J of RG 7.0 will be used **OR**
- ☐ Equivalent Procedures are attached and will be used

AND ONE OF THE FOLLOWING (Check one)
- ☐ Attachment 1 of Appendix J will be used **OR**
- ☐ Equivalent Attachment is attached and will be used

8.D. Safe Use of Unsealed Radioactive Materials (check one)
- ☐ Appendix K of RG 7.0 will be used; **OR**
- ☐ Equivalent Procedures and are attached and will be used; **OR**
- ☐ Not applicable

8.E. Radioactive Gases and Aerosol (e.g., Xenon-133) (check one)
- ☐ Appendix Y is attached; **OR**
- ☐ Equivalent Supporting Information and Calculations Attached **OR**
- ☐ Not applicable

8.F. Minimization of Contamination (check one)
- ☐ Attach a description of how facility design and procedures of operation will minimize contamination

8.G. Ordering and Receiving (check two)
- ☐ Attach Procedures for receipt and accountability; **AND**
- ☐ Appendix L of RG 7.0 will be used; **OR**
- ☐ Equivalent Procedures are attached and will be used

8.H. Opening Packages Containing Radioactive Material (check one)
- ☐ Appendix M of RG 7.0 will be used **OR**
- ☐ Equivalent Procedures are attached and will be used

8.I. ALARA (check one)
- ☐ Appendix Z of RG 7.0 is attached **OR**
- ☐ Equivalent Procedures are attached and will be used

8.J. Occupational Dose Dosimetry, Internal and External Exposure) (check one)
- ☐ Part 1 of Appendix N is attached

8.K. Area Surveys (check one)
- ☐ Appendix O of RG 7.0 will be used; **OR**
- ☐ Equivalent Procedures are attached and will be used

8.L. Installation, Maintenance, Adjustment, Repair, and Inspection of Therapy Devices Containing Sealed Sources (check one)
- ☐ Appendix AA of RG 7.0 is attached **OR**
- ☐ Not applicable

8.M. Procedures for Administrations when a Written Directive is Required (check one)
- ☐ Appendix P of RG 7.0 will be used; **OR**
- ☐ Equivalent Procedures are attached and will be used **OR**
- ☐ Not applicable

8.N. Safety Procedures for Treatment When Patients are Hospitalized (check one)
- ☐ Procedures are attached **OR**
- ☐ *Not applicable*

8.O. Release of Patients or Human Research Subjects (check one)
- ☐ Appendix Q will be used; **OR**
- ☐ Equivalent Procedures are attached and will be used **OR**
- ☐ Not applicable

8.P. Mobile Medical Service (check one)
- ☐ *Procedures are attached (See Appendix E of RG 7.0)* **OR**
- ☐ Not applicable

8.Q. Leak Tests (check one)
- ☐ Part 1 of Appendix R of RG 7.0 is attached and will use Appendix R of RG 7.0; **OR**
- ☐ Part 1 of Appendix R of RG 7.0 is attached and Equivalent Procedures are attached and will be used

NOTE: No response is required for the following items but will be examined during an inspection.

Public Dose, Audit Program, Sealed Source Inventory, Records of Dosage and Use of Brachytherapy Sources, Recordkeeping, Reporting and Transportation.

9. Waste Management (check one)
- ☐ Appendix W will be used.; **OR**
- ☐ Equivalent Procedures attached

10.

(This Item must be completed by applicant.)

The applicant and any official executing this document on behalf of the applicant named in Item 1.a., certify that this application is prepared in conformity with the Nebraska Department of Health and Human Services Regulation and Licensure, Title 180, Regulations for the Control of Radiation and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

_____

Applicant Name From Item 1.a.

_____

By: _____ *Date:* _____

Signature

_____

Print Name and Title of certifying official authorized to act on behalf of the applicant

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE - MEDICAL
NRH - 7A
Medical Use Training and Experience and Preceptor Attestation
Part 1 - Training and Experience

Follow Regulatory Guide for NRH 7A "Medical Use Training & Experience and Preceptor Statement" when determining what information is needed for each type of medical use license.

Note: Description of training and experience must contain sufficient detail to match the training and experience criteria in the applicable regulations in 180 NAC 7.

1. **Name of Individual:** _____

Address: _____

Telephone Number: _____ **FAX Number:** _____

E-Mail Address: _____

2. **Is the individual a physician or pharmacist who is licensed to dispense drugs in the practice of medicine in Nebraska?**
   - ☐ YES (If Yes, list the Nebraska Medical or Pharmacist License #) License #: _____
   - ☐ NO

3. **Authorization**

☐ **On a current license or permit** (Provide a copy of the license or broadscope permit listing the current authorization)

The individual is identified on a license or permit as a:

- ☐ Radiation Safety Officer for medical use licensee
- ☐ Authorized Medical Physicist
- ☐ Authorized Nuclear Pharmacist
- ☐ Authorized User for _____ use(s).

☐ The license or permit number _____.

☐ The individual is seeking additional authorization, as a:

- ☐ Radiation Safety Officer for medical use licensee
- ☐ Authorized Medical Physicist
- ☐ Authorized Nuclear Pharmacist
- ☐ Authorized User for _____ use(s).

4. Certification

Specialty Board	Category	Month and Year Certified

5. Classroom and laboratory training

Description of Training	Location of training	Dates of Training	Clock Hours in Lecture or Laboratory

6. Work Experience

6.A. Work Experience with Radiation.

Description of Experience	Name of Supervising Individual(s)	Location and Corresponding Materials License Number	Dates and/or Clock Hours of Experience

6.B. Supervised Clinical Experience (describe experience elements in 6.A.)

Isotope	Type of Use	No. of Cases Involving Personal Participation	Name of Supervising Individual	Location and Corresponding Radioactive Materials License Number	Date and/or Clock Hours of Experience

6.C. Training for Radiation Safety Officer, Medical Physicist, Authorized Use of sealed sources for diagnosis or Authorized User of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units

Training Element	Type of Training*	Locations and Dates

*Types of training may include supervised didactic, or vendor training.

6.D. Formal Training

Degree, Area of Study or Residency Program	Name of Program and Location with Corresponding Material License Number	Dates	Name of Organization that Approved the Program (e.g., Accreditation Council for Graduate Medical Education and the Applicable Regulation)

7. One Year Full-Time Experience and/or Training

7.A. Radiation Safety Officer

❒ YES
❒ NA

Completed one year of full-time radiation safety experience (in areas identified in 6.A.) under the supervision of_____ the RSO of License No. _____.

7.B. Medical Physicist

❒ YES
❒ NA

Completed one year of full-time training (in areas identified in 6a) in medical physics under the supervision of _____ who meets the requirements of a authorized medical physicist or meets the requirements for Authorized Medical Physicist.

AND

❒ YES
❒ NA

Completed one year of full-time experience (at location providing radiation therapy services described and for topic identified in item 5.A.) for (specify use or device)_____ under the supervision of _____ who is meets the requirements for Authorized Medical Physicists (180 NAC 7-023 (specify use or device) _____.

8. Supervising Individual – Identification and Qualifications

The training and experience indicated above was obtained under the supervision of (*if more than one supervising individual is needed to meet requirements in 180 NAC 7, provide the following information for each):*

8.A. Name of Supervisor

_____

8.B. Supervisor is:

❒ Authorized User ❒ Authorized Medical Physicist
❒ Radiation Safety Officer ❒ Authorized Nuclear Pharmacist

8.C. The supervisor meets the requirements of 180 NAC 7-_____ for medical uses in 180 NAC 7-_____.

8.D. Authorized User on Radioactive Material License Number:

8.E. Licensee Name:
Licensee Address:

SUPPLEMENT A Medical Use Training and Experience and Preceptor Attestation
Part 2—Preceptor Attestation

Note: *The individual's preceptor must complete this part. If more than one preceptor is necessary to document experience, obtain a separate preceptor statement from each.*

9. Preceptor Attestation

9.A. I attest that _____(name of individual named in Item 1):

❒ has satisfactorily completed the requirements in 180 NAC 7-_____, as documented in this application.

9.B. ❒ meets the requirements of 180 NAC 7-_____ for types of use, as documented in section(s)_____ of this form.

9.C. ❒ has achieved a level of competency and radiation safety knowledge sufficient to function independently as a: (check one)

❒ Radiation Safety Officer for a medical use licensee

❒ Authorized Medical Physicist

❒ Authorized Nuclear Pharmacist

❒ Authorized User for _____ uses.

9.D. I am a

❒ Authorized User ❒ Authorized Medical Physicist

❒ Radiation Safety Officer ❒ Authorized Nuclear Pharmacist

I meet the requirement of 180 NAC 7-_____ for medical uses in 180 NAC 7-_____.

9.E. Preceptor on Radioactive Material License #:	**9.F.** Licensee Name: Licensee Address:

9.G. Name of Preceptor (type or print clearly)	Signature --Preceptor	Date

From: <trudy.hill@dhhs.ne.gov>
To: <RXL1@NRC.Gov>
Date: 09/12/2007 3:26:24 PM
Subject: Proposed regulations Part 3 of 3

Trudy K. Hill
Radiological Health Specialist
NE DHHS , Office of Radiological Health
301 Centennial Mall South, P.O. Box 95026
Lincoln, NE 68509-5026
Phone: (402)471-0560, Fax: (402)471-0169
trudy.hill@dhhs.ne.gov .(New email address)

CC: <KXS@NRC.gov>, <julia.schmitt@dhhs.ne.gov>

Mail Envelope Properties (46E83D79.4F9 : 3 : 50425)

Subject:	Proposed regulations Part 1 of 3
Creation Date	09/12/2007 3:23:20 PM
From:	<trudy.hill@dhhs.ne.gov>
Created By:	trudy.hill@dhhs.ne.gov

Recipients

nrc.gov
TWGWPO01.HQGWDO01
RXL1 (Robert Lewis)

nrc.gov
TWGWPO02.HQGWDO01
KXS CC (Kathleen Schneider)

dhhs.ne.gov
julia.schmitt CC

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	dhhs.ne.gov

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NRC proposed letter 9-12-07.pdf	89545	
Mime.822	2244851	

Options

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Priority:	Standard
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Return Notification:	None
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Security:	Standard

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Subject:	Proposed regulations Part 1 of 3
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Recipients

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RXL1 (Robert Lewis)

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TWGWPO02.HQGWDO01
KXS CC (Kathleen Schneider)

dhhs.ne.gov
julia.schmitt CC

Post Office	**Route**
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NRC proposed letter 9-12-07.pdf	89545	
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Options

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Return Notification:	None
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Security:	Standard

Mail Envelope Properties (46E83D57.4DD : 0 : 50397)

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Creation Date	09/12/2007 3:22:25 PM
From:	<trudy.hill@dhhs.ne.gov>
Created By:	trudy.hill@dhhs.ne.gov

Recipients

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RXL1 (Robert Lewis)

nrc.gov
TWGWPO02.HQGWDO01
KXS CC (Kathleen Schneider)

dhhs.ne.gov
julia.schmitt CC

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TWGWPO02.HQGWDO01	nrc.gov
	dhhs.ne.gov

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180NAC13 6-29-07 Dept.doc	3109888	
180NAC15 09-05-07.doc	128000	
180NAC17 09-07-07 Dept.doc	130560	
180NAC18 9-7-07.doc	343552	
180NAC19 9-10-07.doc	269312	
180NAC14 8-18-07 Dept.doc	146432	
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Options

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Return Notification:	None
Concealed Subject:	No

Security: Standard

TITLE 180 CONTROL OF RADIATION

CHAPTER 10 NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS: INSPECTIONS

10-001 Scope and Authority 1
10-002 Posting of Notices to Workers 1
10-003 Instructions to Workers 2
10-004 Notifications and Reports to Individuals 2
10-005 Presence of Representatives of Licensees or Registrants and Workers During Inspection 3
10-006 Consultation with Workers During Inspections 4
10-007 Requests by Workers for Inspections 5
10-008 Inspections Not Warranted, Informal Review 5

FORM(S)

Form NRH-3 Notice to Employees

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TITLE 180 CONTROL OF RADIATION

CHAPTER 10 NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS: INSPECTIONS

10-001 SCOPE AND AUTHORITY

10-001.01 180 NAC 10 establishes requirements for notices, instructions and reports by licensees or registrants to individuals engaged in activities under a license or registration and options available to such individuals in connection with Department inspections of licensees or registrants to ascertain compliance with the provisions of the Act and regulations, orders and licenses issued there under regarding radiological working conditions. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

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10.001.02 The regulations in 180 NAC 10 apply to all persons who receive, possess, use, own or transfer sources of radiation licensed by or registered with the Department pursuant to 180 NAC 2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 16, 19 and 20 and 21.

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Deleted: and

10-002 POSTING OF NOTICES TO WORKERS

10-002.01 Each licensee or registrant must post current copies of the following documents:

1. The regulations in 180 NAC 10 and 180 NAC 4;
2. The license, certificate of registration, conditions or documents incorporated into the license by reference and amendments thereto;
3. The operating procedures applicable to activities under the license or registration; and
4. Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to 180 NAC 17 and any response from the licensee or registrant.

10-002.02 If posting of a document specified in 180 NAC 10-002.01, items 1., 2., or 3. is not practicable, the licensee or registrant may post a notice which describes the document and states where it may be examined.

10-002.03 Department Form NRH-3, "Notice to Employees" must be posted by each licensee or registrant wherever individuals work in or frequent any portion of a restricted area.

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10-002.04 Department documents posted pursuant to 180 NAC 10-002.01, item 4., must be posted within two working days after receipt of the documents from the Department; the licensee's or registrant's response, if any, must be posted within two working days after dispatch from the licensee or registrant. The documents must remain posted for a minimum of five working days or until action correcting the violation has been completed, whichever is later.

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10-002.05 Documents, notices or forms posted pursuant to 180 NAC 10-002 must appear in a sufficient number of places to permit individuals engaged in work under the license or registration to observe them on the way to or from any particular work location to which the document applies, must be conspicuous, and must be replaced if defaced or altered.

10-003 INSTRUCTIONS TO WORKERS

10-003.01 All individuals who in the course of employment are likely to receive in a year an occupational dose in excess of 100 mrem (1 mSv) must be:

1. Kept informed of the storage, transfer, or use of radiation and/or radioactive material;
2. Instructed in the health protection problems associated with exposure to radiation and/or radioactive material, precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed;
3. Instructed in, and required to observe, to the extent within the worker's control, the applicable provisions of Title 180 and licenses for the protection of personnel from exposures to radiation or radioactive material;
4. Instructed of their responsibility to report promptly to the licensee or registrant any condition which may lead to, constitute, or cause a violation of the Act, Title 180, and licenses or unnecessary exposure to radiation or radioactive material;
5. Instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material; and
6. Advised as to the radiation exposure reports which workers must be furnished pursuant to 180 NAC 10-004.

10-003.02 In determining those individuals subject to the requirements of 180 NAC 10-003.01, licensees or registrants must take into consideration assigned activities during normal and abnormal situations involving exposure to radiation and/or radioactive material which can reasonably be expected to occur during the life of a licensees or registrants facility. The extent of these instructions must be commensurate with potential radiological health protection problems present in the work place and must be performed annually.

10-003.03 Records of the instructions to workers required by 180 NAC 10-003 must be maintained by the licensee and/or registrant until reviewed by the Department.

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10-004 NOTIFICATIONS AND REPORTS TO INDIVIDUALS

10-004.01 Radiation exposure data for an individual and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual must be reported to the individual as specified in 180 NAC 10-004. The information reported must include data and results obtained pursuant to Title 180, orders, or license conditions, as shown in records maintained by the licensee or registrant pursuant to 180 NAC 4-052. Each notification and report must:

1. Be in writing;

2. Include appropriate identifying data such as the name of the licensee or registrant, the name of the individual, and the individual's identification number;
3. Include the individual's exposure information; and
4. Contain the following statement:

"This report is furnished to you under the provisions of 180 NAC 10. You should preserve this report for further reference."

10-004.02 Each licensee or registrant must furnish each worker annually a written report of the worker's dose as shown in records maintained by the licensee or registrant pursuant to 180 NAC 4-052.

10-004.03 Each licensee or registrant must furnish a written report of the worker's exposure to sources of radiation at the request of a worker formerly engaged in activities controlled by the licensee or registrant. The report must include the dose record for each year the worker was required to be monitored pursuant to 180 NAC 4-022. The report must be furnished within 30 days from the date of request, or within 30 days after the dose of the individual has been determined by the licensee or registrant, whichever is later. The report must cover the period of time that the worker's activities involved exposure to sources of radiation and must include the dates and locations of work under the license or registration in which the worker participated during this period.

10-004.04 Each licensee or registrant must furnish to each worker a report of the worker's results of any measurements, analyses and calculations of radioactive material deposited or retained in the body. The report must be furnished to the worker within 30 days of such determination by the licensee or registrant.

10-004.05 When a licensee or registrant is required pursuant to 180 NAC 4-058, 4-059, or 4-060 to report to the Department any exposure of an individual to sources of radiation, the licensee or the registrant must also provide the individual a written report on the exposure data included therein. Such reports must be transmitted at a time not later than the transmittal to the Department.

10-004.06 At the request of a worker who is terminating employment with the licensee or registrant in work involving exposure to radiation or radioactive material, during the current year, each licensee or registrant must provide at termination to each such worker, or to the worker's designee, a written report regarding the radiation dose received by that worker from operations of the licensee or registrant during the current year or fraction thereof. If the most recent individual monitoring results are not available at that time, a written estimate of the dose must be provided together with a clear indication that this is an estimate.

10-005 PRESENCE OF REPRESENTATIVES OF LICENSEES OR REGISTRANTS AND WORKERS DURING INSPECTION

10-005.01 Each licensee or registrant must afford to the Department at all reasonable times opportunity to inspect materials, machines, activities, facilities, premises, and records pursuant to Title 180.

10-005.02 During an inspection, Department inspectors may consult privately with workers as specified in 180 NAC 10-006. The licensee or registrant may accompany Department inspectors during other phases of an inspection. Deleted: Agency Deleted: Agency

10-005.03 If, at the time of inspection, an individual has been authorized by the workers to represent them during Department inspections, the licensee or registrant must notify the inspectors of such authorization and must give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions. Deleted: Agency

10-005.04 Each workers' representative must be routinely engaged in work under control of the licensee or registrant and must have received instructions as specified in 180 NAC 10-003.

10-005.05 Different representatives of licensees or registrants and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one workers' representative at a time may accompany the inspectors.

10-005.06 With the approval of the licensee or registrant and the workers' representative, an individual who is not routinely engaged in work under control of the licensee or registrant, for example, a consultant to the licensee or registrant or to the workers' representative, must be afforded the opportunity to accompany Department inspectors during the inspection of physical working conditions. Deleted: Agency

10-005.07 Notwithstanding the other provisions of 180 NAC 10-005, Department inspectors are authorized to refuse to permit accompaniment by any individual who deliberately interferes with a fair and orderly inspection. With regard to any area containing proprietary information, the workers' representative for that area must be an individual previously authorized by the licensee or registrant to enter that area. Deleted: Agency

10-006 CONSULTATION WITH WORKERS DURING INSPECTIONS

10-006.01 Department inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of Title 180 and licenses to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection. Deleted: Agency

10-006.02 During the course of an inspection any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which the worker has reason to believe may have contributed to or caused any violation of the Act, Title 180, or license condition, or any unnecessary exposure of an individual to sources of radiation under the licensee's or registrant's control. Any such notice in writing must comply with the requirements of 180 NAC 10-007.01.

10-006.03 The provisions of 180 NAC 10-006.02 must not be interpreted as authorization to disregard instructions pursuant to 180 NAC 10-003.

10-007 REQUESTS BY WORKERS FOR INSPECTIONS

10-007.01 Any worker or representative of workers who believes that a violation of the Act, Title 180 or license conditions exists or has occurred in work under a license or registration to radiological working conditions in which the worker is engaged, may request an inspection by giving notice of the alleged violation to the Department. Any such notice must be in writing, must set forth the specific grounds for the notice, and must be signed by the worker or representative of the workers. A copy will be provided to the licensee or registrant by the Department no later than at the time of inspection except that, upon the request of the worker giving such notice, his/her name and the name of individuals referred to therein must not appear in such copy or on any record published, released, or made available by the Department, except for good cause shown.

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10-007.02 If, upon receipt of such notice, the Department determines that the complaint meets the requirements set forth in 180 NAC 10-007.01, and that there are reasonable grounds to believe that the alleged violation exists or has occurred, s/he must cause an inspection to be made as soon as practicable, to determine if such alleged violation exists or has occurred. Inspections pursuant to 180 NAC 10-007 need not be limited to matters referred to in the complaint.

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10-007.03 A licensee, registrant, or contractor or subcontractor of a licensee or registrant must not discharge or in any manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under Title 180 or has testified or is about to testify in any such proceeding or because of the exercise by such worker on behalf of himself/herself or others of any option afforded by 180 NAC 10.

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10-008 INSPECTIONS NOT WARRANTED; INFORMAL REVIEW

10-008.01 Review of determination that no inspection is warranted.

1. If the Department determines, with respect to a complaint under 180 NAC 10-007, that an inspection is not warranted because there are no reasonable grounds to believe that a violation exists or has occurred, the Department must notify the complainant in writing of such determination. The complainant may obtain review of such determination by submitting a written statement of position to the Director of the Division of Public Health, who will provide the licensee or registrant with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant. The licensee or registrant may submit an opposing written statement of position to the Director of the Division of Public Health, will provide the complainant with a copy of such statement by certified mail.

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2. Upon the request of the complainant, the Director of the Division of Public Health, may hold an informal conference in which the complainant and the licensee or registrant may orally present their views. An informal conference may also be held at the request of the licensee or registrant, but disclosure of the identity of the complainant will be made only following receipt of written authorization from the

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complainant. After considering all written and oral views presented, the Director of the Division of Public Health, will affirm, modify, or reverse the determination of the Department and furnish the complainant and the licensee or registrant a written notification of the decision and the reason therefor.

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10-008.02 If the Department determines that an inspection is not warranted because the requirements of 180 NAC 10-007.01 have not been met, the Director of the Division of Public Health will notify the complainant in writing of such determination. Such determination must be without prejudice to the filing of a new complaint meeting the requirements of 180 NAC 10-007.01.

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Nebraska Department of Health and Human Services
Division of Public Health - Office of Radiological Health
301 Centennial Mall South
Lincoln, Nebraska 68509

NOTICE TO EMPLOYEES

Standards for Protection Against Radiation; Notices,
Instructions and Reports to Workers; Inspections

In Title 180, Regulations for Control of Radiation, the Nebraska Department of Health and Human Services has established standards for your protection against radiation hazards and has established certain provisions for the options of workers engaged in work under an Department license or registration.

YOUR EMPLOYER'S RESPONSIBILITY:

Your Employer is Required to:

1. Apply these regulations to work involving sources of radiation.
2. Post or otherwise make available to you a copy of Title 180, Regulations for Control of Radiation, and the operating procedures which apply to work you are engaged in, and explain their provisions to you.
3. Post any Notice of Violation involving radiological working conditions, proposed imposition of civil penalties or orders.

YOUR RESPONSIBILITY AS A WORKER:

You should familiarize yourself with those provisions of Title 180, Regulations for Control of Radiation and operating procedures which apply to the work in which you are engaged. You should observe their provisions for your own protection and protection of your co-worker.

WHAT IS COVERED BY THESE REGULATIONS:

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels, and safety interlock equipment;
5. Exposure records and reports; and
6. Options for workers regarding Department Inspections; and
7. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY:

1. The Title 180, Regulations for Control of Radiation require that your employer give you a written report if you receive an exposure in excess of any applicable limit as set forth in the regulations or in any license. The basic limits for exposure to employees are set forth in 180 NAC 4-005, 4-011 and 4-012. These sections specify limits on exposure to radiation and exposure to concentrations of radioactive material in air.
2. If you work where personnel monitoring is required:
   (a) Upon your request, your employer must give you a written report of your radiation exposures upon termination of your employment; and
   (b) Your employer must advise you annually of your exposure to radiation.

INSPECTIONS:

All licensed or registered activities are subject to inspection by representatives of the Department of Health and Human Services, Division of Public Health, Office of Radiological health. In addition, any worker or representative of workers who believes that there is a violation of the Nebraska Radiation Control Act, the regulations issued thereunder, or the terms of the employer's license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by sending a notice of the alleged violation to the Department of Health and Human Services. The request must set forth the specific grounds for the notice, and must be signed by the worker as representative of the workers. During inspections, Department inspectors may confer privately with workers, and any worker may bring to the attention of the inspectors any past or present condition which s/he believes contributed to or caused any violation as described above.

POSTING REQUIREMENTS

Copies of this notice must be posted in a sufficient number of places in every establishment where employees are employed in activities licensed or registered, pursuant to 180 NAC 2 and 180 NAC 3 by the Department of Health and Human Services, to permit employees working in or frequenting any portion of a restricted area to observe a copy on the way to or from their place of employment.

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A copy of the Code of Federal Regulations (CFR) cited in this Chapter are available for review at the Department of Health and Human Services Regulation and Licensure, 301 Centennial Mall South, Lincoln, NE 68509

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or at http://www.gpoaccess.gov/cfr/index.html

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TITLE 180 CONTROL OF RADIATION

CHAPTER 13 TRANSPORTATION OF RADIOACTIVE MATERIAL

13-001 SCOPE AND AUTHORITY:

13-001.01 The regulations in this Chapter establish requirements for packaging, preparation for shipment, and transportation of radioactive material. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

13-001.02 10 CFR as published on January 1, 2006 and 49 CFR as published October 1, 2006 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Public Health Division, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509-5026.

13-001.03 The regulations in 180 NAC 13 apply to any licensee authorized by specific or general license issued by this Department to receive, possess, use, or transfer licensed material, if the licensee delivers that material to a carrier for transport, transport the material outside the site of usage as specified in the Department's license, or transport that material on public highways. No provision of 180 NAC 13 authorizes possession of licensed material.

13-002 DEFINITIONS: As used in 180 NAC 13, the following definitions apply:

Carrier means a person engaged in the transportation of passengers or property by land or water as a common, contract, or private carrier, or by civil aircraft.

Certificate holder means a person who has been issued a certificate of compliance or other package approval by the U.S. Nuclear Regulatory Commission.

Certificate of Compliance (CoC) means the certificate issued by the U.S. Nuclear Regulatory Commission under 10 CFR 71 Subpart D which approves the design of a package for the transportation of radioactive material.

Close reflection by water means immediate contact by water of sufficient thickness for maximum reflection of neutrons.

Consignment means each shipment of a package or groups of packages or load of radioactive material offered by a shipper for transport.

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Containment system means the assembly of components of packaging intended to retain the radioactive material during transport.

Conveyance means:

(1) For transport by public highway or rail any transport vehicle or large freight container;

(2) For transport by water any vessel, or any hold, compartment, or defined deck area of a vessel including any transport vehicle on board the vessel; and

(3) For transport by aircraft any aircraft.

Criticality Safety Index (CSI) means the dimensionless number (rounded up to the next tenth) assigned to and placed on the label of a fissile material package, to designate the degree of control of accumulation of packages containing fissile material during transportation. Determination of the criticality safety index is described in 180 NAC 13-011 and 13-012, and 10 CFR 71.59.

Deuterium means, for the purposes of 180 NAC 13-004.04 and 13-011, deuterium and any deuterium compounds, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000.

DOT means the U.S. Department of Transportation.

Exclusive use means the sole use of a conveyance by a single consignor for which all initial, intermediate, and final loading and unloading are carried out in accordance with the direction of the consignor or consignee. The consignor and the carrier must ensure that any loading or unloading performed by personnel having radiological training and resources appropriate for safe handling of the consignment. The consignor must issue specific instructions, in writing, for maintenance of exclusive use shipment controls and include them with the shipping paper information provided to the carrier by the consignor.

Fissile material means plutonium-239, plutonium-241, uranium-233, uranium-235, or any combination of these radionuclides. Fissile material means the fissile nuclides themselves, not material containing fissile nuclides. Unirradiated natural uranium and depleted uranium and natural uranium or depleted uranium that has been irradiated in thermal reactors only are not included in this definition.[1] Certain exclusions from fissile material control are provided in 180 NAC 13-004.04.

Graphite means, for the purposes of 180 NAC 13-004.04 and 13-011, graphite with a boron equivalent content less than 5 parts per million and density greater than 1.5 grams per cubic centimeter.

Low specific activity (LSA) Material means radioactive material with limited specific activity which is nonfissile or is excepted under 180 NAC 13-004.04, and which satisfies the descriptions and limits set forth below. Shielding materials surrounding the LSA material may not be considered

[1] Department jurisdiction extends only to "special nuclear material in quantities not sufficient to form a critical mass" as defined in 180 NAC 1-002.

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in determining the estimated average specific activity of the package contents. LSA material must be in one of three groups:

(1) LSA-I:

(a) Uranium and thorium ores, concentrates of uranium and thorium ores, and other ores containing naturally occurring radioactive radionuclides which are not intended to be processed for the use of these radonuclides;

(b) Solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures;

(c) Radioactive material for which the A_2 value is unlimited; or

(d) Other radioactive material in which the activity is distributed throughout and the estimated average specific activity does not exceed 30 times the value for exempt material activity concentration determined in accordance with Appendix 13-A.

(2) LSA-II:

(a) Water with tritium concentration up to 0.8 TBq/liter (20.0 Ci/liter); or

(b) Other material in which the activity is distributed throughout, and the average specific activity does not exceed 10^{-4} A_2/g for solids and gases, and 10^{-5} A_2/g for liquids.

(3) LSA-III solids (e g., consolidated wastes, activated materials), excluding powders, that satisfy the requirements of 10 CFR 71.77 in which:

(a) The radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.); and

(b) The radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that, even under loss of packaging, the loss of radioactive material per package leaching, when placed in water for 7 days, would not exceed 0.1 A_2; and

(c) The estimated average specific activity of the solid does not exceed 2 E-3 A_2/g.

Low toxicity alpha emitters means natural uranium, depleted uranium, natural thorium; uranium-235, uranium-238, thorium-232, thorium-228 or thorium-230 when contained in ores or physical or chemical concentrates or tailings; or alpha emitters with a half-life of less than 10 days.

Natural thorium means thorium with the naturally occurring distribution of thorium isotopes (essentially 100 weight percent thorium-232).

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Normal form radioactive material means radioactive material which has not been demonstrated to qualify as "special form radioactive material" as defined 180 NAC 1-002.

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Optimum interspersed hydrogenous moderation means the presence of hydrogenous material between packages to such an extent that the maximum nuclear reactivity results.

Package means the packaging together with its radioactive contents as presented for transport.

(1) Fissile material package or Type AF package, Type BF package, Type B(U)F package or Type B(M)F package means a fissile material packaging together with its fissile material contents.

(2) Type A package means a Type A packaging together with its radioactive contents. A type A package is defined and must comply with the DOT regulations in 49 CFR part 173.

(3) Type B package means a Type B packaging together with its radioactive contents. On approval, a Type B package design is designated by U. S. Nuclear Regulatory Commission (NRC) as B(U) unless the package has a maximum normal operating pressure or more than 700 kPa (100 lb/in^2) gauge or pressure relief device that would allow the release of radioactive material to the environment under the tests specified in 10 CFR Part 71.73 (hypothetical accident conditions), in which it will receive a designation B(M). B(U) refers to the need for unilateral approval of international shipments; B(M) refers to the need for multilateral approval of international shipments. There is no distinction made in how packages with these designations may be used in domestic transportation. To determine their distinction for international transportation, see U. S. Department of Transportation (DOT) regulations, 49 CFR Part 173. A Type B package approved before September 6,1983, was designated only as Type B. Limitations on its use are specified 10 CFR 71.19.

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Packaging means the assembly of components necessary to ensure compliance with the packaging requirements of 180 NAC 13. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie down system, and auxiliary equipment may be designated as part of the packaging.

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Specific activity of a radionuclide means the radioactivity of a radionuclide per unit mass of that nuclide. The specific activity of a material in which the radionuclide is essentially uniformly distributed is the radioactivity per unit mass of the material.

Surface contaminated object (SCO) means a solid object that is not itself classed as radioactive material, but which has radioactive material distributed on any of its surfaces. SCO must be in one of two groups with surface activity not exceeding the following limits:

(1) SCO-1: A solid object on which:

(a) The non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4 Bq/cm^2 (10^{-4}

μCi/cm^2) for beta and gamma and low toxicity alpha emitters, or 0.4 Bq/cm^2 (10^{-5} μCi/cm^2) for all other alpha emitters.

(b) The fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4E+4 Bq/cm^2 (1.0 μCi/cm^2) for beta and gamma and low toxicity alpha emitters, or 4E+3 Bq/cm^2 (0.1 μCi/cm^2) for all other alpha emitters; and

(c) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 4E+4 Bq/cm^2 (1.0 μCi/cm^2) for beta and gamma and low toxicity alpha emitters, or 4E+3 Bq/cm^2 (0.1 μCi/cm^2) for all other alpha emitters.

(2) SCO-II: A solid object on which the limits for SCO-1 are exceeded and on which:

(a) The non-fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 400 Bq/cm^2 (10^{-2} μCi/cm^2) or beta and gamma and low toxicity alpha emitters or 40 Bq/cm^2 (10^{-3} μCi/cm^2) for all other alpha emitters;

(b) The fixed contamination on the accessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8E+5 Bq/cm^2 (20 μCi/cm^2) for beta and gamma and low toxicity alpha emitters, or 8E+4 Bq/cm^2 (2 μCi/cm^2) for all other alpha emitters;

(c) The non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 cm^2 (or the area of the surface if less than 300 cm^2) does not exceed 8E+5 Bq/cm^2 (20 μCi/cm^2) for beta and gamma and low toxicity alpha emitters, or 8E+4 Bq/cm^2 (2 μCi/cm^2) for all other alpha emitters.

Transport index means the dimensionless number (rounded up to the next tenth) placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. The transport index is the number determined by multiplying the maximum radiation level in millisievert (mSv) per hour at 1 meter (3.3 ft) from the external surface of the package by 100 (equivalent to the maximum radiation level in millirem per hour at 1 meter (3.3 ft)).

Type A quantity means a quantity of radioactive material, the aggregate radioactivity of which does not exceed A_1 for special form radioactive material, or A_2 for normal form radioactive material, where A_1 and A_2 are given in Appendix 13-A, Table A-1, or may be determined by procedures described in Appendix 13-AA.

Type B quantity means a quantity of radioactive material greater than a Type A quantity.

Unirradiated uranium means uranium containing not more than 2 x 10^3 Bq of plutonium per gram of uranium-235, not more than 9 x 10^6 Bq of fission products per gram of uranium-235, and not more than 5 x 10^{-3} g of uranium-236 per gram of uranium- 235.

Uranium - natural, depleted, enriched

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¶
For fissile material packages, the number determined by multiplying the maximum radiation level in millisievert per hour at one meter (3.3 ft) from the eternal surface of the package by 100 (equivalent to the maximum radiation level in millirem per hour at one meter (3.3 ft), or, for criticality control purposes, the number obtained as described in 10 CFR Part 71.59, whichever is larger.¶
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(1) Natural uranium means uranium with the naturally occurring distribution of uranium isotopes (approximately 0.711 weight percent uranium-235, and the remainder by weight essentially uranium-238).

(2) Depleted uranium means uranium containing less uranium-235 than the naturally occurring distribution of uranium isotopes.

(3) Enriched Uranium means uranium containing more uranium-235 than the naturally occurring distribution of uranium isotopes.

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13-003 REQUIREMENT FOR LICENSE: Except as authorized in a general or specific license issued by the Department, or as exempted in 180 NAC 13-004, no licensee may:

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1. Deliver radioactive material to a carrier for transport; or
2. Transport radioactive material.

13-004 EXEMPTIONS

13-004.01 Common and contract carriers, freight forwarders, and warehouse workers which are subject to the requirements of the DOT in 49 CFR 170 through 189 or the U.S. Postal Service in the Postal Service Manual (Domestic Mail Manual), incorporated by reference, at 39 CFR 111.1 (1997) and attached hereto as Attachment 13-1, are exempt from the requirements of this section to the extent that they transport or store radioactive material in the regular course of their carriage for others or storage incident thereto. Common and contract carriers who are not subject to the requirements of the DOT or U.S. Postal Service are subject to 180 NAC 13-003 and other applicable requirements of these regulations.

13-004.02 Exemption of physicians: Any physician licensed by the State of Nebraska to dispense drugs in the practice of medicine is exempt from 180 NAC 13-003 with respect to transport by the physician of radioactive material for use in the practice of medicine. However, any physician operating under this exemption must be licensed under 180 NAC 7 or equivalent U.S. Nuclear Regulatory Commission or Agreement State regulations.

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13-004.03 Exemption for low-level materials: Any licensee is exempt from the requirements of 180 NAC 13 with respect to shipment or carriage of the following low-level materials:

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1. Natural material and ores containing naturally occurring radionuclides that are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in Appendix 13-A, Table A-2.
2. Materials for which the activity concentration is not greater than the activity concentration values specified in Appendix 13-A, Table A-2, or for which the consignment activity is not greater than the limit for an exempt consignment found in Appendix 13-A, Table A-2.

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13-004.04 Exemption from classification as fissile material: Fissile material meeting the requirements of at least one of the items of 180 NAC 13-004.04, item 1 through 6 are

exempt from classification as fissile material and from the fissile material package standards of 10 CFR 71.55 and 71.59, but are subject to all other requirements of 180 NAC 13, except as noted.

1. Individual package containing 2 grams or less fissile material.
2. Individual or bulk packaging containing 15 grams or less of fissile material provided the package has at least 200 grams of solid nonfissile material for every gram of fissile material. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass for solid nonfissile material.
3. Packages containing:

   a. Low concentrations of solid fissile material commingled with solid nonfissile material, provided that:

      (1) There is at least 2000 grams of solid nonfissile material for every gram of fissile material, and
      (2) There is no more than 180 grams of fissile material distributed within 360 kg of contiguous nonfissile material.

   b. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass of solid nonfissile material.

4. Uranium enriched in uranium-235 to a maximum of 1% by weight, and with total plutonium and uranium-233 content of up to 1 percent of the mass of uranium-235, provided that the mass of any beryllium, graphite, and hydrogenous material enriched in deuterium constitutes less than 5% of the uranium mass.
5. Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2% by mass, with a total plutonium and uranium-233 content not exceeding 0.002% of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2. The material must be contained in at least a DOT Type A package.
6. Packages containing, individually, a total plutonium mass of not more than 1000 grams, of which not more than 20% by mass may consist of plutonium-239, plutonium-241, or any combination of these radionuclides.

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¶
1. . Packages containing no more than Type A quantities or radioactive material if the package contains no fissile material; or¶
2. . A package containing radioactive materials that is low specific activity (LSA) material in group LSA-1, or surface contaminated objects (SCO) in group SCO-1.

13-005 TRANSPORTATION OF LICENSED MATERIAL

13-005.01 Each licensee who transports licensed material outside of the site of usage, as specified in the Department license, or where transport is on public highways, or who delivers licensed material to a carrier for transport, must comply with the applicable requirements of the DOT regulation in 49 CFR part 170 through 189 appropriate to mode of transport.

1. The licensee must comply with the applicable DOT regulations in the following areas:

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a. Packaging - 49 CFR Part 173: Subparts A and B and I.
b. Marking and labeling - 49 CFR Part 172: Subpart D, §§ 172.400 through 172.407, §§ 172.436 through 172.440, and Subpart E.
c. Placarding - 49 CFR Part 172: Subpart F, especially §§ 172.500 through 172.519, 172.556, and Appendices B and C.
d. Accident Reporting - 49 CFR Part 171: §§ 171.15 and 171.16.
e. Shipping papers and emergency information - 49 CFR Part 172: Subparts C and G.
f. Hazardous material employee training - 49 CFR Part 172: Subpart H.
g. Hazardous material shipper/carrier registration - 49 CFR Part 107: Subpart G.

2. The licensee must also, comply with applicable DOT regulations pertaining to the following modes of transportation: Deleted: Also

a. Rail - 49 CFR Part 174: Subparts A through D and K.
b. Air - 49 CFR Part 175
c. Vessel - 49 CFR Part 176: Subparts A through F and M.
d. Public Highway - 49 CFR Part 177 and Parts 390 through 397.

3. Assure that any special instructions needed to safely open the package are sent to or have been made available to the consignee in accordance with 180 NAC 4-038.

13-005.02 If, for any reason, the regulations of the DOT are not applicable to a shipment of licensed material, the licensee must conform to the standards and requirements of 49 CFR Parts 170 through 189 appropriate to the mode of transport to the same extent as if the shipment was subject to the regulations.

GENERAL LICENSES

13-006 GENERAL LICENSES FOR CARRIERS

13-006.01 A general license is hereby issued to any common or contract carrier not exempt under 180 NAC 13-004 to receive, possess, transport, and store radioactive material in the regular course of their carriage for others or storage incident thereto, provided the transportation and storage is in accordance with the applicable requirements, appropriate to the mode of transport, of the DOT insofar as such requirements relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting[2].

13-006.02 A general license is hereby issued to any private carrier to transport radioactive material, provided the transportation is in accordance with the applicable requirements, appropriate to the mode of transport, of the DOT insofar as such requirements relate to the

[2]Notification of incidents must be filed with, or made to, the Department as prescribed in 49 CFR, regardless of and in addition to notification made to DOT or other agencies. Deleted: Agency

loading and storage of packages, placarding of the transporting vehicle, and incident reporting.

13-006.03 Persons who transport radioactive material pursuant to the general licenses in 180 NAC 13-006.01 or 13-006.02 are exempt from the requirements of 180 NAC 4 and 10 to the extent that they transport radioactive material.

13-007 GENERAL LICENSE: U.S. NUCLEAR REGULATORY COMMISSION NRC APPROVED PACKAGES

13-007.01 A general license is hereby issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a package for which a license, certificate of compliance, or other approval has been issued by the NRC.

13-007.02 This general license applies only to a licensee who:

1. Has a copy of the specific license, certificate of compliance, or other approval by the NRC of the package and has the drawings and other documents referenced in the approval relating to the use and maintenance of the packaging and to the actions to be taken prior to shipment;
2. Complies with the terms and conditions of the license, certificate, or other approval by the NRC, as applicable, and the applicable requirements of 180 NAC 13;
3. Prior to the licensee's first use of the package, has registered with the NRC; and
4. Has a quality assurance program required by 180 NAC 13-021.

13-007.03 The general license in 180 NAC 13-007.01 applies only when the package approval authorizes use of the package under this general license.

13-007.04 For a Type B or fissile material package, the design of which was approved before April 1, 1996 the general license is subject to the additional restrictions of 10 CFR 71.19.

13-008 RESERVED

13-009 GENERAL LICENSE: DOT SPECIFICATION CONTAINER

13-009.01 A general license is issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a specification container for fissile material or for a Type B quantity of radioactive material as specified in 49 CFR Parts 173 and 178.

13-009.02 Except as otherwise provided in 180 NAC 13, the general license applies only to a licensee who has a quality assurance program approved by the Department as satisfying the applicable provision of 180 NAC 13-021.

13-009.03 This general license applies only to a licensee who:

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Deleted: 13-008.01 A Type B package previously approved by the NRC, but not designated as B(U) or B(M) in . the identification number of the NRC Certificate of Compliance, may be used under the general license of 180 NAC 13-007 with the following additional conditions:¶
¶
1. . Fabrication of the packaging was satisfactorily completed before August 31, 1986, as demonstrated by application of its model number in accordance with NRC regulations at 10 CFR 71.85(c);¶
2. . A package used for a shipment to a location outside the United States is subject to multilateral approval, as defined in DOT regulations at 49 CFR 173.403; and¶
3. . A serial number that uniquely identifies each packaging which conforms to the approved design is assigned to, and legibly and durably marked on, the outside of each packaging.¶
¶
13-008.02 A Type B(U) package, a Type B(M)package, a low specific activity (LSA) material package or a fissile material package, previously approved by the NRC but without the designation "-85" in the identification number of the NRC Certificate of Compliance, may be used under the general license of 180 NAC 13-007 with the following additional conditions:¶
¶
1. . Fabrication of the package is satisfactorily completed by April 1, 1996, as demonstrated by application of its model number in accordance with NRC regulations at 10 CFR 71.85(c).¶
2. . A package used for a shipment to a location outside the United States is subject to multilateral approval except approved under special arrangement in accordance with DOT regulations at 49 CFR 173.403; and¶
3. . A serial number which uniquely identifies each packaging which conforms to the approved design is assigned to, and legibly and durably marked on, the outside of each packaging.

1. Has a copy of the specification;
2. Complies with the terms and conditions of the specification and the applicable requirements of 180 NAC 13; and
3. Has a quality assurance program required by 180 NAC 13-021.

13-009.04 The general license in 180 NAC 13-009.01 is subject to the limitation that the specification container may not be used for a shipment to a location outside the United States except by multilateral approval as defined in 49 CFR 173.403.

13-010 GENERAL LICENSE: USE OF FOREIGN APPROVED PACKAGE

13-010.01 A general license is issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a package the design of which has been approved in a foreign national competent authority certificate which has been revalidated by the DOT as meeting the applicable requirements of 49 CFR 171.12.

13-010.02 Except as otherwise provided in this section, the general license applies only to a licensee who has a quality assurance program approved by the U.S. Nuclear Regulatory Commission as satisfying the applicable provisions of 10 CFR 71, subpart H.

13-010.03 This general license applies only to international shipments.

13-010.04 This general license applies only to a licensee who:

1. Has a copy of the applicable certificate, the revalidation, and the drawings and other documents referenced in the certificate relating to the use and maintenance of the packaging and to the actions to be taken prior to shipment; and
2. Complies with the terms and conditions of the certificate and revalidation and with the applicable requirements of 180 NAC 13.
3. Has a quality assurance program approved by the Department.

13-011 GENERAL LICENSE; FISSILE MATERIAL

13-011.01 A general license is hereby issued to any licensee to transport fissile material, or to deliver fissile material to a carrier for transport, if the material is shipped in accordance with this 180 NAC 13-011. The fissile material need not be contained in a package which meets the standards of 10 CFR 71 subparts E and F; however the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 49 CFR 173.417(a).

13-011.02 The general license applies only to a licensee who has a quality assurance program approved by the Department.

13-011.03 The general license applies only when a package's contents:

1. Contains less than a Type A quantity of fissile material; and
2. Contain less than 500 total grams of beryllium, graphite, or hydrogenous material enriched in deuterium.

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Deleted: Except as provided in 180 NAC 13-011.04, this general license applies only when a package contains no more than a Type A quantity of radioactive material, including only one of the following:¶

Deleted: Up to 40 grams of uranium-235;

Deleted: Up to 30 grams of uranium-233;

Deleted: 3. . Up to 25 grams of the fissile radionuclides of plutonium, except that for encapsulated plutonium-beryllium neutron sources in special form, an A_1 quantity of plutonium may be present; or¶
4. . A combination of fissile radionuclides in which the sum of the ratios of the amount of each radionuclide to the corresponding maximum amounts in 013.11C(1), (2) and (3) does not exceed unity.¶

13-011.04 The general license applies only to packages containing fissile material that are labeled with a CSI which;

1. Has been determined in accordance with 180 NAC 13-011.05;
2. Has a value less than or equal to 10; and
3. For a shipment of multiple packages containing fissile material, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and less than or equal to 100 (for shipment on an exclusive use conveyance).

13-011.05 CSI determination;

1. The value for the CSI must be greater than or equal to the number calculated by the following equation:

$$CSI = 10\left[\frac{\text{grams of } {}^{235}U}{X} + \frac{\text{grams of } {}^{233}U}{Y} + \frac{\text{grams of Pu}}{Z}\right]$$

2. The calculated CSI must be rounded up to the first decimal place;
3. The values of X, Y, and Z used in the CSI equation must be taken from Table 13-1 or Table 13-2, as appropriate;
4. If Table 13-2 is used to obtain the value of X, then the values for the terms in the equation for uranium-233 and plutonium must be assumed to be zero; and
5. Table 13-1 values for X, Y., and Z must be used to determine the CSI if:

   a. Uranium-233 is present in the package;
   b. The mass of the plutonium exceeds 1% of the mass of uranium-235;
   c. The uranium is unknown uranium-235 enrichment or greater than 24 weight percent enrichment; or
   d. Substances having a moderating effectiveness (that is, an average hydrogen density greater that H_2O (for example, certain hydrocarbon oils or plastics) are present in any form, except as polyethylene used for packing or wrapping.

TABLE 13-1
Mass Limits for General License Packages Containing Mixed Quantities of Fissile Material or Uranium-235 of Unknown Enrichment per 180 NAC 13-011.05

Fissile material	Fissile material mass mixed with moderating substances having an average hydrogen density less than or equal to H_2O (grams)	Fissile material mass mixed with moderating substances having an average hydrogen density greater than H_2O[a] (grams)
^{235}U (X)	60	38
^{233}U (Y)	43	27

Deleted: For packages where fissile material is mixed with substances having an average hydrogen density greater than water, this general license applies only when a package contains no more than a Type A quantity of radioactive material, including one of the following:

Deleted: Up to 29 grams of uranium-235;

Deleted: Up to 18 grams of uranium-233;

Deleted: Up to 18 grams of fissile radionuclides of plutonium, or

Deleted: 4. . A combination of fissile radionuclides in which the sums of the ratios of the amount of each radionuclide to the corresponding maximum amounts in 180 NAC 13-011.04, item (1), (2) and (3) does not exceed unity.¶

Deleted: Except for the beryllium contained within the special form plutonium-beryllium sources authorized in 180 NAC 13-011.07, this general license applies only when beryllium, graphite, or hydrogenous material enriched in deuterium is not present in quantities exceeding 0.1% of the fissile material mass.

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^{239}Pu or ^{241}Pu (Z)	37	24

[a] When mixtures of moderating substances are present, the lower mass limits must be used if more than 15% of the moderating substance has an average hydrogen density greater than H_2O.

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TABLE 13-2 - Mass Limits for General License Packages Containing Uranium-235 of Known enrichment per 180 NAC 13-011

Uranium enrichment in weight percent of uranium-235 not exceeding	Fissile material mass of uranium-235 U(X) (grams)
24	60
20	63
15	67
11	72
10	76
9.5	78
9	81
8.5	82
8	85
7.5	88
7	90
6.5	93
6	97
5.5	102
5	108
4.5	114
4	120
3.5	132
3	150
2.5	180
2	246
1.5	408
1.35	480
1	1,020
0.92	1,800

13-012 GENERAL LICENSE: PLUTONIUM-BERYLLIUM SPECIAL FORM MATERIAL

13-012.01 A general license is hereby issued to any licensee to transport fissile material, or to deliver fissile material in the form of plutonium-beryllium (Pu-Be) special form sealed sources, or to deliver Pu-Be sealed sources to a carrier for transport, if the material is shipped in accordance with this subsection. This material need not be contained in package which meets the standards of 10 CFR 71 subpart E and F; however the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 40 CFR 173.417(a).

13-012.02 This general license applies only when all of the following requirements are met:

1. The package contains no more than a Type A quantity of radioactive material; and
2. Contain less than 1000 g of plutonium, provided that: plutonium-239, plutonium-241, or any combination of these radionuclides, constitutes less than 240 g of the total quantity of plutonium in the package.

13-012.03 The general license applies only to a licensee who has a quality assurance program approved by the Department.

13-012.04 The general license applies only to packages labeled with a CSI which:

1. Has been determined per 180 NAC 13-012.05;
2. Has a value less than or equal to 100; and
3. For a shipment of multiple packages containing Pu-Be sealed sources, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and less than or equal to 100 (for shipment on an exclusive use conveyance).

13-012.05 CSI determination:

1. The value for the CSI must be greater than or equal to the number calculated by the following equation:

$$CSI = 10\left[\frac{\text{grams of } {}^{239}\text{Pu} + \text{grams of } {}^{241}\text{Pu}}{24}\right]$$

;and

2. The calculated CSI must be rounded up to the first decimal place.

13-013 ASSUMPTIONS AS TO UNKNOWN PROPERTIES

When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee must package

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13-011.06 Except as specified in 180 NAC 13-011.06, item 1. for encapsulated plutonium-beryllium sources, this general license applies only when, a package is labeled with a transport index not less than the number given by the following equation, where the package contains x grams of uranium-235, y grams of uranium-233, and z grams of the fissile radionuclides of plutonium:¶
¶
. . . . . Minimum Transport Index = (0.25x + 0.33y + 0.4z)¶
¶
1. . For a package in which the only fissile material is in the form of encapsulated plutonium-beryllium neutron sources in special form, the transport index based on criticality considerations may be taken as 0.025 times the number of grams of the fissile radionuclides of plutonium. ¶
2. . Packages which have a transport index greater than 10 are not authorized under the general license provisions of this 180 NAC 13-011. ¶

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Deleted: Neither beryllium nor hydrogenous material enriched in deuterium is present;¶
3. . The total mass of graphite present does not exceed 7.7 times the total mass of uranium-235 plus plutonium;¶
4. . Substances having a higher hydrogen density than water, for example certain hydrocarbon oils are not present, except that polyethylene may be used for packing or wrapping;¶
5. . Uranium-233 is not present, and the amount of plutonium does not exceed 1 percent of the amoun... [2]

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7. . The transport index of each package based on criticality considerations is taken as 10 times the number of grams of uranium-235 in the package divided by the maximum allowable number of... [3]

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Per Fissile Material Package¶
[Nonuniform Distribution]¶
¶
¶
Uranium enrichment in weight ... [4]

the fissile material as if the unknown properties have credible values that will cause the maximum neutron multiplication.

13-014 PRELIMINARY DETERMINATIONS: Prior to the first use of any packaging for the shipment of licensed material:

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13-014.01 The licensee must ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects which could significantly reduce the effectiveness of the packaging;

13-014.02 Where the maximum normal operating pressure will exceed 35 kilopascal (5 lbf/in^2) gauge, the licensee must test the containment system at an internal pressure at least 50% higher than the maximum normal operating pressure to verify the capability of that system to maintain its structural integrity at that pressure;

13-014.03 The licensee must determine that the packaging has been fabricated in accordance with the design approved by the NRC; and

13-014.04 The licensee must conspicuously and durably mark the packaging with its model number, serial number, gross weight, and a package identification number assigned by the NRC.

13-015 ROUTINE DETERMINATIONS: Prior to each shipment of licensed material, the licensee must determine that:

13-015.01 The package is proper for the contents to be shipped;

13-015.02 The package is in unimpaired physical condition except for superficial defects such as marks or dents;

13-015.03 Each closure device of the packaging, including any required gasket, is properly installed and secured and free of defects;

13-015.04 Any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid;

13-015.05 Any pressure relief device is operable and set in accordance with written procedures;

13-015.06 The package has been loaded and closed in accordance with written procedures;

13-015.07 Any structural part of the package which could be used to lift or tie down the package during transport is rendered inoperable for that purpose unless it satisfies design requirements specified in 10 CFR 71.45;

13-015.08 The level of removable radioactive contamination on the external surfaces of each package offered for shipment is as low as reasonably achievable. The level of removable radioactive contamination may be determined by wiping an area of 300 square centimeters of the surface concerned with an absorbent material, using moderate pressure, and measuring

the activity on the wiping material. Sufficient measurements must be taken in the most appropriate locations to yield a representative assessment of the removable contamination levels. Except as provided in 180 NAC 13-015.08, item (1), the amount of radioactivity measured on any single wiping material, when averaged over the surface wiped, must not exceed the limits given in TABLE 13-3 of 180 NAC 13-015 at any time during transport. Other methods of assessment of equal or greater efficiency may be used. When other methods are used, the detection efficiency of the method used must be taken into account and in no case may the removable contamination on the external surfaces of the package exceed 10 times the limits listed in TABLE 13-3.

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1. In the case of packages transported as exclusive use shipments by rail or highway only, the removable radioactive contamination at any time during transport must not exceed 10 times the levels prescribed in 180 NAC 13-015.08. The levels at the beginning of transport must not exceed the levels in 180 NAC 13-015.08;

13-015.09 External radiation levels around the package and around the vehicle, if applicable, will not exceed 2 mSv/h (200 mrem/hr) at any point on the external surface of the package at any time during transportation. The transport index must not exceed 10.;

13-015.10 For a package transported in exclusive use by rail, highway or water, radiation levels external to the package may exceed the limits specified in 180 NAC 13-015.09 but must not exceed any of the following:

1. 2 mSv/h (200 mrem/hr) on the accessible external surface of the package unless the following conditions are met, in which case the limit is 10 mSv/h (1000 mrem/hr);

   a. The shipment is made in a closed transport vehicle,
   b. Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation, and
   c. There are no loading or unloading operations between the beginning and end of the transportation.

2. 2 mSv/h (200 mrem/hr) at any point on the outer surface of the vehicle, including the upper and top and underside of the vehicle, or, in the case of a flat-bed style vehicle, with a personnel barrier*, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load [or enclosure, if used], and on the lower external surface of the vehicle[3] ;
3. 0.1 mSv/h (10 mrem/hr) at any point 2 meters from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of a flat-bed style vehicle, at any point 2 meters from the vertical planes projected from the outer edges of the vehicle; and
4. 0.02 mSv/h (2 mrem/hr) in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons

[3]A flat-bed style vehicle with a personnel barrier must have radiation levels determined at vertical planes. If no personnel barrier, the package cannot exceed 2 mSv/h (200 mrem/hr) at the surface.*

occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and training in accordance with 180 NAC 10-003; and

13-015.11 A package must be prepared for transport so that in still air at 100 degrees Fahrenheit (38 degrees Celsius) and in the shade, no accessible surface of a package would have a temperature exceeding 122 degrees Fahrenheit (50 degrees Celsius) in a nonexclusive use shipment or 185 degrees Fahrenheit (85 degrees Celsius) in an exclusive use shipment. Accessible package surface temperatures must not exceed these limits at any time during transportation.

13-015.12 A package may not incorporate a feature intended to allow continuous venting during transport.

TABLE 13-3
Removable External Radioactive Contamination Wipe Limits

Contaminant	Maximum Permissible Limits		
	Bq/cm^2	$\mu Ci/cm^2$	dpm/cm^2
Beta and gamma emitteers and low toxicity alpha emitters	0.41	1.0 E-5	22
All other alpha emitting radionuclides	0.04	1.0 E-6	2.2

13-016 AIR TRANSPORT OF PLUTONIUM

13-016.01 Notwithstanding the provisions of any general licenses and notwithstanding any exemptions stated directly in this Section or included indirectly by citation of the DOT regulations, as may be applicable, the licensee must assure that plutonium in any form is not transported by air, or delivered to a carrier for air transport, unless:

1. The plutonium is contained in a medical device designed for individual human application; or

2. The plutonium is contained in a material in which the specific activity is less than or equal to the activity concentration values for plutonium specified in Appendix 13-A, Table A-2, and in which the radioactivity is essentially uniformly distributed; or

3. The plutonium is shipped in a single package containing no more than an A_2 quantity of plutonium in any isotope or form and is shipped in accordance with 180 NAC 13-005; or

4. The plutonium is shipped in a package specifically authorized for the shipment of plutonium by air in the Certificate of Compliance for that package issued by the NRC.

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13-016.02 Nothing in 180 NAC 13-016.01 is to be interpreted as removing or diminishing the requirements of 10 CFR 73.24.

13-016.03 For a shipment of plutonium by air which is subject to 180 NAC 13-015.04, the licensee must, through special arrangement with the carrier, require compliance with 49 CFR 175.704, the DOT regulations applicable to the air transport of plutonium.

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13-017 OPENING INSTRUCTIONS: Before delivery of a package to a carrier for transport, the licensee must ensure that any special instructions needed to safely open the package have been sent to, or otherwise made available to, the consignee for the consignee's use in accordance with 180 NAC 4-038.

13-018 SHIPMENT RECORDS: Each licensee must maintain for a period of three years after shipment a record of each shipment of licensed material not exempt under 180 NAC 13-004, showing, where applicable:

1. Identification of the packaging by model number and serial number;
2. Verification that the packaging, as shipped, has no significant defects;
3. Volume and identification of coolant;
4. Type and quantity of licensed material in each package, and the total quantity of each shipment;
5. Date of the shipment;
6. Name and address of the transferee;
7. Address to which the shipment was made; and
8. Results of the determinations required by 180 NAC 13-015 and by the conditions of the package approval.

13-019 REPORTS The licensee must report to the Department within 30 days:

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1. Any instance in which there is significant reduction in the effectiveness of any packaging during use;
2. Details of any defects with safety significance in the packaging after first use, with the means employed to repair the defects and prevent their recurrence; or
3. Instances in which the conditions of approval in the Certificate of Compliance were not observed in making a shipment.

13-020 ADVANCE NOTIFICATION OF TRANSPORT OF NUCLEAR WASTE

13-020.01 Prior to the transport of any nuclear waste outside of the confines of the licensee's facility or other place of use or storage, or prior to the delivery of any nuclear waste to a carrier for transport, each licensee must provide advance notification of such transport to the governor, or governor's designee, of each state within or through which the waste will be transported.[4]

13-020.02 Advance notification is required only when:

1. The nuclear waste is required to be in Type B packaging for transportation;
2. The nuclear waste is being transported into, within, or through, a state enroute to a disposal facility or to a collection point for transport to a disposal facility; and
3. The quantity of licensed material in a single package exceeds:

    a. 3000 times the A_1 value of the radionuclides as specified in Appendix 13-A, Table I for special form radioactive material;
    b. 3000 times the A_2 value of the radionuclides as specified in Appendix 13-A, Table I for normal form radioactive material; or
    c. 1000 TBq (27,000 Ci).

13-020.03 Each advance notification required by 180 NAC 13-020.01 must contain the following information:

1. The name, address, and telephone number of the shipper, carrier, and receiver of the shipment;
2. A description of the nuclear waste contained in the shipment as required by 49 CFR 172.202 and 172.203(d);
3. The point of origin of the shipment and the seven-day period during which departure of the shipment is estimated to occur;
4. The seven-day period during which arrival of the shipment at state boundaries is estimated to occur;
5. The destination of the shipment, and the seven-day period during which arrival of the shipment is estimated to occur; and
6. A point of contact with a telephone number for current shipment information.

13-020.04 The notification required by 180 NAC 13-020.01 must be made in writing to the office of each appropriate governor, or governor's designee, and to the Department. A notification delivered by mail must be postmarked at least seven days before the beginning of the seven-day period during which departure of the shipment is estimated to occur. A notification delivered by messenger must reach the office of the governor, or governor's designee, at least four days before the beginning of the seven-day period during which departure of the shipment is estimated to occur. A copy of the notification must be retained by the licensee for one year.

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[4]A list of the mailing addresses of the governors and governors' designees is available upon request from the Director, Office of State Programs, NRC, Washington, D.C. 20555. The list will be published annually in the Federal register on or about June 30 to reflect any changes in information.

13-020.05 The licensee must notify each appropriate governor, or governor's designee, and the Department of any changes to schedule information provided pursuant to 180 NAC 13-020.01. Such notification must be by telephone to a responsible individual in the office of the governor, or governor's designee, of the appropriate state or states. The licensee must maintain for one year a record of the name of the individual contacted.

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13-020.06 Each licensee who cancels a nuclear waste shipment, for which advance notification has been sent, must send a cancellation notice, identifying the advance notification that is being canceled, to the governor, or governor's designee, of each appropriate state and to the Department. A copy of the notice must be retained by the licensee for one year.

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13-021 QUALITY ASSURANCE REQUIREMENTS

13-021.01 Unless otherwise authorized by the Department, each licensee, certificate holder and applicant for a CoC must establish, maintain, and execute a quality assurance program to verify by procedures such as checking, auditing, and inspection that deficiencies, deviations, and defective material and equipment relating to the shipment of packages containing radioactive material are promptly identified and corrected.

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13-021.02 The licensee, certificate holder and applicant for a CoC must identify the material and components to be covered by the quality assurance program.

13-021.03 Each licensee, certificate holder and applicant for a CoC must document the quality assurance program by written procedures or instructions and must carry out the program in accordance with those procedures throughout the period during which packaging is used.

13-021.04 Prior to the use of any package for the shipment of radioactive material, each licensee, certificate holder and applicant for a CoC must obtain approval by the Department of its quality assurance program.

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13-021.05 The licensee, certificate holder and applicant for a CoC must maintain sufficient written records to demonstrate compliance with the quality assurance program. Records of quality assurance pertaining to the use of a package for shipment of radioactive material must be maintained for a period of three years after shipment.

13-021.06 The licensee, certificate holder and applicant for a CoC must maintain a program for transport container inspection and maintenance limited to radiographic exposure devices, source changer, or packages transporting these devices and meeting the requirements of 180 NAC 5-011 or equivalent Agreement State or U.S. Nuclear Regulatory Commission requirements.

APPENDIX 13-A

DETERMINATION OF A_1 AND A_2

I. Values of A_1 and A_2 for individual radionuclides, which are the bases for many activity limits elsewhere in these regulations are given in Table A-1. The curie (Ci) values specified are obtained by converting from the Terabecquerel (TBq) value. The curie values are expressed to three significant figures to assure that the difference in the TBq and Ci quantities is one tenth of one percent or less. Where values of A_1 or A_2 are unlimited, it is for radiation control purposes only. For nuclear criticality safety, some materials are subject to controls placed on fissile material.

II. a. For individual radionuclides whose identities are known, but which are not listed in Table A-1, the A_1 and A_2 values contained in Table A-3 may be used. Otherwise the licensee must obtain prior Department approval of the A_1 and A_2 values for radionuclides not listed in Table A-1, before shipping the material.

b. For individual radionuclides whose identities are known, but which are not listed in Table A-2, the exempt material activity concentration and exempt consignment activity values contained in Table A-3 may be used. Otherwise, the licensee must obtain prior Department approval of the exempt material activity concentration and exempt consignment activity values for radionuclides not listed in Table A-2, before shipping the material.

c. The licensee must submit requests for prior approval, described under paragraphs II.a. and II.b. of this Appendix, to the Department, in accordance with 180 NAC 1-012.

III. In the calculations of A_1 and A_2 for a radionuclide not in Table A-1, a single radioactive decay chain, in which radionuclides are present in their naturally occurring proportions, and in which no daughter radionuclide has a half-life either longer than 10 days, or longer than that of the parent radionuclide, must be considered as a single radionuclide, and the activity to be taken into account, and the A_1 and A_2 value to be applied must be those corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter radionuclide has a half-life either longer than 10 days, or greater than that of the parent radionuclide, the parent and those daughter radionuclides must be considered as mixtures of different nuclides.

IV. For mixtures of radionuclides whose identities and respective activities are known, the following conditions apply:

a. For special form radioactive material, the maximum quantity transported in a Type A package is as follows:

$$\sum_i \frac{B(i)}{A_1(i)} \leq 1$$

where B(i) is the activity of radionuclide i, and $A_1(i)$ is the A_1 value for radionuclide I.

b. For normal form radioactive material, the maximum quantity transported in a Type A package is a follows:

$$\sum B(i)/A2(i) \leq$$

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APPENDIX 13-A

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where B(i) is the activity of radionuclide i and $A_2(i)$ is the $A_2(i)$ value for radionuclide i.

c. Alternatively, the A_1 value for mixtures of special form material may be determined as follows:

$$A_1 \text{ for mixture} = \frac{1}{\sum_i \frac{f(i)}{A_1(i)}}$$

where f(i) is the fraction of activity for radionuclide i in the mixture and A_1 (i) is the appropriate A_1 value for radionuclide i.

d. Alternatively, the A_2 value for mixtures of normal form material may be determined as follows:

$$A_2 \text{ for mixture} = \frac{1}{\sum_i \frac{f(i)}{A_2(i)}}$$

where f(i) is the fraction of activity of radionuclide i in the mixture and $A_2(i)$ is the appropriate A_2 value for radionuclide i.

e. The exempt activity concentration for mixture of nuclides may be determined as follows:

$$\text{Exempt activity concentration for mixture} = \frac{1}{\sum_i \frac{f(i)}{[A](i)}}$$

Where f(i) is the fraction of activity concentration of radionuclide I in the mixture, and [A] is the activity concentration for exempt material containing radionuclide I.

f. The activity limit for an exempt consignment for mixtures of radionuclides may be determined as follows:

$$\text{Exempt consignment activity limits for mixture} = \frac{1}{\sum_i \frac{f(i)}{A(i)}}$$

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APPENDIX 13-A

where f(i) is the fraction of activity of radionuclide I in the mixture, and A is the activity limit for exempt consignments for radionuclide I.

V. When the identity of each radionuclide is known, but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest A_1 or A_2 value, as appropriate, for the radionuclides in each group may be used in applying the formulas in paragraph IV. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest A_1 or A_2 values for the alpha emitters and beta/gamma emitters.

APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
Ac-225 (a)	Actinium (89)	$8.0X10^{-1}$	$2.2X10^{1}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$2.1X10^{3}$	$5.8X10^{4}$
Ac-227 (a)		$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-5}$	$2.4X10^{-3}$	2.7	$7.2X10^{1}$
Ac-228		$6.0X10^{-1}$	$1.6X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$8.4X10^{4}$	$2.2X10^{6}$
Ag-105	Silver (47)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.1X10^{3}$	$3.0X10^{4}$
Ag-108m (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$9.7X10^{-1}$	$2.6X10^{1}$
Ag-110m (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.8X10^{2}$	$4.7X10^{3}$
Ag-111		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$5.8X10^{3}$	$1.6X10^{5}$
Al-26	Aluminum (13)	$1.0X10^{-1}$	2.7	$1.0X10^{-1}$	2.7	$7.0X10^{-4}$	$1.9X10^{-2}$
Am-241	Americium (95)	$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$1.3X10^{-1}$	3.4
Am-242m (a)		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.6X10^{-1}$	$1.0X10^{1}$
Am-243 (a)		5.0	$1.4X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$7.4X10^{-3}$	$2.0X10^{-1}$
Ar-37	Argon (18)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.7X10^{4}$	$9.9X10^{4}$
Ar-39		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{1}$	$5.4X10^{2}$	1.3	$3.4X10^{1}$
Ar-41		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.5X10^{6}$	$4.2X10^{7}$
As-72	Arsenic (33)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$6.2X10^{4}$	$1.7X10^{6}$
As-73		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$8.2X10^{2}$	$2.2X10^{4}$
As-74		1.0	$2.7X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$3.7X10^{3}$	$9.9X10^{4}$
As-76		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$5.8X10^{4}$	$1.6X10^{6}$
As-77		$2.0X10^{1}$	$5.4X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$3.9X10^{4}$	$1.0X10^{6}$
At-211 (a)	Astatine (85)	$2.0X10^{1}$	$5.4X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$7.6X10^{4}$	$2.1X10^{6}$
Au-193	Gold (79)	7.0	$1.9X10^{2}$	2.0	$5.4X10^{1}$	$3.4X10^{3}$	$9.2X10^{5}$
Au-194		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.5X10^{4}$	$4.1X10^{5}$
Au-195	Gold (79)	$1.0X10^{1}$	$2.7X10^{2}$	6.0	$1.6X10^{2}$	$1.4X10^{2}$	$3.7X10^{3}$
Au-198		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$9.0X10^{3}$	$2.4X10^{5}$
Au-199		$1.0X10^{1}$	$2.7X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$7.7X10^{3}$	$2.1X10^{5}$
Ba-131 (a)	Barium (56)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$3.1X10^{3}$	$8.4X10^{4}$
Ba-133		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	9.4	$2.6X10^{2}$
Ba-133m		$2.0X10^{1}$	$5.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.2X10^{4}$	$6.1X10^{5}$
Ba-140 (a)		$5.0X10^{-1}$	$1.4X10^{1}$	$3.0X10^{-1}$	8.1	$2.7X10^{3}$	$7.3X10^{4}$
Be-7	Beryllium (4)	$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$1.3X10^{4}$	$3.5X10^{5}$
Be-10		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-1}$	$1.6X10^{1}$	$8.3X10^{-4}$	$2.2X10^{-2}$
Bi-205	Bismuth (83)	$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$1.5X10^{-3}$	$4.2X10^{4}$
Bi-206		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$3.8X10^{3}$	$1.0X10^{5}$
Bi-207		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	1.9	$5.2X10^{1}$
Bi-210		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.6X10^{3}$	$1.2X10^{5}$
Bi-210m (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$2.1X10^{-5}$	$5.7X10^{-4}$
Bi-212 (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$5.4X10^{5}$	$1.5X10^{7}$
Bk-247	Berkelium (97)	8.0	$2.2X10^{2}$	$8.0X10^{-4}$	$2.2X10^{-2}$	$3.8X10^{-2}$	1.0
Bk-249 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{-1}$	8.1	$6.1X10^{1}$	$1.6X10^{3}$
Br-76	Bromine (35)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$9.4X10^{4}$	$2.5X10^{6}$
Br-77		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$2.6X10^{4}$	$7.1X10^{5}$
Br-82		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{4}$	$1.1X10^{6}$
C-11	Carbon (6)	1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.1X10^{7}$	$8.4X10^{8}$
C-14		$4.0X10^{1}$	$1.1X10^{3}$	3.0	$8.1X10^{1}$	$1.6X10^{-1}$	4.5
Ca-41	Calcium (20)	Unlimited	Unlimited	Unlimited	Unlimited	$3.1X10^{-3}$	$8.5X10^{-2}$
Ca-45		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$6.6X10^{2}$	$1.8X10^{4}$
Ca-47 (a)		3.0	$8.1X10^{1}$	$3.0X10^{-1}$	8.1	$2.3X10^{4}$	$6.1X10^{5}$
Cd-109	Cadmium (48)	$3.0X10^{1}$	$8.1X10^{2}$	2.0	$5.4X10^{1}$	$9.6X10^{1}$	$2.6X10^{3}$
Cd-113m		$4.0X10^{1}$	$1.1X10^{3}$	$5.0X10^{-1}$	$1.4X10^{1}$	8.3	$2.2X10^{2}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
Cd-115 (a)		3.0	$8.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.9X10^{4}$	$5.1X10^{5}$
Cd-115m		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$9.4X10^{2}$	$2.5X10^{4}$
Ce-139	Cerium (58)	7.0	$1.9X10^{2}$	2.0	$5.4X10^{1}$	$2.5X10^{2}$	$6.8X10^{3}$
Ce-141		$2.0X10^{1}$	$5.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.1X10^{3}$	$2.8X10^{4}$
Ce-143		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{4}$	$6.6X10^{5}$
Ce-144 (a)		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.2X10^{2}$	$3.2X10^{3}$
Cf-248	Californium (98)	$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$5.8X10^{1}$	$1.6X10^{3}$
Cf-249		3.0	$8.1X10^{1}$	$8.0X10^{-4}$	$2.2X10^{-2}$	$1.5X10^{-1}$	4.1
Cf-250		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	4.0	$1.1X10^{2}$
Cf-251		7.0	$1.9X10^{2}$	$7.0X10^{-4}$	$1.9X10^{-2}$	$5.9X10^{-7}$	1.6
Cf-252 (h)		$5.0X10^{-2}$	1.35	$3.0X10^{-3}$	$8.1X10^{-2}$	$2.0X10^{1}$	$5.4X10^{2}$
Cf-253 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{-2}$	1.1	$1.1X10^{3}$	$2.9X10^{4}$
Cf-254		$1.0X10^{-3}$	$2.7X10^{-2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.1X10^{2}$	$8.5X10^{3}$
Cl-36	Chlorine (17)	$1.0X10^{1}$	$2.7X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.2X10^{-3}$	$3.3X10^{-2}$
Cl-38		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$4.9X10^{6}$	$1.3X10^{8}$
Cm-240	Curium (96)	$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$7.5X10^{2}$	$2.0X10^{4}$
Cm-241		2.0	$5.4X10^{1}$	1.0	$2.7X10^{1}$	$6.1X10^{2}$	$1.7X10^{4}$
Cm-242		$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{-2}$	$2.7X10^{-1}$	$1.2X10^{2}$	$3.3X10^{3}$
Cm-243		9.0	$2.4X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$1.9X10^{-3}$	$5.2X10^{1}$
Cm-244		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	3.0	$8.1X10^{1}$
Cm-245		9.0	$2.4X10^{2}$	$9.0X10^{-3}$	$2.4X10^{-2}$	$6.4X10^{-3}$	$1.7X10^{-1}$
Cm-246		9.0	$2.4X10^{2}$	$9.0X10^{-3}$	$2.4X10^{-2}$	$1.1X10^{-2}$	$3.1X10^{-1}$
Cm-247 (a)		3.0	$8.1X10^{1}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.4X10^{-6}$	$9.3X10^{-5}$
Cm-248		$2.0X10^{-2}$	$5.4X10^{-1}$	$3.0X10^{-4}$	$8.1X10^{-3}$	$1.6X10^{-5}$	$4.2X10^{-4}$
Co-55	Cobalt (27)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.1X10^{5}$	$3.1X10^{6}$
Co-56		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.1X10^{3}$	$3.0X10^{4}$
Co-57		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$3.1X10^{2}$	$8.4X10^{3}$
Co-58		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.2X10^{3}$	$3.2X10^{4}$
Co-58m		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$2.2X10^{5}$	$5.9X10^{6}$
Co-60		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.2X10^{1}$	$1.1X10^{3}$
Cr-51	Chromium (24)	$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$3.4X10^{3}$	$9.2X10^{4}$
Cs-129	Cesium (55)	4.0	$1.1X10^{2}$	4.0	$1.1X10^{2}$	$2.8X10^{5}$	$7.6X10^{5}$
Cs-131		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$3.8X10^{3}$	$1.0X10^{5}$
Cs-132		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$5.7X10^{3}$	$1.5X10^{5}$
Cs-134		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.8X10^{1}$	$1.3X10^{3}$
Cs-134m		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{5}$	$8.0X10^{6}$
Cs-135		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$4.3X10^{-5}$	$1.2X10^{-3}$
Cs-136		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.7X10^{3}$	$7.3X10^{4}$
Cs-137 (a)		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	3.2	$8.7X10^{1}$
Cu-64	Copper (29)	6.0	$1.6X10^{2}$	1.0	$2.7X10^{1}$	$1.4X10^{5}$	$3.9X10^{6}$
Cu-67		$1.0X10^{1}$	$2.7X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$2.8X10^{4}$	$7.6X10^{5}$
Dy-159	Dysprosium (66)	$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$2.1X10^{2}$	$5.7X10^{3}$
Dy-165		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{5}$	$8.2X10^{6}$
Dy-166 (a)		$9.0X10^{-1}$	$2.4X10^{1}$	$3.0X10^{-1}$	8.1	$8.6X10^{4}$	$2.3X10^{5}$
Er-169	Erbium (68)	$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$3.1X10^{3}$	$8.3X10^{4}$
Er-171		$8.0X10^{-1}$	$2.2X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$9.0X10^{4}$	$2.4X10^{6}$
Eu-147	Europium (63)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.4X10^{3}$	$3.7X10^{4}$
Eu-148		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.0X10^{2}$	$1.6X10^{4}$
Eu-149		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$3.5X10^{2}$	$9.4X10^{3}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
Eu-150 (short lived)		2.0	$5.4X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$6.1X10^{4}$	$1.6X10^{6}$
Eu-150 (long lived)		7×10^{-1}	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$6.1X10^{4}$	$1.6X10^{6}$
Eu-152		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	6.5	$1.8X10^{2}$
Eu-152m		$8.0X10^{-1}$	$2.2X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$8.2X10^{4}$	$2.2X10^{6}$
Eu-154		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	9.8	$2.6X10^{2}$
Eu-155		$2.0X10^{1}$	$5.4X10^{2}$	3.0	$8.1X10^{1}$	$1.8X10^{1}$	$4.9X10^{2}$
Eu-156		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$2.0X10^{3}$	$5.5X10^{4}$
F-18	Fluorine (9)	1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.5X10^{6}$	$9.5X10^{7}$
Fe-52 (a)	Iron (26)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$2.7X10^{5}$	$7.3X10^{6}$
Fe-55		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$8.8X10^{1}$	$2.4X10^{3}$
Fe-59		$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$1.8X10^{3}$	$5.0X10^{4}$
Fe-60 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-1}$	5.4	$7.4X10^{-4}$	$2.0X10^{-2}$
Ga-67	Gallium (31)	7.0	$1.9X10^{2}$	3.0	$8.1X10^{1}$	$2.2X10^{4}$	$6.0X10^{5}$
Ga-68		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.5X10^{6}$	$4.1X10^{7}$
Ga-72		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.1X10^{5}$	$3.1X10^{6}$
Gd-146 (a)	Gadolinium (64)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.9X10^{2}$	$1.9X10^{4}$
Gd-148		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	1.2	$3.2X10^{1}$
Gd-153		$1.0X10^{1}$	$2.7X10^{2}$	9.0	$2.4X10^{2}$	$1.3X10^{2}$	$3.5X10^{3}$
Gd-159		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.9X10^{4}$	$1.1X10^{6}$
Ge-68 (a)	Germanium (32)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.6X10^{2}$	$7.1X10^{3}$
Ge-71		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$5.8X10^{3}$	$1.6X10^{5}$
Ge-77		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.3X10^{5}$	$3.6X10^{6}$
Hf-172 (a)	Hafnium (72)	$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.1X10^{1}$	$1.1X10^{3}$
Hf-175		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$3.9X10^{2}$	$1.1X10^{4}$
Hf-181		2.0	$5.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.3X10^{2}$	$1.7X10^{4}$
Hf-182		Unlimited	Unlimited	Unlimited	Unlimited	$8.1X10^{-6}$	$2.2X10^{-4}$
Hg-194 (a)	Mercury (80)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.3X10^{-1}$	3.5
Hg-195m (a)		3.0	$8.1X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$1.5X10^{4}$	$4.0X10^{5}$
Hg-197		$2.0X10^{1}$	$5.4X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$9.2X10^{3}$	$2.5X10^{5}$
Hg-197m		$1.0X10^{1}$	$2.7X10^{2}$	$4.0X10^{-1}$	$1.1X10^{1}$	$2.5X10^{4}$	$6.7X10^{5}$
Hg-203		5.0	$1.4X10^{2}$	1.0	$2.7X10^{1}$	$5.1X10^{2}$	$1.4X10^{4}$
Ho-166	Holmium (67)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$2.6X10^{4}$	$7.0X10^{5}$
Ho-166m		$6.0X10^{-1}$	$1.6X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.6X10^{-2}$	1.8
I-123	Iodine (53)	6.0	$1.6X10^{2}$	3.0	$8.1X10^{1}$	$7.1X10^{4}$	$1.9X10^{6}$
I-124		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$9.3X10^{3}$	$2.5X10^{5}$
I-125		$2.0X10^{1}$	$5.4X10^{2}$	3.0	$8.1X10^{1}$	$6.4X10^{2}$	$1.7X10^{4}$
I-126		2.0	$5.4X10^{1}$	1.0	$2.7X10^{1}$	$2.9X10^{3}$	$8.0X10^{4}$
I-129		Unlimited	Unlimited	Unlimited	Unlimited	$6.5X10^{-6}$	$1.8X10^{-4}$
I-131		3.0	$8.1X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.6X10^{3}$	$1.2X10^{5}$
I-132		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.8X10^{5}$	$1.0X10^{7}$
I-133		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.2X10^{4}$	$1.1X10^{6}$
I-134		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$9.9X10^{5}$	$2.7X10^{7}$
I-135 (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.3X10^{5}$	$3.5X10^{6}$
In-111	Indium (49)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$1.5X10^{4}$	$4.2X10^{5}$
In-113m		4.0	$1.1X10^{2}$	2.0	$5.4X10^{1}$	$6.2X10^{5}$	$1.7X10^{7}$
In-114m (a)		$1.0X10^{1}$	$2.7X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$8.6X10^{2}$	$2.3X10^{4}$
In-115m		7.0	$1.9X10^{2}$	1.0	$2.7X10^{1}$	$2.2X10^{5}$	$6.1X10^{6}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
Ir-189 (a)	Iridium (77)	$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$1.9X10^{3}$	$5.2X10^{4}$
Ir-190		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$2.3X10^{3}$	$6.2X10^{4}$
Ir-192 (c)		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.4X10^{2}$	$9.2X10^{3}$
Ir-194		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$3.1X10^{4}$	$8.4X10^{5}$
K-40	Potassium (19)	$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$2.4X10^{-7}$	$6.4X10^{-6}$
K-42		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$2.2X10^{2}$	$6.0X10^{3}$
K-43		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.2X10^{5}$	$3.3X10^{6}$
Kr-81	Krypton (36)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$7.8X10^{-4}$	$2.1X10^{-2}$
Kr-85		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$1.5X10^{1}$	$3.9X10^{2}$
Kr-85m		8.0	$2.2X10^{2}$	3.0	$8.1X10^{1}$	$3.0X10^{3}$	$8.2X10^{4}$
Kr-87		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.0X10^{0}$	$2.8X10^{1}$
La-137	Lanthanum (57)	$3.0X10^{1}$	$8.1X10^{2}$	6.0	$1.6X10^{2}$	$1.6X10^{-3}$	$4.4X10^{-2}$
La-140		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$2.1X10^{3}$	$5.6X10^{4}$
Lu-172	Lutetium (71)	$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.2X10^{3}$	$1.1X10^{5}$
Lu-173		8.0	$2.2X10^{2}$	8.0	$2.2X10^{2}$	$5.6X10^{1}$	$1.5X10^{3}$
Lu-174		9.0	$2.4X10^{2}$	9.0	$2.4X10^{2}$	$2.3X10^{1}$	$6.2X10^{2}$
Lu-174m		$2.0X10^{1}$	$5.4X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$2.0X10^{2}$	$5.3X10^{3}$
Lu-177		$3.0X10^{1}$	$8.1X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.1X10^{3}$	$1.1X10^{5}$
Mg-28 (a)	Magnesium (12)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$2.0X10^{5}$	$5.4X10^{6}$
Mn-52	Manganese (25)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.6X10^{4}$	$4.4X10^{5}$
Mn-53		Unlimited	Unlimited	Unlimited	Unlimited	$6.8X10^{-5}$	$1.8X10^{-3}$
Mn-54		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$2.9X10^{2}$	$7.7X10^{3}$
Mn-56		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$8.0X10^{5}$	$2.2X10^{7}$
Mo-93	Molybdenum (42)	$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{1}$	$5.4X10^{2}$	$4.1X10^{-2}$	1.1
Mo-99 (a) (i)		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.8X10^{4}$	$4.8X10^{5}$
N-13	Nitrogen (7)	$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$5.4X10^{7}$	$1.5X10^{9}$
Na-22	Sodium (11)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.3X10^{2}$	$6.3X10^{3}$
Na-24		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$3.2X10^{5}$	$8.7X10^{6}$
Nb-93m	Niobium (41)	$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	8.8	$2.4X10^{2}$
Nb-94		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$6.9X10^{-3}$	$1.9X10^{-1}$
Nb-95		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.5X10^{3}$	$3.9X10^{4}$
Nb-97		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$9.9X10^{5}$	$2.7X10^{7}$
Nd-147	Neodymium (60)	6.0	$1.6X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{3}$	$8.1X10^{4}$
Nd-149		$6.0X10^{-1}$	$1.6X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$4.5X10^{6}$	$1.2X10^{8}$
Ni-59	Nickel (28)	Unlimited	Unlimited	Unlimited	Unlimited	$3.0X10^{-3}$	$8.0X10^{-2}$
Ni-63		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	2.1	$5.7X10^{1}$
Ni-65		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$7.1X10^{5}$	$1.9X10^{7}$
Np-235	Neptunium (93)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$5.2X10^{1}$	$1.4X10^{3}$
Np-236 (short-lived)		$2.0X10^{1}$	$5.4X10^{2}$	2.0	$5.4X10^{1}$	$4.7X10^{-4}$	$1.3X10^{-2}$
Np-236 (long-lived)		$9.0X10^{0}$	$2.4X10^{2}$	$2.0x10^{-2}$	$5.4X10^{-1}$	$4.7X10^{-4}$	$1.3X10^{-2}$
Np-237		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	$2.6X10^{-5}$	$7.1X10^{-4}$
Np-239		7.0	$1.9X10^{2}$	$4.0X10^{-1}$	$1.1X10^{1}$	$8.6X10^{3}$	$2.3X10^{5}$
Os-185	Osmium (76)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$2.8X10^{2}$	$7.5X10^{3}$
Os-191		$1.0X10^{1}$	$2.7X10^{2}$	2.0	$5.4X10^{1}$	$1.6X10^{1}$	$4.4X10^{2}$
Os-191m		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	$4.6X10^{4}$	$1.3X10^{6}$
Os-193		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.0X10^{4}$	$5.3X10^{5}$
Os-194 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.1X10^{1}$	$3.1X10^{2}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
P-32	Phosphorus (15)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.1X10^{4}$	$2.9X10^{5}$
P-33		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$5.8X10^{3}$	$1.6X10^{5}$
Pa-230 (a)	Protactinium (91)	2.0	$5.4X10^{1}$	$7.0X10^{-2}$	1.9	$1.2X10^{3}$	$3.3X10^{4}$
Pa-231		4.0	$1.1X10^{2}$	$4.0X10^{-4}$	$1.1X10^{-2}$	$1.7X10^{-3}$	$4.7X10^{-2}$
Pa-233		5.0	$1.4X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$7.7X10^{2}$	$2.1X10^{4}$
Pb-201	Lead (82)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$6.2X10^{4}$	$1.7X10^{6}$
Pb-202		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{1}$	$5.4X10^{2}$	$1.2X10^{-4}$	$3.4X10^{-3}$
Pb-203		4.0	$1.1X10^{2}$	3.0	$8.1X10^{1}$	$1.1X10^{4}$	$3.0X10^{5}$
Pb-205		Unlimited	Unlimited	Unlimited	Unlimited	$4.5X10^{-6}$	$1.2X10^{-4}$
Pb-210 (a)		1.0	$2.7X10^{1}$	$5.0X10^{-2}$	1.4	2.8	$7.6X10^{1}$
Pb-212 (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$2.0X10^{-1}$	5.4	$5.1X10^{3}$	$1.4X10^{6}$
Pd-103 (a)	Palladium (46)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$2.8X10^{3}$	$7.5X10^{4}$
Pd-107		Unlimited	Unlimited	Unlimited	Unlimited	$1.9X10^{-5}$	$5.1X10^{-4}$
Pd-109		2.0	$5.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$7.9X10^{4}$	$2.1X10^{6}$
Pm-143	Promethium (61)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$1.3X10^{2}$	$3.4X10^{3}$
Pm-144		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$9.2X10^{1}$	$2.5X10^{3}$
Pm-145		$3.0X10^{1}$	$8.1X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	5.2	$1.4X10^{2}$
Pm-147		$4.0X10^{1}$	$1.1X10^{3}$	2.0	$5.4X10^{1}$	$3.4X10^{1}$	$9.3X10^{2}$
Pm-148m (a)		$8.0X10^{-1}$	$2.2X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$7.9X10^{2}$	$2.1X10^{4}$
Pm-149		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.5X10^{4}$	$4.0X10^{5}$
Pm-151		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.7X10^{4}$	$7.3X10^{5}$
Po-210	Polonium (84)	$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$1.7X10^{2}$	$4.5X10^{3}$
Pr-142	Praseodymium (59)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.3X10^{4}$	$1.2X10^{6}$
Pr-143		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{3}$	$6.7X10^{4}$
Pt-188 (a)	Platinum (78)	1.0	$2.7X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$2.5X10^{3}$	$6.8X10^{4}$
Pt-191		4.0	$1.1X10^{2}$	3.0	$8.1X10^{1}$	$8.7X10^{3}$	$2.4X10^{5}$
Pt-193		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	1.4	$3.7X10^{1}$
Pt-193m		$4.0X10^{1}$	$1.1X10^{3}$	$5.0X10^{-1}$	$1.4X10^{1}$	$5.8X10^{3}$	$1.6X10^{5}$
Pt-195m		$1.0X10^{1}$	$2.7X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.2X10^{3}$	$1.7X10^{5}$
Pt-197		$2.0X10^{1}$	$5.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.2X10^{4}$	$8.7X10^{5}$
Pt-197m		$1.0X10^{1}$	$2.7X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.7X10^{5}$	$1.0X10^{7}$
Pu-236	Plutonium (94)	$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{-3}$	$8.1X10^{-2}$	$2.0X10^{1}$	$5.3X10^{2}$
Pu-237		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$4.5X10^{2}$	$1.2X10^{4}$
Pu-238		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$6.3X10^{-1}$	$1.7X10^{1}$
Pu-239		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$2.3X10^{-3}$	$6.2X10^{-2}$
Pu-240		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$8.4X10^{-3}$	$2.3X10^{-1}$
Pu-241 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-2}$	1.6	3.8	$1.0X10^{2}$
Pu-242		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$1.5X10^{-4}$	$3.9X10^{-3}$
Pu-244 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$6.7X10^{-7}$	$1.8X10^{-5}$
Ra-223 (a)	Radium (88)	$4.0X10^{-1}$	$1.1X10^{1}$	$7.0X10^{-3}$	$1.9X10^{-1}$	$1.9X10^{3}$	$5.1X10^{4}$
Ra-224 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$5.9X10^{3}$	$1.6X10^{5}$
Ra-225 (a)		$2.0X10^{-1}$	5.4	$4.0X10^{-3}$	$1.1X10^{-1}$	$1.5X10^{3}$	$3.9X10^{4}$
Ra-226 (a)		$2.0X10^{-1}$	5.4	$3.0X10^{-3}$	$8.1X10^{-2}$	$3.7X10^{-2}$	1.0
Ra-228 (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$1.0X10^{1}$	$2.7X10^{2}$
Rb-81	Rubidium (37)	2.0	$5.4X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.1X10^{5}$	$8.4X10^{6}$
Rb-83 (a)		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$6.8X10^{2}$	$1.8X10^{4}$
Rb-84		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.8X10^{3}$	$4.7X10^{4}$
Rb-86		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$3.0X10^{3}$	$8.1X10^{4}$
Rb-87		Unlimited	Unlimited	Unlimited	Unlimited	$3.2X10^{-9}$	$8.6X10^{-8}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
Rb(nat)		Unlimited	Unlimited	Unlimited	Unlimited	$6.7X10^{6}$	$1.8X10^{8}$
Re-184	Rhenium (75)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$6.9X10^{2}$	$1.9X10^{4}$
Re-184m		3.0	$8.1X10^{1}$	1.0	$2.7X10^{1}$	$1.6X10^{2}$	$4.3X10^{3}$
Re-186		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$6.9X10^{3}$	$1.9X10^{5}$
Re-187		Unlimited	Unlimited	Unlimited	Unlimited	$1.4X10^{-9}$	$3.8X10^{-8}$
Re-188		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.6X10^{4}$	$9.8X10^{5}$
Re-189 (a)		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{4}$	$6.8X10^{5}$
Re(nat)		Unlimited	Unlimited	Unlimited	Unlimited	0.0	$2.4X10^{-8}$
Rh-99	Rhodium (45)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$3.0X10^{3}$	$8.2X10^{4}$
Rh-101		4.0	$1.1X10^{2}$	3.0	$8.1X10^{1}$	$4.1X10^{1}$	$1.1X10^{3}$
Rh-102		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$4.5X10^{1}$	$1.2X10^{3}$
Rh-102m		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$2.3X10^{2}$	$6.2X10^{3}$
Rh-103m		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$1.2X10^{6}$	$3.3X10^{7}$
Rh-105		$1.0X10^{1}$	$2.7X10^{2}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.1X10^{4}$	$8.4X10^{5}$
Rn-222 (a)	Radon (86)	$3.0X10^{-1}$	8.1	$4.0X10^{-3}$	$1.1X10^{-1}$	$5.7X10^{3}$	$1.5X10^{5}$
Ru-97	Ruthenium (44)	5.0	$1.4X10^{2}$	5.0	$1.4X10^{2}$	$1.7X10^{4}$	$4.6X10^{5}$
Ru-103 (a)		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.2X10^{3}$	$3.2X10^{4}$
Ru-105		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{5}$	$6.7X10^{6}$
Ru-106 (a)		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.2X10^{2}$	$3.3X10^{3}$
S-35	Sulphur (16)	$4.0X10^{1}$	$1.1X10^{3}$	3.0	$8.1X10^{1}$	$1.6X10^{3}$	$4.3X10^{4}$
Sb-122	Antimony (51)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.5X10^{4}$	$4.0X10^{5}$
Sb-124		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$6.5X10^{2}$	$1.7X10^{4}$
Sb-125		2.0	$5.4X10^{1}$	1.0	$2.7X10^{1}$	$3.9X10^{1}$	$1.0X10^{3}$
Sb-126		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.1X10^{3}$	$8.4X10^{4}$
Sc-44	Scandium (21)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.7X10^{5}$	$1.8X10^{7}$
Sc-46		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.3X10^{3}$	$3.4X10^{4}$
Sc-47		$1.0X10^{1}$	$2.7X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$3.1X10^{4}$	$8.3X10^{5}$
Sc-48		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$5.5X10^{4}$	$1.5X10^{6}$
Se-75	Selenium (34)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$5.4X10^{2}$	$1.5X10^{4}$
Se-79		$4.0X10^{1}$	$1.1X10^{3}$	2.0	$5.4X10^{1}$	$2.6X10^{-3}$	$7.0X10^{-2}$
Si-31	Silicon (14)	$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.4X10^{6}$	$3.9X10^{7}$
Si-32		$4.0X10^{1}$	$1.1X10^{3}$	$5.0X10^{-1}$	$1.4X10^{1}$	3.9	$1.1X10^{2}$
Sm-145	Samarium (62)	$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$9.8X10^{1}$	$2.6X10^{3}$
Sm-147		Unlimited	Unlimited	Unlimited	Unlimited	$8.5X10^{-1}$	$2.3X10^{-8}$
Sm-151		$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{1}$	$2.7X10^{2}$	$9.7X10^{-1}$	$2.6X10^{1}$
Sm-153		9.0	$2.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.6X10^{4}$	$4.4X10^{5}$
Sn-113 (a)	Tin (50)	4.0	$1.1X10^{2}$	2.0	$5.4X10^{1}$	$3.7X10^{2}$	$1.0X10^{4}$
Sn-117m		7.0	$1.9X10^{2}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.0X10^{3}$	$8.2X10^{4}$
Sn-119m		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	$1.4X10^{2}$	$3.7X10^{3}$
Sn-121m (a)		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-1}$	$2.4X10^{1}$	2.0	$5.4X10^{1}$
Sn-123		$8.0X10^{-1}$	$2.2X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{2}$	$8.2X10^{3}$
Sn-125		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{3}$	$1.1X10^{5}$
Sn-126 (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.0X10^{-3}$	$2.8X10^{-2}$
Sr-82 (a)	Strontium (38)	$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$2.3X10^{3}$	$6.2X10^{4}$
Sr-85		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$8.8X10^{2}$	$2.4X10^{4}$
Sr-85m		5.0	$1.4X10^{2}$	5.0	$1.4X10^{2}$	$1.2X10^{6}$	$3.3X10^{7}$
Sr-87m		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$4.8X10^{5}$	$1.3X10^{7}$
Sr-89		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.1X10^{3}$	$2.9X10^{4}$
Sr-90 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	5.1	$1.4X10^{2}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
Sr-91 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.3X10^{5}$	$3.6X10^{6}$
Sr-92 (a)		1.0	$2.7X10^{1}$	$3.0X10^{-1}$	8.1	$4.7X10^{5}$	$1.3X10^{7}$
T(H-3)	Tritium (1)	$4.0X10^{1}$	$1.1X10^{2}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.6X10^{2}$	$9.7X10^{3}$
Ta-178 (long-lived)	Tantalum (73)	1.0	$2.7X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$4.2X10^{6}$	$1.1X10^{8}$
Ta-179		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$4.1X10^{1}$	$1.1X10^{3}$
Ta-182		$9.0X10^{-1}$	$2.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.3X10^{2}$	$6.2X10^{3}$
Tb-157	Terbium (65)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$5.6X10^{-1}$	$1.5X10^{1}$
Tb-158		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$5.6X10^{-1}$	$1.5X10^{1}$
Tb-160		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.2X10^{2}$	$1.1X10^{4}$
Tc-95m (a)	Technetium (43)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$8.3X10^{2}$	$2.2X10^{4}$
Tc-96		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.2X10^{4}$	$3.2X10^{5}$
Tc-96m (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.4X10^{6}$	$3.8X10^{7}$
Tc-97		Unlimited	Unlimited	Unlimited	Unlimited	$5.2X10^{-5}$	$1.4X10^{-3}$
Tc-97m		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$5.6X10^{2}$	$1.5X10^{4}$
Tc-98		$8.0X10^{-1}$	$2.2X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$3.2X10^{-5}$	$8.7X10^{-4}$
Tc-99		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-1}$	$2.4X10^{1}$	$6.3X10^{-4}$	$1.7X10^{-2}$
Tc-99m		$1.0X10^{1}$	$2.7X10^{2}$	4.0	$1.1X10^{2}$	$1.9X10^{5}$	$5.3X10^{6}$
Te-121	Tellurium (52)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$2.4X10^{3}$	$6.4X10^{4}$
Te-121m		5.0	$1.4X10^{2}$	3.0	$8.1X10^{1}$	$2.6X10^{2}$	$7.0X10^{3}$
Te-123m		8.0	$2.2X10^{2}$	1.0	$2.7X10^{1}$	$3.3X10^{2}$	$8.9X10^{3}$
Te-125m		$2.0X10^{1}$	$5.4X10^{2}$	$9.0X10^{-1}$	$2.4X10^{1}$	$6.7X10^{2}$	$1.8X10^{4}$
Te-127		$2.0X10^{1}$	$5.4X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$9.8X10^{4}$	$2.6X10^{6}$
Te-127m (a)		$2.0X10^{1}$	$5.4X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$3.5X10^{2}$	$9.4X10^{3}$
Te-129		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$7.7X10^{5}$	$2.1X10^{7}$
Te-129m (a)		$8.0X10^{-1}$	$2.2X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.1X10^{3}$	$3.0X10^{4}$
Te-131m (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$3.0X10^{4}$	$8.0X10^{5}$
Te-132 (a)		$5.0X10^{-1}$	$1.4X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.1X10^{4}$	$8.0X10^{5}$
Th-227	Thorium (90)	$1.0X10^{1}$	$2.7X10^{2}$	$5.0X10^{-3}$	$1.4X10^{-1}$	$1.1X10^{3}$	$3.1X10^{4}$
Th-228 (a)		$5.0X10^{-1}$	$1.4X10^{1}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.0X10^{1}$	$8.2X10^{2}$
Th-229		5.0	$1.4X10^{2}$	$5.0X10^{-4}$	$1.4X10^{-2}$	$7.9X10^{-3}$	$2.1X10^{-1}$
Th-230		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$7.6X10^{-4}$	$2.1X10^{-2}$
Th-231		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$2.0X10^{4}$	$5.3X10^{5}$
Th-232		Unlimited	Unlimited	Unlimited	Unlimited	$4.0X10^{-9}$	$1.1X10^{-7}$
Th-234 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$8.6X10^{2}$	$2.3X10^{4}$
Th(nat)		Unlimited	Unlimited	Unlimited	Unlimited	$8.1X10^{-9}$	$2.2X10^{-7}$
Ti-44 (a)	Titanium (22)	$5.0X10^{-1}$	$1.4X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	6.4	$1.7X10^{2}$
Tl-200	Thallium (81)	$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$2.2X10^{4}$	$6.0X10^{5}$
Tl-201		$1.0X10^{1}$	$2.7X10^{2}$	4.0	$1.1X10^{2}$	$7.9X10^{3}$	$2.1X10^{5}$
Tl-202		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$2.0X10^{3}$	$5.3X10^{4}$
Tl-204		$1.0X10^{1}$	$2.7X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$1.7X10^{1}$	$4.6X10^{2}$
Tm-167	Thulium (69)	7.0	$1.9X10^{2}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.1X10^{3}$	$8.5X10^{4}$
Tm-170		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.2X10^{2}$	$6.0X10^{3}$
Tm-171		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$
U-230 (fast lung absorption) (a)(d)	Uranium (92)	$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{-1}$	2.7	$1.0X10^{3}$	$2.7X10^{4}$
U-230 (medium lung absorption) (a)(e)		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{-3}$	$1.1X10^{-1}$	$1.0X10^{3}$	$2.7X10^{4}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
U-230 (slow lung absorption) (a)(f)		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{-3}$	$8.1X10^{-2}$	$1.0X10^{3}$	$2.7X10^{4}$
U-232 (fast lung absorption) (d)		$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{-2}$	$2.7X10^{-1}$	$8.3X10^{-1}$	$2.2X10^{1}$
U-232 (medium lung absorption) (e)		$4.0X10^{1}$	$1.1X10^{3}$	$7.0X10^{-3}$	$1.9X10^{-1}$	$8.3X10^{-1}$	$2.2X10^{1}$
U-232 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$8.3X10^{-1}$	$2.2X10^{1}$
U-233 (fast lung absorption) (d)		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-2}$	2.4	$3.6X10^{-4}$	$9.7X10^{-3}$
U-233 (medium lung absorption) (e)		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$3.6X10^{-4}$	$9.7X10^{-3}$
U-233 (slow lung absorption) (f)		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$3.6X10^{-4}$	$9.7X10^{-3}$
U-234 (fast lung absorption) (d)		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-2}$	2.4	$2.3X10^{-4}$	$6.2X10^{-3}$
U-234 (medium lung absorption) (e)		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$2.3X10^{-4}$	$6.2X10^{-3}$
U-234 (slow lung absorption) (f)		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$2.3X10^{-4}$	$6.2X10^{-3}$
U-235 (all lung absorption types) (a),(d),(e),(f)		Unlimited	Unlimited	Unlimited	Unlimited	$8.0X10^{-8}$	$2.2X10^{-6}$
U-236 (fast lung absorption) (d)		Unlimited	Unlimited	Unlimited	Unlimited	$2.4X10^{-6}$	$6.5X10^{-5}$
U-236 (medium lung absorption) (e)		$4.0x10^{1}$	$1.1X10^{3}$	$2.0x10^{-2}$	$5.4X10^{-1}$	$2.4X10^{-6}$	$6.5X10^{-5}$
U-236 (slow lung absorption) (f)		$4.0x10^{1}$	$1.1X10^{3}$	$6.0x10^{-3}$	$1.6X10^{-1}$	$2.4X10^{-6}$	$6.5X10^{-5}$
U-238 (all lung absorption types) (d),(e),(f)		Unlimited	Unlimited	Unlimited	Unlimited	$1.2X10^{-8}$	$3.4X10^{-7}$
U (nat)		Unlimited	Unlimited	Unlimited	Unlimited	$2.6X10^{-8}$	$7.1X10^{-7}$
U (enriched to 20% or less)(g)		Unlimited	Unlimited	Unlimited	Unlimited	§ 173.434	§ 173.434
U (dep)		Unlimited	Unlimited	Unlimited	Unlimited	§ 173.434	§ 173.434
V-48	Vanadium (23)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$6.3X10^{3}$	$1.7X10^{5}$
V-49		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{2}$	$8.1X10^{3}$
W-178 (a)	Tungsten (74)	9.0	$2.4X10^{2}$	5.0	$1.4X10^{2}$	$1.3X10^{3}$	$3.4X10^{4}$
W-181		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$2.2X10^{2}$	$6.0X10^{3}$
W-185		$4.0X10^{1}$	$1.1X10^{3}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.5X10^{2}$	$9.4X10^{3}$
W-187		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.6X10^{4}$	$7.0X10^{5}$
W-188 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$3.0X10^{-1}$	8.1	$3.7X10^{2}$	$1.0X10^{4}$
Xe-122 (a)	Xenon (54)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.8X10^{4}$	$1.3X10^{6}$
Xe-123		2.0	$5.4X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.4X10^{5}$	$1.2X10^{7}$
Xe-127		4.0	$1.1X10^{2}$	2.0	$5.4X10^{1}$	$1.0X10^{3}$	$2.8X10^{4}$
Xe-131m		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.1X10^{3}$	$8.4X10^{4}$

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APPENDIX 13-A, TABLE A-1 - A_1 AND A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity (TBq/g)	Specific activity (Ci/g)
Xe-133		$2.0X10^{1}$	$5.4X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$6.9X10^{3}$	$1.9X10^{5}$
Xe-135		3.0	$8.1X10^{1}$	2.0	$5.4X10^{1}$	$9.5X10^{4}$	$2.6X10^{6}$
Y-87 (a)	Yttrium (39)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.7X10^{4}$	$4.5X10^{5}$
Y-88		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$5.2X10^{2}$	$1.4X10^{4}$
Y-90		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$2.0X10^{4}$	$5.4X10^{5}$
Y-91		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$9.1X10^{2}$	$2.5X10^{4}$
Y-91m		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.5X10^{6}$	$4.2X10^{7}$
Y-92		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$3.6X10^{5}$	$9.6X10^{6}$
Y-93		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.2X10^{5}$	$3.3X10^{6}$
Yb-169	Ytterbium (79)	4.0	$1.1X10^{2}$	1.0	$2.7X10^{1}$	$8.9X10^{2}$	$2.4X10^{4}$
Yb-175		$3.0X10^{1}$	$8.1X10^{2}$	$9.0X10^{-1}$	$2.4X10^{1}$	$6.6X10^{3}$	$1.8X10^{5}$
Zn-65	Zinc (30)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$3.0X10^{2}$	$8.2X10^{3}$
Zn-69		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.8X10^{6}$	$4.9X10^{7}$
Zn-69m (a)		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.2X10^{5}$	$3.3X10^{6}$
Zr-88	Zirconium (40)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$6.6X10^{2}$	$1.8X10^{4}$
Zr-93		Unlimited	Unlimited	Unlimited	Unlimited	$9.3X10^{-5}$	$2.5X10^{-3}$
Zr-95 (a)		2.0	$5.4X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$7.9X10^{2}$	$2.1X10^{4}$
Zr-97 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$7.1X10^{4}$	$1.9X10^{6}$

NOTES:

(a) A_1 and/or A_2 values include contributions from daughter nuclides with half-lives less than 10 days.

(b) The values of A_1 and/or A_2 in Curies (Ci) are approximate and for infomraiton only; the regulatory standard units are Terabecque (TBq), (see Appendix 13-A – Determination of A_1 and/or A_2, Section 1)

(c) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

(d) These values apply only to compounds of uranium that take the chemical form of UF_6, UO_2F_2 and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

(e) These values apply only to compounds of uranium that take the chemical form of UO_3, UF_4, UCl_4 and hexavalent compounds in both normal and accident conditions of transport.

(f) These values apply to all compounds of uranium other than those specified in notes (d) and (e) of this table.

(g) These values apply to unirradiated uranium only.

(h) A_1 = 0.1 TBq (2.7 Ci) and A_2 = 0.001 TBq (0.027 Ci) for Cf-252 for domestic use.

(i) A_2 = 0.74 TBq (20 Ci) for Mo-99 for domestic use.

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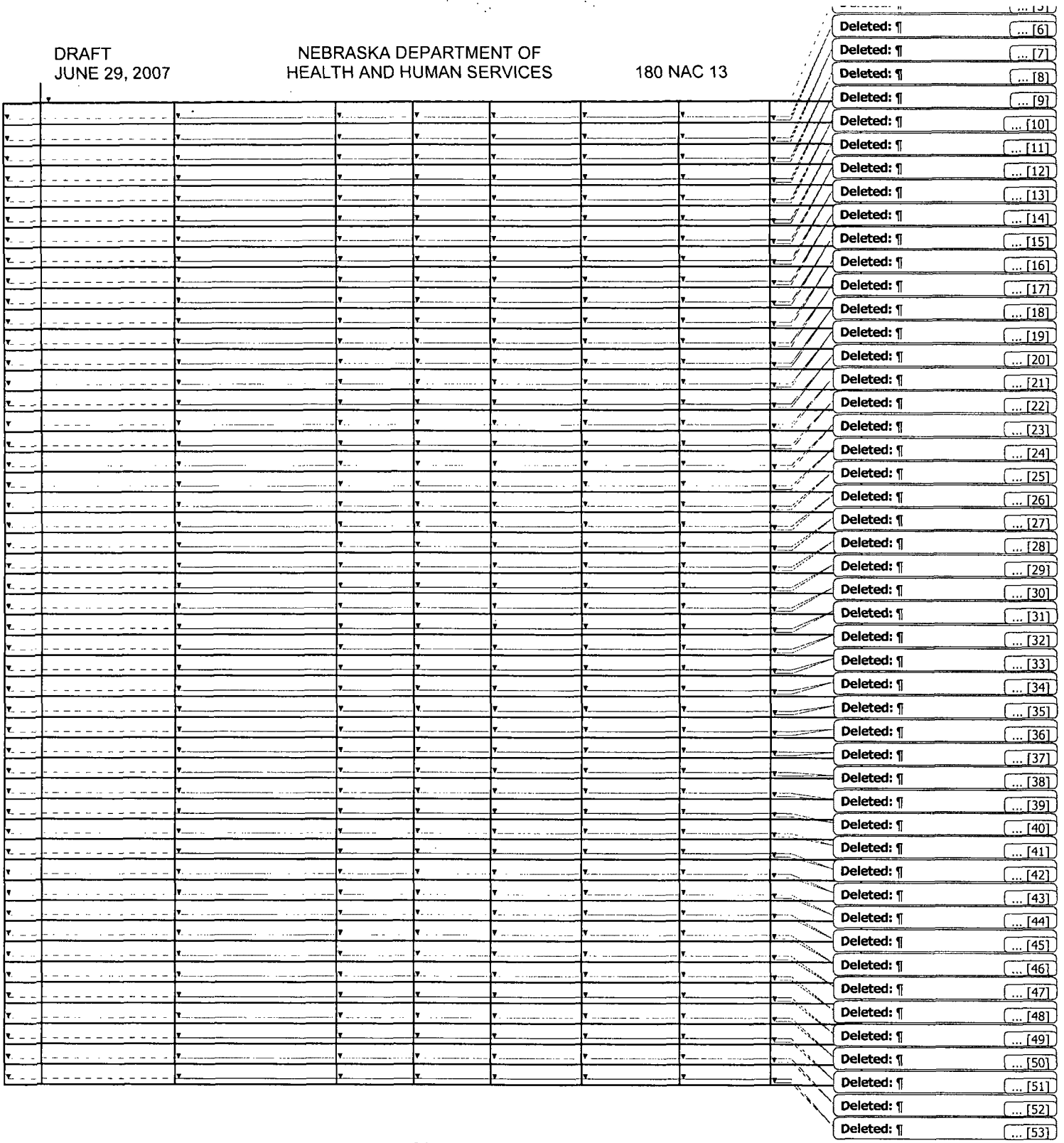
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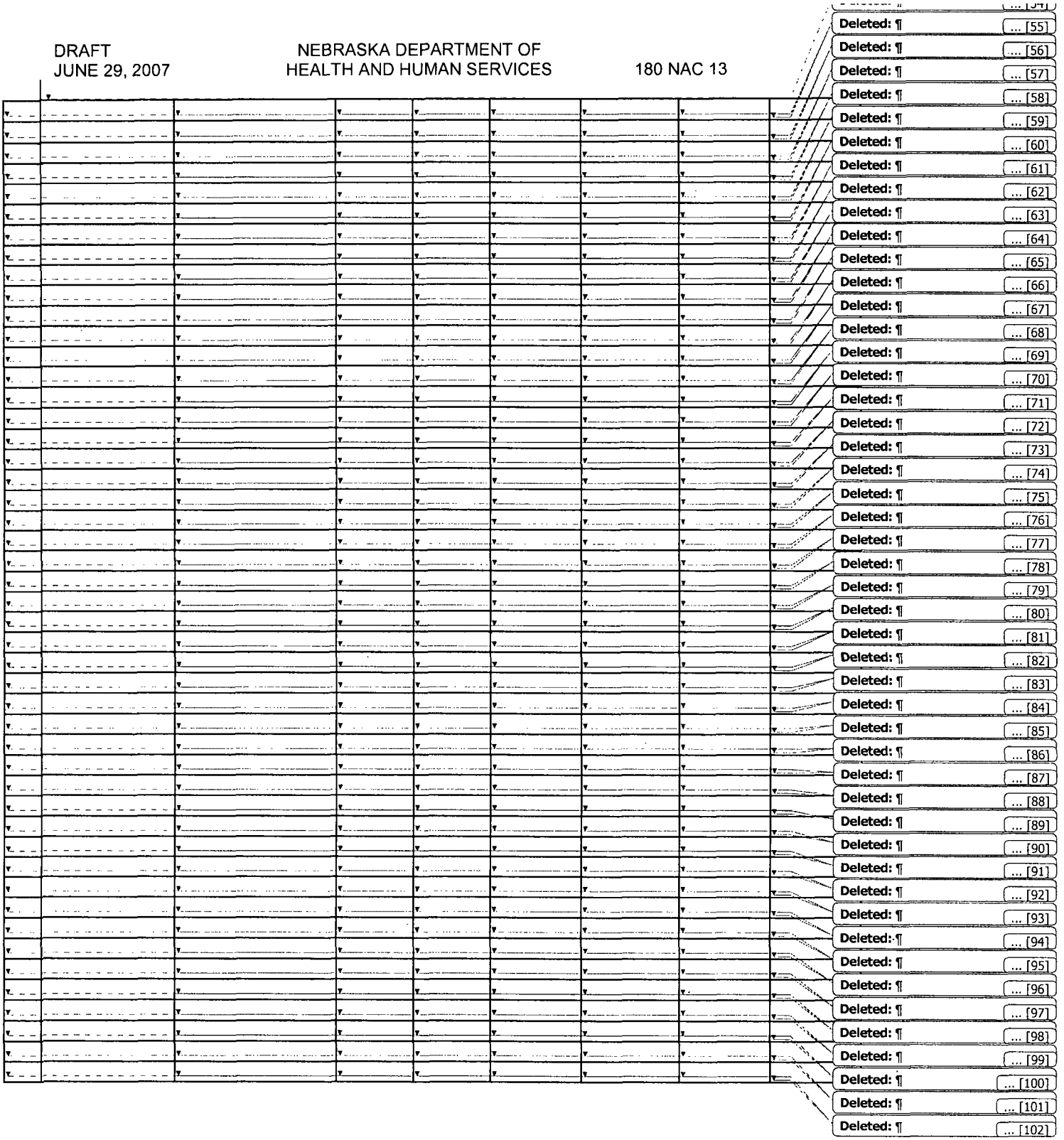
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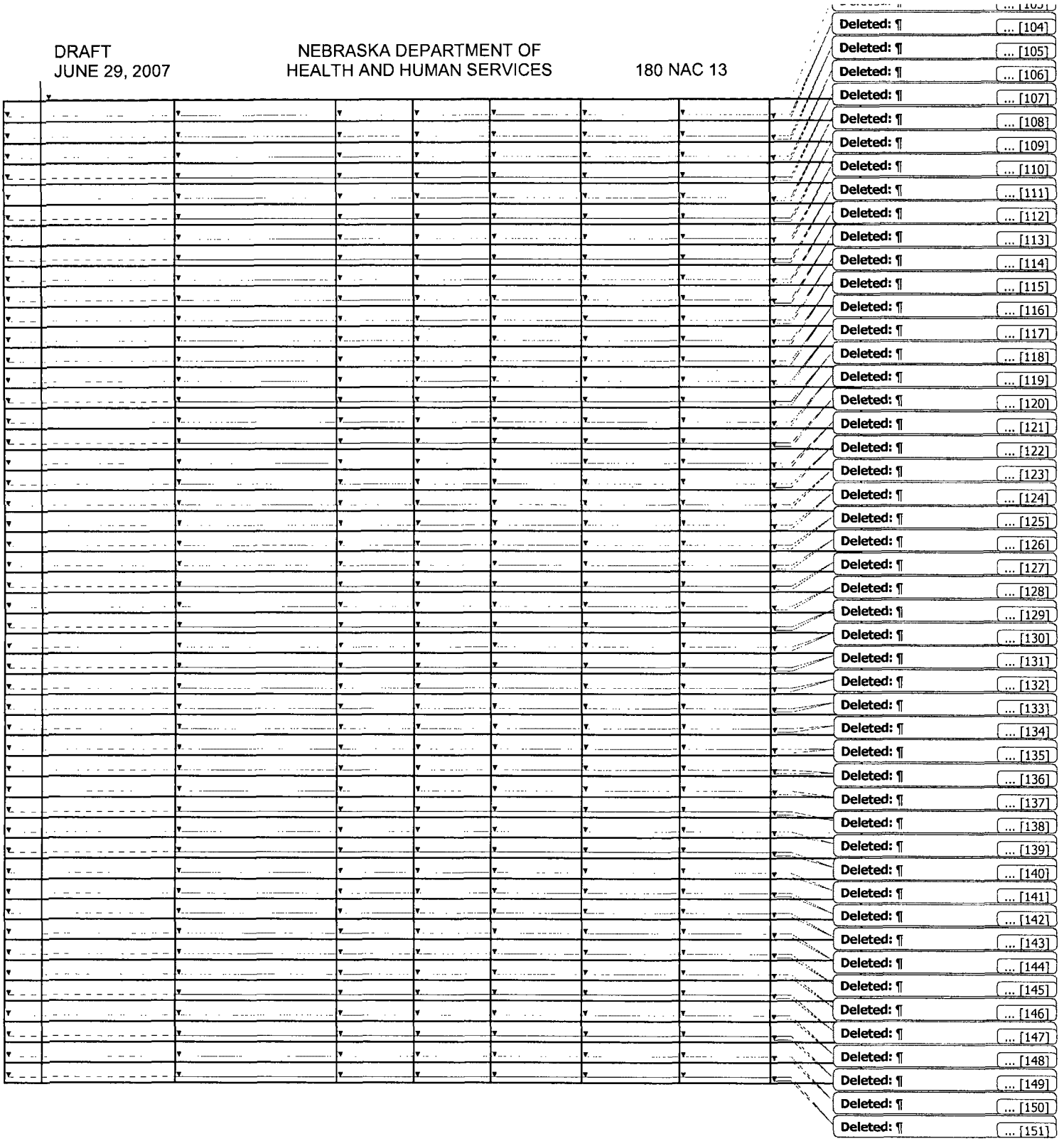
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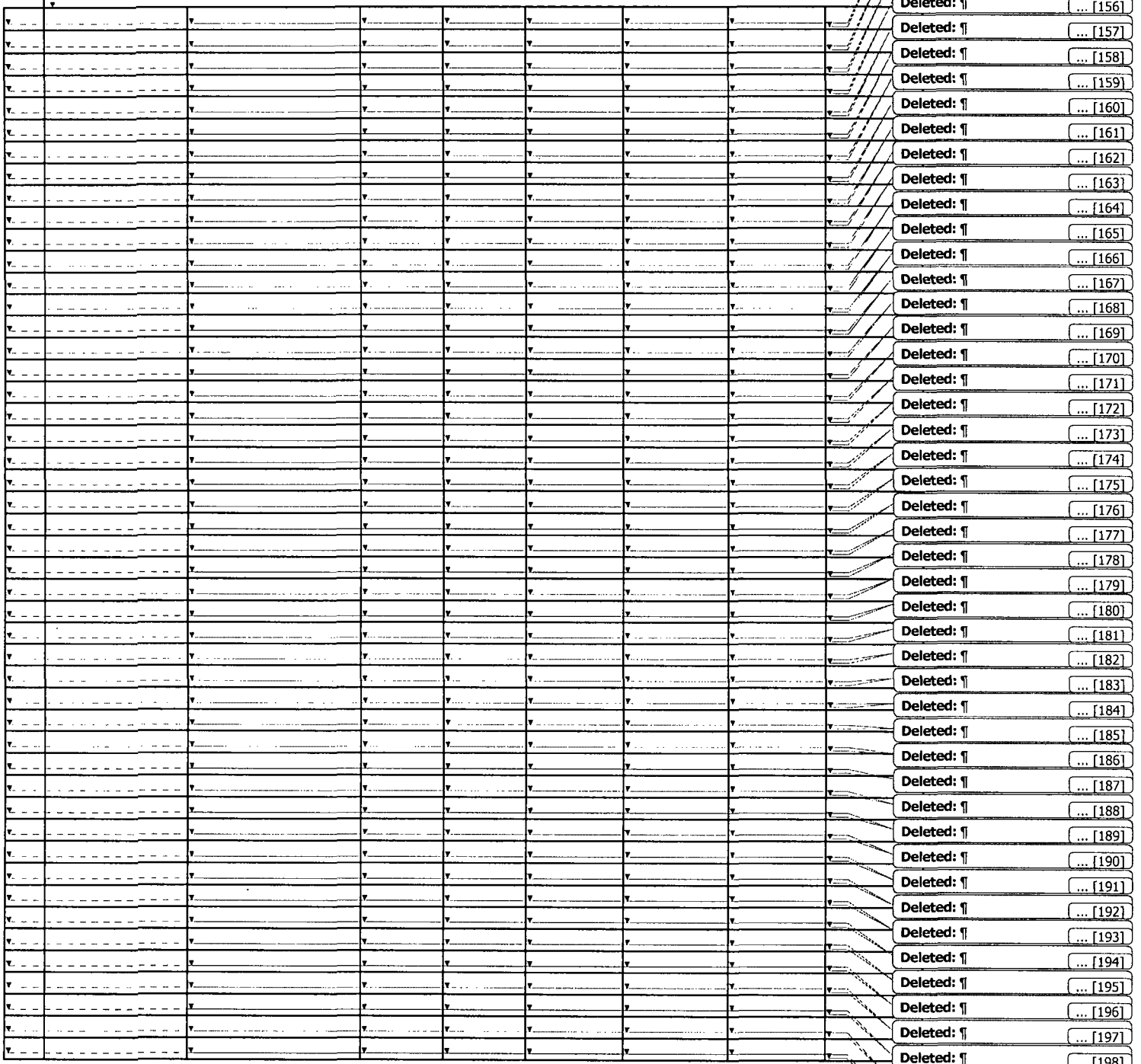
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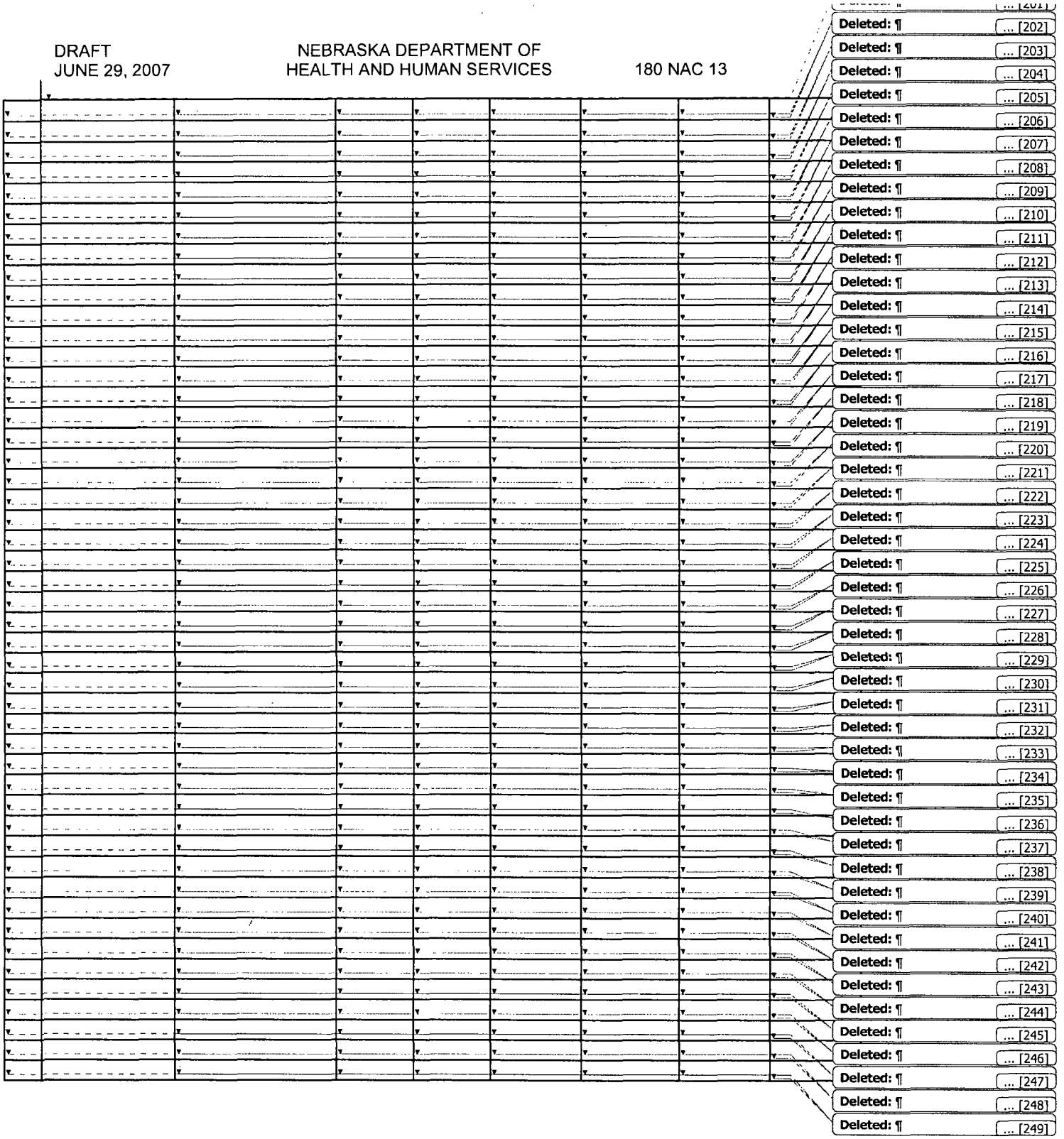
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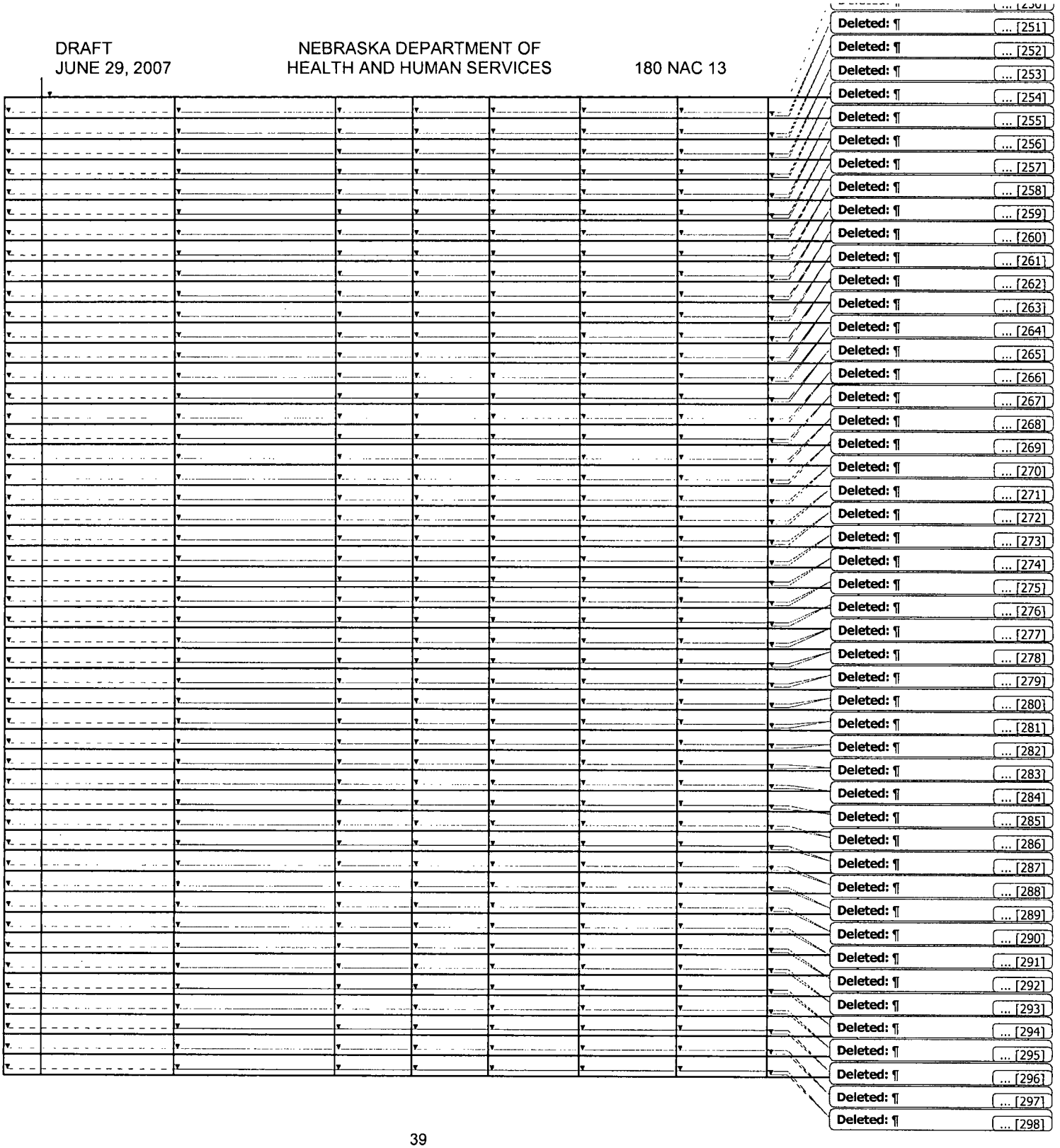
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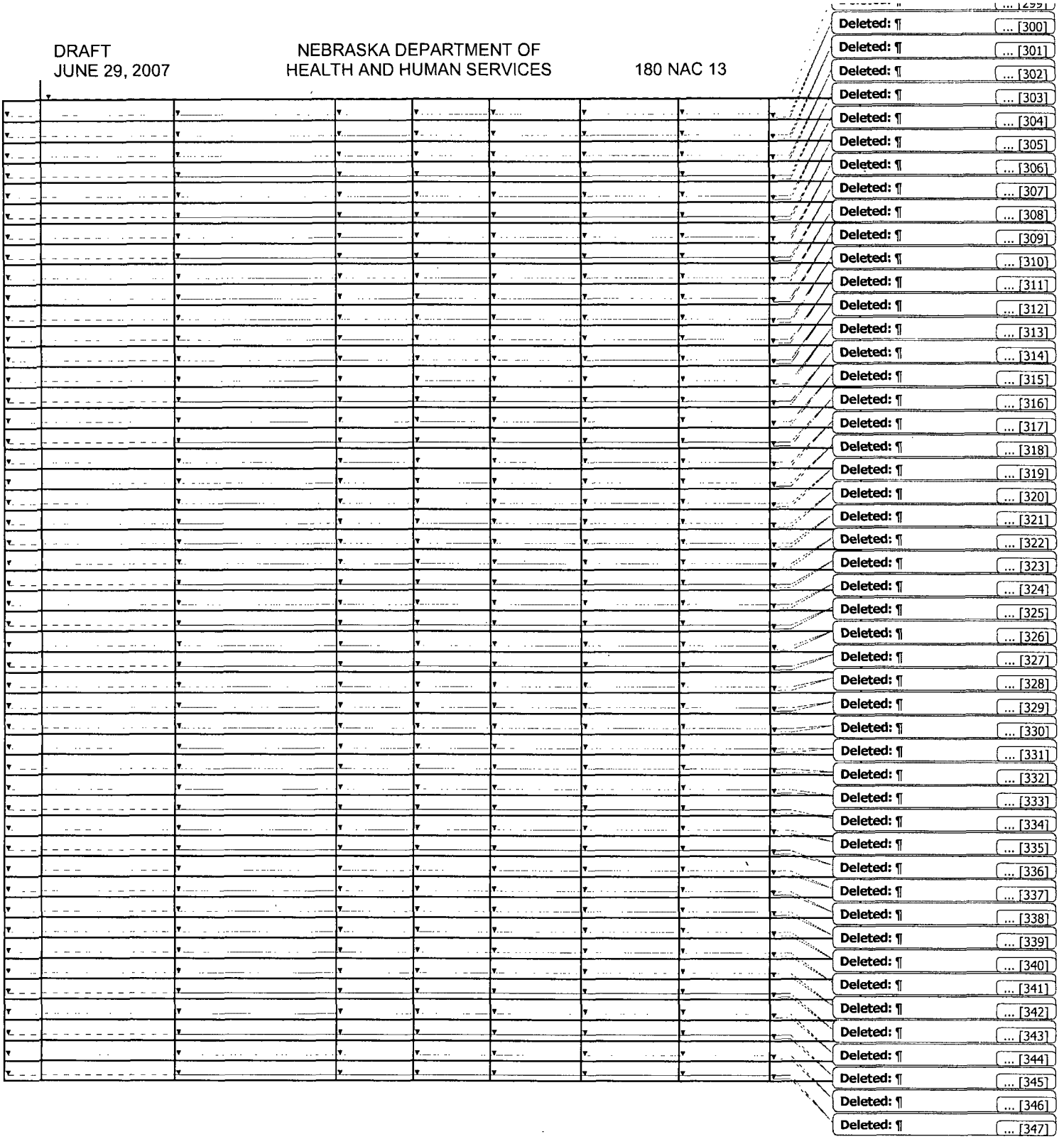
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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Ac-225 (a)	Actinium (89)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ac-227 (a)		$1.0X10^{-1}$	$2.7X10^{-12}$	$1.0X10^{3}$	$2.7X10^{-8}$
Ac-228		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-105	Silver (47)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-108m (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-110m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-111		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Al-26	Aluminum (13)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Am-241	Americium (95)	1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Am-242m (b)		1.0	$2.7X10^{-11}$	$1.0X10^{1}$	$2.7X10^{-7}$
Am-243 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Ar-37	Argon (18)	$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ar-39		$1.0X10^{7}$	$2.7X10^{-4}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ar-41		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
As-72	Arsenic (33)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
As-73		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
As-74		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
As-76		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
As-77		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
At-211 (a)	Astatine (85)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Au-193	Gold (79)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Au-194		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Au-195		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Au-198		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Au-199		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ba-131 (a)	Barium (56)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ba-133		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ba-133m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ba-140 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Be-7	Beryllium (4)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Be-10		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-205	Bismuth (83)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-206		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Bi-207		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-210		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-210m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Bi-212 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Bk-247	Berkelium (97)	1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Bk-249		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Br-76	Bromine (35)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Br-77		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Br-82		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
C-11	Carbon (6)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
C-14		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ca-41	Calcium (20)	$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{7}$	$2.7X10^{-4}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Ca-45		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ca-47		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-109	Cadmium (48)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-113m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-115		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-115m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ce-139	Cerium (58)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ce-141		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ce-143		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ce-144 (b)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cf-248	Californium (98)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cf-249		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cf-250		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cf-251		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cf-252		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cf-253 (a)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cf-254		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cl-36	Chlorine (17)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cl-38		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cm-240	Curium (96)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cm-241		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cm-242		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cm-243		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Cm-244		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cm-245		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cm-246		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cm-247 (a)		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cm-248		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Co-55	Cobalt (27)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Co-56		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Co-57		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Co-58		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Co-58m		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Co-60		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cr-51	Chromium (24)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Cs-129	Cesium (55)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-131		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cs-132		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-134		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cs-134m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-135		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Cs-136		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-137 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cu-64	Copper (29)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cu-67		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Dy-159	Dysprosium (66)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Dy-165		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Dy-166		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Er-169	Erbium (68)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Er-171		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-147	Europium (63)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-148		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-149		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Eu-150 (short lived)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-150 (long lived)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-152		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-152 m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-154		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-155		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Eu-156		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
F-18	Fluorine (9)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-52 (a)	Iron (26)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-55		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-59		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-60 (a)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ga-67	Gallium (31)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ga-68		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ga-72		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Gd-146 (a)	Gadolinium (64)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Gd-148		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Gd-153		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Gd-159		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ge-68 (a)	Germanium (32)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ge-71		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ge-77		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Hf-172 (a)	Hafnium (72)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hf-175		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hf-181		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hf-182		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-194 (a)	Mercury (80)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-195m (a)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-197		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Hg-197m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-203		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ho-166	Holmium (67)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ho-166m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-123	Iodine (53)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
I-124		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-125		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-126		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-129		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
I-131		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-132		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
I-133		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-134		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
I-135 (a)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-111	Indium (49)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-113m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-114m (a)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-115m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ir-189 (a)	Iridium (77)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ir-190		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ir-192		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ir-194		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
K-40	Potassium (19)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
K-42		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
K-43		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Kr-81	Krypton (36)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Kr-85		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{4}$	$2.7X10^{-7}$
Kr-85m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{10}$	$2.7X10^{-1}$
Kr-87		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
La-137	Lanthanum (57)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
La-140		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Lu-172	Lutetium (71)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Lu-173		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Lu-174		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Lu-174m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Lu-177		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Mg-28 (a)	Magnesium (12)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Mn-52	Manganese (25)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Mn-53		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{9}$	$2.7X10^{-2}$
Mn-54		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Mn-56		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Mo-93	Molybdenum (42)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{8}$	$2.7X10^{-3}$
Mo-99 (a)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
N-13	Nitrogen (7)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
Na-22	Sodium (11)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Na-24		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Nb-93m	Niobium (41)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Nb-94		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Nb-95		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Nb-97		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Nd-147	Neodymium (60)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Nd-149		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ni-59	Nickel (28)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ni-63		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ni-65		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Np-235	Neptunium (93)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Np-236 (short-lived)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Np-236 (long-lived)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Np-237 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Np-239		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Os-185	Osmium (76)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Os-191		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Os-191m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Os-193		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Os-194		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
P-32	Phosphorus (15)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
P-33		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Pa-230 (a)	Protactinium (91)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pa-231		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Pa-233		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pb-201	Lead (82)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pb-202		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pb-203		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pb-205		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pb-210 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pb-212 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Pd-103 (a)	Palladium (46)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{8}$	$2.7X10^{-3}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Pd-107		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Pd-109		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-143	Promethium (61)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-144		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-145		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pm-147		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pm-148m (a)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-149		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-151		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Po-210	Polonium (84)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pr-142	Praseodymium (59)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Pr-143		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-188 (a)	Platinum (78)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-191		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-193		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pt-193m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pt-195m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-197		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-197m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pu-236	Plutonium (94)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-237		$.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pu-238		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-239		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Pu-240		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-241		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Pu-242		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-244		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ra-223 (b)	Radium (88)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ra-224 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ra-225		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ra-226 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ra-228		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Rb-81	Rubidium (37)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rb-83		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rb-84		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rb-86		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Rb-87		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Rb(nat)		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Re-184	Rhenium (75)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re-184m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re-186		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re-187		$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{9}$	$2.7X10^{-2}$
Re-188		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Re-189		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re(nat)		$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{9}$	$2.7X10^{-2}$
Rh-99	Rhodium (45)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Rh-101		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Rh-102		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rh-102m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rh-103m		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Rh-105		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Rn-222 (b)	Radon (86)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ru-97	Ruthenium (44)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ru-103 (a)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ru-105		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ru-106 (b)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
S-35	Sulphur (16)	$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Sb-122	Antimony (51)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{4}$	$2.7X10^{-7}$
Sb-124		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sb-125		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sb-126		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sc-44	Scandium (21)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sc-46		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sc-47		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sc-48		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Se-75	Selenium (34)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Se-79		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Si-31	Silicon (14)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Si-32		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$

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TABLE A-1: A_1 AND A_2 VALUES FOR RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Sm-145	Samarium (62)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sm-147		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Sm-151		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Sm-153		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sn-113 (a)	Tin (50)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sn-117m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sn-119m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sn-121m (a)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sn-123		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sn-125		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sn-126 (a)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sr-82 (a)	Strontium (38)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sr-85		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sr-85m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sr-87m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sr-89		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sr-90 (b)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{4}$	$2.7X10^{-7}$
Sr-91		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sr-92		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
T(H-3)	Tritium (1)	$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{9}$	$2.7X10^{-2}$
Ta-178 (long-lived)	Tantalum (73)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ta-179		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ta-182		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Tb-157	Terbium (65)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tb-158		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tb-160		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-95m	Technetium (43)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-96		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-96m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tc-97		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{8}$	$2.7X10^{-3}$
Tc-97m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tc-98		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-99		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tc-99m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-121	Tellurium (52)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-121m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Te-123m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-125m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-127		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-127m (a)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-129		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-129m (a)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-131m (a)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-132 (a)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Th-227	Thorium (90)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Th-228 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Th-229 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-8}$
Th-230		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Th-231		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Th-232		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Th-234 (b)		$1.0X10^{3}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Th (nat) (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Ti-44	Titanium (22)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Tl-200	Thallium (81)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tl-201		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tl-202		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tl-204		$1.0X10^{1}$	$2.7X10^{-7}$	$1.0X10^{4}$	$2.7X10^{-7}$
Tm-167	Thulium (69)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tm-170		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tm-171		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
U-230 (fast lung absorption) (b),(d)	Uranium (92)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-230 (medium lung absorption) (e)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-230 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-232 (fast lung absorption) (b),(d)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
U-232 (medium lung absorption) (e)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-232 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-233 (fast lung absorption) (d)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-233 (medium lung absorption) (e)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-233 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-234 (fast lung absorption) (d)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-234 (medium lung absorption) (e)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-234 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-235 (all lung absorption types) (b),(d),(e),(f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-236 (fast lung absorption) (d)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-236 (medium lung absorption) (e)		$1.0X10^{2}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-7}$
U-236 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-9}$	$1.0X10^{4}$	$2.7X10^{-6}$
U-238 (all lung absorption types) (b),(d),(e),(f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
U (nat) (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
U (enriched to 20% or less)(g)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
U (dep)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
V-48	Vanadium (23)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
V-49		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
W-178	Tungsten (74)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
W-181		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
W-185		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
W-187		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
W-188		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Xe-122	Xenon (54)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
Xe-123		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
Xe-127		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Xe-131m		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{4}$	$2.7X10^{-7}$
Xe-133		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{4}$	$2.7X10^{-7}$
Xe-135		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{10}$	$2.7X10^{-1}$
Y-87	Yttrium (39)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-88		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-90		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Y-91		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-91m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-92		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Y-93		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$

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TABLE A-1:
A_1 AND A_2 VALUES FOR RADIONUCLIDES

APPENDIX 13-A, TABLE A-2 - EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Yb-169	Ytterbium (79)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Yb-175		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Zn-65	Zinc (30)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zn-69		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zn-69m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zr-88	Zirconium (40)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zr-93 (b)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Zr-95		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zr-97 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$

NOTES:

(a) [Reserved]

(b) Parent nuclides and their progeny included in secular equilibrium are listed in the following:

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Cs-137	Ba-137m
Ce-134	La-134
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-220	Po-216
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207

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TABLE A-1:
A_1 AND A_2 VALUES FOR
RADIONUCLIDES

Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-226	Ra-222, Rn-218, Po-214
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
U-240	Np-240m
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

(c) [Reserved]

(d) These values apply only to compounds of uranium that take the chemical form of UF_6, UO_2F_2 and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

(e) These values apply only to compounds of uranium that take the chemical form of UO_3, UF_4, UCl_4 and hexavalent compounds in both normal and accident conditions of transport.

(f) These values apply to all compounds of uranium other than those specified in notes (d) and (e) of this table.

(g) These values apply to unirradiated uranium only.

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TABLE A-3: GENERAL VALUES FOR A_1 AND A_2

CONTENTS	A_1		A_2		Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limits for exempt consignments (Bq)	Activity limits for exempt consignments (Ci)
	TBq	Ci	TBq	Ci				
Only beta- or gamma-emitting nuclides are known to be present	1×10^{-1}	2.7×10^{0}	2×10^{-2}	5.4×10^{-1}	1×10^{-1}	2.7×10^{-10}	1×10^{-4}	2.7×10^{-7}
Only alpha-emitting nuclides are known to be present	2×10^{-1}	5.4×10^{0}	9×10^{-5}	2.4×10^{-3}	1×10^{-1}	2.7×10^{-12}	1×10^{3}	2.7×10^{-8}
No relevant data are available	1×10^{-3}	2.7×10^{-2}	9×10^{-5}	2.4×10^{-3}	1×10^{-1}	2.7×10^{-12}	1×10^{3}	2.7×10^{-8}

TABLE A-4: ACTIVITY-MASS RELATIONSHIPS FOR URANIUM

Uranium Enrichment*-weight % U-235 present	Specific Activity	
	TBq/g	Ci/g
0.45	1.8 E-8	5.0 E-7
0.72	2.6 E-8	7.1 E-7
1.0	2.8 E-8	7.6 E-7
15	3.7 E-8	1.0 E-6
5.0	1.0 E-7	2.7 E-6
10.0	1.8 E-7	4.8 E-6
20.0	3.7 E-7	1.0 E-5
35.0	7.4 E-7	2.0 E-5
50.0	9.3 E-7	2.5 E-5
90.0	2.2 E-6	2.8 E-5
93.0	2.6 E-6	7.0 E-5
95.0	3.4 E-6	9.1 E-5

* The figures for uranium include representative values for the activity of the uranium-234 that is concentrated during the enrichment process.

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Deleted: 5.4 E-4
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Deleted: -
Deleted: 3
Deleted: Ci/g
Deleted: TBq/g
Deleted: which
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NOTE: Copies of 49 CFR Part 107, 49 CFR Part 170 through 189, 49 CRF Part 390 through 397 and 10 CFR 71 may be obtained from:

U.S. Government Printing Office
Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250-7954

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Or . Internet at
http://www access.gpo.gov/su_docs

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ATTACHMENT 13-1

39 CFR Part 111, §111.1

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SUBCHAPTER C—POST OFFICE SERVICES [DOMESTIC MAIL]

General Information on Postal Service

PART 111—GENERAL INFORMATION ON POSTAL SERVICE

Sec.

111.1 Domestic Mail Manual; incorporation by reference of regulations governing domestic mail services.
111.2 Availability of the Domestic Mail Manual.
111.3 Amendments to the Domestic Mail Manual.
111.4 Approval of the Director of the Federal Register.
111.5 Contents of the Domestic Mail Manual

AUTHORITY: 5 U.S.C. 552(a); 39 U.S.C. 101, 401, 403, 404, 3001-3011, 3201-3219, 3403-3406, 3621, 3626, 5001.

SOURCE: 44 FR 39952, July 6, 1979, unless otherwise noted.

§ 111.1 Domestic Mail Manual; incorporated by reference of regulations governing domestic mail services.

Section 552(a) of title 5, U.S.C., relating to the public information requirements of the Administrative Procedure Act, provides in pertinent part that "* * * matter reasonably available to the class of persons affected thereby is deemed published in the FEDERAL REGISTER when incorporated by reference therein with the approval of the Director of the Federal Register." In conformity with that provision, and with 39 U.S.C. section 410(b)(1), and as provided in this part, the U.S. Postal Service hereby incorporates by reference in this part, the Domestic Mail Manual, a looseleaf document published twice each year in January and July, unless otherwise determined by the Postal Service.

[62 FR 14827, Mar. 28, 1997]

§ 111.2 Availability of the Domestic Mail Manual.

(a) Copies of the Domestic Mail Manual, both current and previous issues, are available during regular business hours for reference and public inspection at the U.S. Postal Service Library, National Headquarters in Washington, DC. Copies of only the current issue are available during regular business hours for public inspection at area and district offices of the Postal Service and at all post offices, classified stations and classified branches.

(b) A copy of the current Domestic Mail Manual is on file with the Director, Office of the Federal Register, National Archives and Records Administration, 800 North Capitol Street, NW, Suite 700, Washington, DC.

(c) A 1-year subscription to the Domestic Mail Manual for two consecutive issues can be purchased by the public from the Superintendent of Documents, Washington, DC 20402-9375

[62 FR 14827, Mar. 28, 1997]

§ 111.3 Amendments to the Domestic Mail Manual.

(a) Except for interim or final regulations published as provided in paragraph (b) of this section, only notices rather than complete text of changes made to the Domestic Mail Manual are published in the FEDERAL REGISTER. These notices are published in the form of one summary transmittal letter for each issue of the Domestic Mail Manual. A complete issue of the Domestic Mail Manual including the text of all changes published to date, will be filed with the Director, Office of the Federal Register. Subscribers to the Domestic Mail Manual receive the latest issue of the Domestic Mail Manual from the Government Printing Office.

(b) When the Postal Service invites comments from the public on a proposed change to the Domestic Mail Manual, the proposed change and, if adopted, the full text of the interim or the final regulation is published in the FEDERAL REGISTER.

(c) The Postal Bulletin contains the full text of all interim and final regulations published as provided in paragraph (b) of this section, and the full text of all other changes to the Domestic Mail Manual that are summarized in the notices published under paragraph (a) of this section, except for nonsubstantive changes and corrections of typographical errors. The

Attachment 13-1

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ATTACHMENT 13-1

39 CFR Part 111, §111.1

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TITLE 180 CONTROL OF RADIATION

CHAPTER 15 TRAINING AND EXPERIENCE REQUIRMENTS FOR USE OF RADIATION SOURCES

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Deleted: Training and Experience Requirements for Radiation Therapists

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TITLE 180 CONTROL OF RADIATION

CHAPTER 15 TRAINING AND EXPERIENCE REQUIREMENTS FOR USE OF RADIATION SOURCES

15-001 SCOPE AND AUTHORITY

15-001.01 180 NAC 15 establishes the training and experience requirements of personnel in 180 NAC 3, 5, 6, 8, 9, 12 and 20.

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15-001.02 It establishes the criteria which courses of instruction must possess prior to being approved by the Department for the certification training programs.

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15-001.03 The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

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15-002 DEFINITIONS: As used in 180 NAC 15, the following definitions apply.

Deleted: Approved Program means an education and training program which the Agency has determined meets the minimum requirements of the Radiation Control Act.¶
¶
Clinical Education means the direct participation of the student in completion of diagnostic studies.¶

Experience means active participation in events or activities, leading to accumulation of knowledge.

Formal Training means training or education, including either didactic or clinical practicum or both, which has a specified objective, planned activities for students, and suitable methods for measuring student attainment, and which is offered, sponsored, or approved by an organization or institution which is able to meet or enforce these criteria.

15-003 RESERVED

15-004 RESERVED

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15-007 RESERVED

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15-010 RESERVED

15-011 RECENTNESS OF TRAINING: The training and experience specified in 180 NAC 15 must have been obtained within the seven years preceding the date of application or the individual must have had related continuing education and experience since the required training and experience was completed.

15-012 RESERVED

15-013 MINIMUM QUALIFICATIONS FOR RADIOLOGICAL MEDICAL PHYSICIST, RADIOLOGICAL HEALTH PHYSICIST AND QUALIFIED EXPERT

15-013.01 Radiological Medical Physicist means a person having the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs. This person must have training and experience in the clinical applications of radiation physics. This person must have at least the following:

1. Is certified by the American Board of Radiology in Therapeutic Radiological Physics, Roentgen Ray and Gamma Ray Physics, X-Ray and Radium Physics; or Radiological Physics; or the American Board of Medical Physics in Radiation Oncology Physics or the Canadian College of Medical Physics, certification must be in the specialty the individual will be clinically practicing, or

2. Holds a Master's or Doctor's Degree in physics, medical physics, other physical science, engineering, applied mathematics, nuclear physics, biophysics, radiological physics, or health physics and has completed one year of full time training in medical physics and an additional year of full time work experience under the supervision of a Radiological Medical Physicist that meets the requirements of 15-013.01, item 1 at a medical institution. Full time training and full time work experience must be in the specialty the individual will be clinically practicing.

15-013.02 Radiological Health Physicist with reference to radiation protection, means a person having the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs (for example, persons having relevant certification from the American Board of Radiology or American Board of Health Physics, or those having equivalent qualifications). With reference to shielding design, a person having particular knowledge and training in the field of radiation shielding. This person must have at least the following:

1. Is certified by the American Board of Health Physics or the American Board of Radiology in Therapeutic Radiological Physics, Roentgen Ray and Gamma Ray Physics, X-Ray and Radium Physics, or Radiological Physics;

Deleted: to radiation therapy (for example, persons certified in Radiological Physics or Therapeutic Radiological Physics by the American Board of Radiology, or those having equivalent qualifications).

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or the American Board of Medical Physics in Radiation Oncology Physics or the Canadian College of Medical Physics; or

Deleted: Science in Nuclear Medicine;

2. A Master's or a Doctor's degree in a physical or natural science or equivalent, biophysics, radiological physics or health physics, plus one year of full time experience in radiation protection and measurements, or

3. A Bachelor's Degree in a physical or natural science or equivalent, plus three years of full time training and experience in radiation protection and measurements and a written statement from a radiological health physicist as defined in 180 NAC 15-013.02, items 1 or 2 that two years of training and experience in radiation protection and measurements were obtained under his/her supervision.

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15-013.04 Qualified Expert means an individual who has demonstrated to the satisfaction of the Department that (s)/he possesses the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs. This person must have at least the following:

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1. A Bachelor's Degree in a physical or natural science, and one year of experience in radiation protection and measurements, or

2. A Certificate or an Associate Degree from an accredited radiological technology school and one year of experience in radiation protection and measurements.

15-014 RESERVED

15-015 TRAINING AND EXPERIENCE REQUIREMENTS FOR PERSONNEL FOR INSTITUTIONAL BROAD SCOPE TYPE LICENSE A, B, AND C LISTED IN 180 NAC 3-013

15-015.01 The minimum qualifications are:

1. Radiation Safety Officer.

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a. A college degree at the bachelor level, in physical or biological sciences or in engineering plus four years work experience in health physics, radiological health or another field equivalent to the above fields; or

b. A master's degree of graduate work in health physics or radiological health with two years of work experience in health physics or radiological health.

2. Authorized User.

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a. A college degree at the bachelor level, or equivalent training or experience, in the physical or biological sciences or in engineering; and

b. At least forty hours of formal instruction in:

(1) Radiation physics and instrumentation;
(2) Radiation protection;
(3) Mathematics pertaining to the use and measurement of radioactivity; and
(4) Biological effects of radiation; and

c. One-Hundred and Sixty hours experience in the safe handling of radioactive material.

15-016 PERSONNEL TRAINING AND EXPERIENCE REQUIREMENTS FOR LICENSEE'S IN AN EDUCATIONAL INSTITUTION OTHER THAN BROAD SCOPE LICENSES

15-016.01 Radiation Safety Officer and/or Authorized User:

1. A college degree at the bachelor level, or equivalent training and experience in the physical or biological sciences or in engineering; and

2. Forty hours of formal instruction in:

a. Radiation physics and instrumentation;
b. Radiation protection;
c. Mathematics pertaining to the use and measurement of radioactivity, and
d. Biological effects of radiation; and

3. Demonstrate an understanding of institution radiation safety policy and procedures and Title 180 or their equivalent.

15-017 TRAINING AND EXPERIENCE REQUIREMENTS FOR LABORATORY AND INDUSTRIAL USE OF RADIOACTIVE MATERIAL PERSONNEL

15-017.01 For Millicurie Quantities:

1. Radiation Safety Officer and/or Authorized User:

a. A college degree at the bachelor level, or equivalent training and experience in the physical or biological sciences or in engineering; and

(1) Forty hours of formal instruction in:

(a) Radiation physics and instrumentation;
(b) Radiation protection;
(c) Mathematics pertaining to the use and measurement of radioactivity; and
(d) Biological effects of radiation; and

(2) Demonstrate an understanding of operating and emergency procedures and Title 180 or their equivalent.

15-017.02 For Microcurie Quantities:

1. Radiation Safety Officer and/or Authorized User:

   a. Forty hours of formal instruction in:

      (1) Radiation physics and instrumentation;
      (2) Radiation protection;
      (3) Mathematics pertaining to the use and measurement of radioactivity; and
      (4) Biological effects of radiation; and

   b. Demonstrate an understanding of operating and emergency procedures and Title 180 or their equivalent.

15-018 PERSONNEL TRAINING AND EXPERIENCE REQUIREMENTS FOR LICENSES TO MANUFACTURE OR INTRODUCTION OF RADIOACTIVE MATERIAL INTO MANUFACTURED PRODUCTS AND DEVICES SPECIFIED IN 180 NAC 3-014.01 through 3-014.06, 3-014.09, and 3-014.12 and 3-014.13

15-018.01 Radiation Safety Officer and/or Authorized User:

1. A college degree at the bachelor level, or equivalent training and experience in the physical or biological sciences or in engineering; and
2. Forty hours of formal instruction in:

   a. Radiation physics and instrumentation;
   b. Radiation protection;
   c. Mathematics pertaining to the use and measurement of radioactivity;
   d. Biological effects of radiation; and

3. Demonstrate an understanding of company radiation safety policy and procedures and Title 180 or their equivalent.

15-019 PERSONNEL TRAINING AND EXPERIENCE REQUIREMENTS FOR LICENSES TO MANUFACTURE AND INTRODUCE RADIOACTIVE MATERIAL INTO RADIOPHARMACEUTICALS AS SPECIFIED IN 180 NAC 3-014.08

15-019.01 Radiation Safety Officer and/or Authorized User:

1. A registered pharmacist;

2. Basic radioisotope handling techniques of 200 hours, including: Deleted: two-hundred

   a. Radiation physics and instrumentation;
   b. Radiation protection;
   c. Mathematics pertaining to the use and measurement of radioactivity;

d. Biological effects of radiation; and
e. Radiopharmaceutical chemistry.

3. Three-hundred hours experience as a radiopharmaceutical chemist.

15-020 RESERVED

15-021 RESERVED

15-022 RESERVED

15-023 RESERVED

15-024 RESERVED

15-025 TRAINING AND EXPERIENCE REQUIREMENTS FOR PARTICLE ACCELERATORS PERSONNEL NON HUMAN USE

15-025.01 Radiation Safety Officer or Supervisor must have a Bachelor of Science Degree plus one year experience in the use and operation of particle accelerators which includes forty hours instruction as specified for particle accelerator operators.

15-025.02 Operators must have forty hours instruction in subject matter listed below and three months experience, the first one month on-the-job training must be under direct supervision.

1. Forty Hours instruction of Particle Accelerator Operators.

   a. All operators must be instructed in the fundamentals of radiation.

      (1) Characteristics of radiation.
      (2) Units of radiation dose (sievert/rem).
      (3) Biological effects of radiation.
      (4) Levels of radiation from particle accelerators.
      (5) Methods used to prevent radiation exposure at the specific facility to be operated:

         (a) Shielding
         (b) Interlock system
         (c) Safety rules
         (d) Radiation monitoring equipment

2. All operators must:

   a. Be instructed on the use and care of personnel monitoring equipment employed at the facility.
   b. Be familiar with the location and use of all operating controls.
   c. Be familiar with the requirements of pertinent State regulations.

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¶
<#>Is certified in radiation therapy technology by the American Registry of Radiologic Technologists; or¶
¶
2. . Has completed an integrated program of full-time training and experience that includes classroom and laboratory training applicable to the use of a source of radiation, supervised work experience, and supervised clinical experience as follow:¶
¶
a. . Two-hundred hours of classroom and laboratory training that includes:¶
¶
(1) . Radiation physics and instrumentation;¶
(2) . Radiation protection policy, management, procedures, and regulations;¶
(3) . Mathematics of radiation and radioactivity; and¶
(4) . Radiation biology;¶
¶
b. . Supervised work experience under the supervision of an authorized user or practicing technologist that includes:¶
¶
(1) . Review of the full calibration measurements and periodic spot checks as appropriate;¶ ... [1]

Deleted: MINIMUM TRAINING REQUIREMENTS FOR OPERATORS OF NON HUMAN X-RAYS OR PARTICLE ACCELERATORS ... [2]

Deleted: 15-024.01 The registrant must require that the operator receives a minimum of eight hours of instruction in the following area ... [3]

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d. Be familiar with the registrant's written operating and emergency procedures.
e. Receive at least one month of full time on-the-job training before assuming operational responsibility.

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3. . All operator's assistants or helpers must receive the training listed in 180 NAC 15-025.02, item 1.a. through 15-025.02, item 2.a. at not less than twenty hours.¶

15-027 TRAINING AND EXPERIENCE REQUIREMENTS FOR INDUSTRIAL GAUGE PERSONNEL

15-027.01 Licensed User: Demonstrate competency in use, maintenance and transfer of device by satisfactory completion of eight hour course provided by the manufacturer of the device or any Department approved course.

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15-028 TRAINING AND EXPERIENCE REQUIREMENTS FOR ANALYTICAL X-RAY EQUIPMENT PERSONNEL

15-028.01 At least 20 hours of instruction in the fundamentals of:

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1. Radiation physics and instrumentation;
2. Radiation protection;
3. Radiation units of measurement;
4. Biological effects of radiation; and
5. Equipment operation

a. Operation of analytical x-ray equipment;
b. Safety devices;
c. Labeling;
d. Registrant's operations and emergency procedures; and
e. Case histories of analytical x-ray accidents.

15-029 TRAINING AND EXPERIENCE REQUIREMENTS FOR GAS CHROMATOGRAPH PERSONNEL

15-029.01 Licensed User: Has received and is competent in operating procedures and manufacturer's instructions.

15-030 RESERVED

15-031 RESERVED

15-032 TRAINING AND EXPERIENCE REQUIREMENTS FOR MANAGEMENT OF RADIOACTIVE WASTE PERSONNEL

15-032.01 Radiation Safety Officer (RSO)

1. The RSO must have experience in applied radiation protection at nuclear facilities or waste disposal sites dealing with radiation protection problems. The individual

should be familiar with the design features and operations of LLW sites that affect the potential for exposures of site personnel to radiation. In addition, the RSO should have the technical competence to establish radiation protection programs and the supervisory capability to direct the work of radiation protection technicians.

2. The RSO should have a bachelor's degree in science or engineering (or equivalent), including formal training in radiation protection. Minimum acceptable substitutes for a bachelor's degree are a high school diploma or its equivalent and one of the following: (1) four years of formal schooling in science or engineering, (2) four years of applied experience at a nuclear facility in the area of radiation protection, or (3) any combination of the above totaling four years, and

3. The RSO should have at least three years of experience in radiation protection, one year of which should be at a LLW disposal site. If the RSO does not have a bachelor's degree, then a total of seven years experience is recommended. A master's degree and doctor's degree may be considered equivalent to one and two years experience, respectively, if the course work is related to radiation protection.

15-032.02 Radiation Protection Technician

1. The senior radiation protection technician should have three years of working experience in radiation protection of which one year should be from an LLW disposal site. The technician should possess a high degree of manual dexterity and ability, and should be capable of learning and applying basic skills.

2. Individuals in training or apprentice positions should not be considered technicians, but should be permitted to perform work for which qualification has been demonstrated. The classification of radiation protection technicians should be as follows:

   a. In training (minimal experience) - apprentice technician.
   b. 0-3 years experience - technician.
   c. Greater than three years experience - senior technician.

However, time alone is not enough. Any training and advancement program should also require technicians to pass written and oral examinations before advancing to different technician levels.

15-032.03 Radiation Protection Training Instructor

1. At the time of appointment to the instructor position, the responsible individual must have experience in applied radiation at nuclear facilities dealing with the radiation protection problems and programs similar to those at LLW disposal sites. The individual should be familiar with the design features and operations of LLW sites that affect the potential for exposure of site personnel to radiation.

2. The instructor should have an associate's degree in science or engineering (or equivalent), including formal training in radiation protection. Minimum acceptable substitutes for an associate degree are a high school diploma or its equivalent and one of the following: (1) two years of formal schooling in science or engineering, (2) two years of applied experience at a nuclear facility in the area of radiation protection, or (3) any combination of the above totaling two years. The instructor should have one year of experience in radiation protection at an LLW disposal site. If the instructor does not have an associate's degree, then a total of three years experience is recommended.

15-032.04 General Employee: Information on the LLW site's radiation protection policy and program should be presented to all new employees during the general employee orientation training. The orientation training should consist of classroom instruction and may be supplemented by other training methods. Written material covering the basic topics of the training should be distributed to the new employees for future reference. Visitor and contractor personnel should be given the same training, if it is expected that they may encounter radioactive material or radiation levels above background. It is recommended that the classroom instruction phase of this training be at least eight hours in length.

15-032.05 Radiation Worker: Personnel who work in a radiation area are termed radiation workers and their radiation worker training must be received prior to entering or beginning work in a radiation area. The classroom instruction phase of this training must be at least twenty hours in length.

15-033 TRAINING AND EXPERIENCE REQUIREMENTS FOR INSTALLATION AND/OR SERVICING OF RADIATION GENERATING EQUIPMENT AND ASSOCIATED RADIATION GENERATING EQUIPMENT AS SUPPLIED BY THE EMPLOYER

15-033.01 A minimum of eight hours of formal course work or as approved by the Department should be completed and include the following:

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1. Radiation physics and instrumentation
2. Radiation protection
3. Mathematics pertaining to the use and measurement of radioactivity
4. Biological effects of radiation

15-033.02 On-the-job training should include hands-on experience installing and/or servicing radiation generating equipment and associated radiation generating equipment components. On-the-job training must be for six months under the supervision of an individual who has completed the training in 180 NAC 15-033.01.

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15-034 RESERVED

Deleted: 15-034.01 Personnel must work for a dosimetry processor who holds a current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology (NIST).

TITLE 180 CONTROL OF RADIATION

CHAPTER 17 ENFORCEMENT OF RADIATION CONTROL ACT AND RIGHTS TO HEARING PROCEDURES FOR LICENCEES AND REGISTRANTS; PENALTIES

17-001 Scope and Authority 1
17-002 Definitions 1
17-003 Public Hearings 3
17-004 Right to a Hearing 4
17-005 Discipline 4
17-006 Hearings 5
17-007 Sanctions 6
17-008 Emergency Sanctions 7
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17-0010 Deliberate Misconduct 9

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APPENDIX

Appendix 17-A Examples of Severity Levels 11

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TITLE 180 CONTROL OF RADIATION

CHAPTER 17 ENFORCEMENT OF RADIATION CONTROL ACT AND RIGHTS TO HEARING PROCEDURES FOR LICENSEES AND REGISTRANTS; PENALTIES.

17-001 SCOPE AND AUTHORITY: 180 NAC 17 governs the conduct of proceeding under the Radiation Control Act, the administrative procedures of the Department and the Formal Hearing Procedures of the Department of Health and Human Services, for the issuing, denying, renewing, transferring, amending, suspending, revoking of any license, registration or certification of persons to use radiation sources and for determining compliance with or granting of exemptions from Department rule, order, or condition of license or certification of persons; for assessing administrative penalties; and for determining content of other Department orders. Proceedings held under the Radiation Control Act will be governed by 184 NAC 1, except as provided below. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

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17-002 DEFINITIONS: Terms used in 180 NAC 17 have the following definitions:

Act means the Radiation Control Act as defined in the Nebraska Revised Statutes.

Applicant means a person seeking a license or certificate of registration or a person's certification to use radiation sources issued under the provisions of the Act and these rules.

Certificate of Registration means a document issued pursuant to the Act and rules promulgated thereunder.

Civil Penalty means a monetary penalty levied on a licensee or registrant because of violations of statutes, rules, regulations, licenses, or registration certificates but does not include criminal penalties.

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Contested Case means a proceeding in which the Department determines the legal rights, duties, or privileges of a party after an opportunity for adjudicative hearing.

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Deliberate misconduct means an intentional act or omission by a person that (a) would intentionally cause a licensee, registrant, or applicant for a license or registration to be in violation of any rule, regulation, or order of or any term, condition or limitation of any license or registration issued by the department under the Radiation Control Act or (b) constitutes an intentional violation of a requirement, procedure, instruction, contract, purchase order, or policy under the Radiation Control Act of a licensee, a registrant, an applicant for a license or registration, or contractor or subcontractor of a licensee, registrant or applicant for a license or registration.

Discipline means the imposition by the Department of a sanction, including revocation, suspension, limitation, condition, or civil penalty. Deleted: Agency

Disposal facility refers to a facility licensed to dispose of radioactive waste received from other persons.

Enforcement Conference is a meeting held by the Department with licensee/registrant management to discuss safety, safeguards, or environmental problems; the licensee's/registrant's compliance with regulatory, license condition, or registration condition requirements; a licensee's/registrant's proposed corrective measures (including, but not limited to, schedules for implementation); and enforcement options available to the Department. Deleted: Agency Deleted: Agency

Hearing is a proceeding to examine an application or other matter before the Department in order to receive information or to adjudicate rights, duties, or privileges. Deleted: Agency

Hearing Examiner means a person selected by the Director of the Division of Public Health conduct hearings. Deleted: Regulation and Licensure to

Interested person is a person who participates in a hearing concerning a contested case but who is not admitted as a party by the Hearing Examiner.

Notice of Violation is a written statement of one or more infringements of a legally binding requirement. The notice normally requires the licensee/registrant to provide a written statement describing:

Corrective steps taken by the licensee/registrant, and the results achieved;

Corrective steps to be taken to prevent recurrence; and

The projected date for achieving full compliance.

Order means a specific directive contained in a legal document issued by the Department. Deleted: Agency

Party is a person designated as such by the Hearing Examiner. A party may consist of the following:

The Department; Deleted: Agency

An applicant/licensee/registrant; and

Any person affected.

Person affected means a person:

Who is a resident of a county, or a county adjacent to the county, in which radioactive materials subject to the Act are or will be located, including any person who is doing business or who has a legal interest in land in the county or adjacent county, and any local government in the county; and

Who demonstrates that s/he has suffered or will suffer actual injury or economic damage.

Preliminary Report is a document prepared by the Department containing:

A statement of facts on which the Department bases the conclusion that a violation has occurred;
Recommendations that an administrative penalty be imposed on the person charged; and

Recommendations for the amount of that proposed penalty.

Public Hearing means a proceeding which will be open to the public, for the purpose of hearing testimony or receiving written statements from any person who chooses to offer information on the subject matter set for hearing, conducted after notice to the public of the time, date, and place of the hearing.

Severity level means a classification of violations based on relative seriousness of each violation and the significance of the effect of the violation on the occupational or public health or safety or the environment.

Violation is an infringement of any rule, license or registration condition, order of the Department, or any provision of the Act.

17-003 PUBLIC HEARINGS

17-003.01 The Department will hold public hearings
In any proceeding for the issuance or modification of rules or regulations relating to control of sources of radiation, the Department will provide an opportunity for public participation through written comments and a public hearing.

17-003.02 Public Hearing on Applications

1. Procedure

a. The Department will provide a public hearing for an application for a license for licensing ores processed for their source material content and management of byproduct material and source material mill tailings, or for licensing management of low-level radioactive waste.

b. The Department will issue public notice of the public hearing and provide opportunity for written comments. A transcript of the hearing and a written determination will be available of the action to be taken based on the

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findings of the evidence presented during the public hearing and public comment period. Department staff, the hearing officer and applicant may ask questions of any witness testifying at the public hearing.

2. Environmental Impact Analysis

a. When the Department determines that the issuance, amendment or renewal of a license to manage, process or dispose of low-level radioactive waste as defined in Neb. Rev. Stat. § 71-3503(22) of the Act or process materials resulting in byproduct material as defined in Neb. Rev. Stat. § 71-3503(12) of the Act will have a significant impact on the public health and safety and environment, the Department will secure a written analysis of the impact from the applicant or licensee, and the Department will prepare a written statement on the analysis and make them available to the public for written comment at least 30 days before holding the public hearing on the issuance, amendment or renewal of a license.

b. The analysis will assess the radiological and nonradiological impact on the public health and the impact on the total environment. It will consider the alternatives to the issuance, amendment or renewal of the license, including long term impacts of the licensing action may have on radioactive materials remaining at the site after decommissioning and reclamation.

c. Any major construction is prohibited by the applicant for a license before the environmental impact analysis has been completed and a report filed and a license issued.

3. Prior to termination of a license issued after public hearing in compliance with 180 NAC 17-003.02, item 1 the Department will assure that the licensee has :

a. Complied with the decontamination, decommissioning and reclamation standards established by the Department, as set out in 180 NAC 12.

b. Transferred ownership of the site to the State of Nebraska or the United States Government; and

c. Made adequate funding arrangements to provide for long term surveillance and care of the site.

17-004 RIGHT TO A HEARING: When the Department:

1. Denies:
   a. An application for a license or registration,
   b. An amendment to a license or registration, or
   c. An application for an exemption from license or registration requirements;
2. Revokes, suspends, modifies, conditions, or limits a license or registration; or
3. Imposes a civil penalty or appropriate order,

The Department will provide the applicant or licensee a hearing in accordance with the Department's Rules of Practice and Procedures for Administrative Hearings, adopted pursuant to the Administrative Procedures Act, currently at 180 NAC 1.

17-005 DISCIPLINE

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17-005.01 Any person who violates any provision of the Radiation Control Act, or any rule, regulation, or order issued pursuant to such Act, or any term, condition, or limitation of any license, registration, or certificate issued pursuant to such Act or has engaged in deliberate misconduct will be subject to:

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Revocation, denial, suspension, modification, condition or limitation;

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The imposition of a civil penalty; or

The terms of an appropriate order issued by the Department.

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17-005.02 Compliance

1. In all instances other than the issuance of emergency sanctions pursuant to 180 NAC 17-008, the Department may afford the licensee, registrant or certificate holder the opportunity to:

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   a. Correct violations and show compliance with applicable provisions of the Act, or the rules and regulations, license or registration requirements, and any orders of the Department issued thereunder, or

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   b. Attend an enforcement conference to discuss with the Department methods and schedules for correcting the violation(s) or to show compliance with the Act, rules and regulations and license conditions. Notice of any enforcement conference will be sent by personal service or certified mail, return receipt requested. An enforcement conference is not a prerequisite for any action.

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2. The Department may permit the licensee or registrant, or certified individual to respond in writing to the alleged violation of the Act, rule, regulation, order, or any term, conditions of limitation of license or registration.

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3. Failure of a licensee or registrant to respond is cause for the Department to proceed with disciplinary action.

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17-006 HEARINGS : Whenever the Department proposes to subject a licensee or registrant to the provisions of 180 NAC 17-005.01, the Department will notify the person in writing, (a) setting forth the date, facts, and nature of each act or omission with which the person is charged, (b) specifically identifying the chapter, rule, regulation, order, license or registration certificate involved in the violation and (c) of the sanction or order to be imposed. If a civil penalty is imposed, the notice will include a statement that it can be collected by civil action. The notice will be delivered to each alleged violator by personal service, by certified or registered mail to his/her last known address, or by publication. Notice by publication will only be made if personal service or service by mail cannot be effectuated. The sanction or order in the notice will become final 30 days after the mailing of the notice unless the applicant, registrant, or licensee, within the 30-day period, requests, in writing, a hearing before the department. If the notice is served by personal service or publication, the sanction order will become final 30 days after completion of such service unless the applicant, registrant, or licensee, within the 30-day period, requests, in writing, a hearing before the department.

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17-007 SANCTIONS

17-007.01 The Department may consider the following:

1. Criteria in determining what sanctions are appropriate:

   a. Previous history of noncompliance;
   b. Action necessary to deter future violations;
   c. Lack of reasonable efforts to correct the violation(s);
   d. Willfulness; and
   e. Any other aggravating factors.

2. The severity levels: The seriousness of violations will be categorized by one of the following severity levels:

   a. Severity Level I - Violations that are most significant and have a direct negative impact on occupational and/or public health and safety or on the environment.
   b. Severity Level II - Violations that are very significant and have an impact on occupational and/or public health and safety or on the environment.
   c. Severity Level III - Violations that are significant and which, if not corrected, could threaten occupational and/or public health and safety or the environment.
   d. Severity Level IV - Violations that are of more than minor significance, but if left uncorrected, could lead to more serious circumstances affecting public health and safety.
   e. Severity Level V - Violations that are of minor public health and safety or environmental significance.

3. Examples of violations in each severity level(s) are set out in Appendix 17-A of 180 NAC 17.

17-007.02 Civil Penalties: May impose a civil penalty in an amount not to exceed $10,000 for each violation. If any violation is a continuing one, each day a violation continues will be considered a separate violation for purposes of penalty assessment. Table 1 provides examples for civil penalties.

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TABLE I
Examples of
Civil Penalty Base

Amounts Based on Severity Level of Violations

Severity Level	Amount
I	$5,000
II	$3,000
III	$1,500
IV	$ 500
V	$ 100

Adjustments to the amounts in Table I may be made for the presence of the criteria set out in 180 NAC 17-007.01, item 1.

17-007.03 Suspension and Revocation of a License or Registration: In addition to the other factors set out in 180 NAC 17-007, used by the Department to determine appropriateness of license revocation or suspension, the Department may act to suspend or revoke a license or a registration if a person:

1. Knowingly causes a material misstatement or misrepresentation to be made in the application for license or registration if such misstatement would impair the Department's ability to evaluate the applicant's qualifications, or
2. Willfully aids another person in violating the Act or Title 180.

17-008 EMERGENCY SANCTIONS: In the event of an emergency requiring immediate action to protect the occupational or public health and safety, or the environment, the Department may immediately, without prior notice or hearing:

1. Issue a regulation or order citing the existence of such emergency and require that certain actions be taken to meet the emergency:

   a. An emergency regulation or order takes effect immediately upon service on the person to whom the order is directed.
   b. Any person receiving such emergency regulation or order must comply immediately.

2. If the Department determines that a person possessing sources of radiation is not equipped to observe or fails to observe the provisions of the Act or Title 180, then the Department may impound or order the impounding of the sources of radiation. Service on the affected person of notice of impoundment or of an order of impoundment will be

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made as soon as is practical under the circumstances. Any person receiving an order of impoundment will comply immediately.

3. Service of any regulation order, or other notice or pleading under 180 NAC 17 will be made by personal service or by certified mail, return receipt requested. Affidavit of service, proof of mailing to the proper address, or the return receipt is evidence of service.

4. Hearings on Emergency Sanctions

   a. A hearing will be held on an emergency regulation or order pursuant to 180 NAC 17-008 item 1 or upon an impoundment or order of impoundment pursuant to 180 NAC 17-008 item 2 if the person to whom the regulation or order or impoundment is directed makes a written application to the Department for a hearing; said application must be filed within 15 days of receipt of the emergency regulation or order of impoundment or notice of impoundment.
   b. The hearing must be held not less that 15 days nor more than 30 days after filing the written application for hearing.
   c. Whenever a person has requested a hearing pursuant to 180 NAC 17-008 item 4 the Department will notify the person in writing, setting forth the time, date and place at which a hearing will be held. The notice must be served in accordance with 180 NAC 17-008 item 3 on the applicant not less that ten days before the time set for the hearing.
   d. On the basis of the evidence presented at the hearing, the Director or his/her designee will, within 30 days after such hearing, continue, modify or revoke the emergency regulation or order or impoundment or order of impoundment that was the subject of the hearing, and the Department will send the applicant a copy of its findings of fact and determination.

5. Any final department action on emergency regulations or orders or impoundment of sources of radiation is be subject to judicial review pursuant to the Administrative Procedure Act.

17-009 DISPOSITION OF AN IMPOUNDED SOURCE OF RADIATION: Any source of radiation impounded by the Department is declared to be a common nuisance and cannot be subject to a replevin action. Possession of an impounded source of radiation will be determined by 180 NAC 17-009 and Neb. Rev. Stat. §71-3516.01.

17-009.01 The Department will keep any source of radiation impounded under Neb.Rev.Stat. §71-2516 for as long as it is needed as evidence for any hearing.

17-009.02 Prior to the issuance of an order of disposition for an impounded source of radiation, the Department will notify in writing any person, known by the Department to claim an interest in the source of radiation, that the Department intends to dispose of the source of radiation. Notice will be served by personal service, by certified or registered mail to the last-known address of the person, or by publication. Notice by publication will only be made if personal service or service by mail cannot be effectuated.

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17-009.03 Within 15 days after service of the notice under 180 NAC 17-009.02, any person claiming an interest in the impounded source of radiation may request, in writing, a hearing before the Department to determine possession of the source of radiation. The hearing will be held in accordance with rules and regulations adopted and promulgated by the Department. If the Department determines that the person claiming an interest in the source of radiation has proven by a preponderance of the evidence that such person:

1. Had not used or intended to use the source of radiation in violation of the Radiation Control Act,
2. Has an interest in the source of radiation acquired in good faith as an owner, a lien holder, or otherwise, and
3. Has the authority under the Radiation Control Act to possess such source of radiation, the Department will order that possession of the source of radiation be given to such person. If possession of the impounded source of radiation is not given to the person requesting the hearing, such person may appeal the decision of the Department, and the appeal will be in accordance with the Administrative Procedure Act. If possession of the impounded source of radiation is not given to the person so appealing, the Department will order such person to pay for the costs of the hearing, storage fees, and any other reasonable and necessary expenses related to the impounded source of radiation.

17-009.04 If possession of the impounded source of radiation is not given to the person requesting the hearing under 180 NAC 17-009.03, the Department will issue an order of disposition for the source of radiation and will dispose of the source of radiation as directed in the order. Disposition methods are at the discretion of the Department and may include, but are not limited to:

1. Sale of the source of radiation to a person authorized to possess the source of radiation under the act,
2. Transfer to the manufacturer of the source of radiation, or
3. Destruction of the source of radiation.

The order of disposition will be considered a transfer of title of the source of radiation.

17-009.05 If expenses related to the impounded source of radiation are not paid under 180 NAC 17-009.03, the Department will pay such expenses from:

1. Proceeds from the sale of the source of radiation, if sold; or
2. Available funds in the Department of Health and Human Services Cash Fund.

17-0010 DELIBERATE MISCONDUCT:

17-0010.01 Any licensee, registrant, applicant for a license or registration, employee of a licensee or registrant, contractor or subcontractor to a licensee, registrant, or applicant for a licensee or registration, or employee of any contractor or subcontractor to a licensee, registrant, or applicant for a license or registration, who knowingly provides to any licensee,

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registrant, applicant, contractor, or subcontractor, any components, equipment, materials, or other goods or services that relate to a licensee's, registrant's or applicant's activities covered by the Radiation Control Act, will not:

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1. Engage in deliberate misconduct that causes or would have caused, if not detected, a licensee, registrant, or applicant to be in violation of any rule, regulation, or order; or any term, condition, or limitation of any license or registration issued by the Department; or

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2. Intentionally submit to the Department, a licensee, a registrant, an applicant, or a licensee's, registrant's or applicant's contractor or subcontractor, information that the person submitting the information knows to be incomplete or inaccurate in some respect material to the Department.

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17-0010.02 Any person who violates 180 NAC 17-0010, is subject to the provisions of 180 NAC 17-005.

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APPENDIX 17-A

EXAMPLES OF SEVERITY LEVELS

The following examples of severity levels apply to licensees or registrants and are neither exhaustive nor controlling. They reflect only the seriousness of the violation and not the intent of the violator, the history of the violator, the amount necessary to deter future violations, or efforts to correct the violation.

A. Severity I - Most Significant Violations.

1. Exposure of a worker in excess of 250 mSv (25 rems) of radiation to the whole body, or 1.50 Sv (150 rems) to the skin of the whole body, or 3.75 Sv (375 rems) to the feet, ankles, hands, or forearms;

2. Annual whole body exposure in excess of 25 mSv (2.5 rems) of radiation to a non-radiation worker or a radiation worker who is a minor;

3. Release of radioactive material to an unrestricted area(s) in excess of ten times the limits specified in the rules;

4. Radiation levels, contamination levels, or releases that exceed ten times the limits specified in the rules;

5. Disposal of licensed material into a sanitary sewage system in quantities or concentrations which exceed ten times the limits of 180 NAC 4-041;

6. Exposure of a worker in a restricted area(s) to ten times the limits of 180 NAC 4-005;

7. A required system or equipment designed to prevent or mitigate a serious safety event or unnecessary exposure is absent or not operable due to a deliberate act by the licensee or registrant (e.g., bypassing an interlock);

8. A material false statement. This is a written or sworn statement that is false and is relevant to the regulatory process;

9. Action by management to discriminate against an employee for attempting to communicate or for actually communicating with the Department pursuant to 180 NAC 10-007.03;

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10. Deliberate exposure of an individual except by or under the supervision of an individual licensed to engage in the healing arts;

11. Refusing authorized Department personnel access to facilities and/or equipment to conduct inspections or investigations; or

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12. Possession of licensable quantities of radioactive material without a license.

B. Severity II - Very Significant Violations.

APPENDIX 17-A

1. Single exposure of a worker in excess of 50 mSv (5 rems) of radiation to the whole body, 300 mSv (30 rems) to the skin of the whole body, or 750 mSv (75 rems) to the feet, ankles, hands or forearms;

2. Annual whole body exposure in excess of 5 mSv (0.5 rem) of radiation to a non-radiation worker or radiation worker who is a minor;

3. Release of radioactive material to an unrestricted area in excess of five times the limits of 180 NAC 4-014;

4. Radiation levels, contamination levels, or releases that exceed five times the limits specified in the rules;

5. Failure to immediately notify the Department as required by 180 NAC 4-057.01, item 1 and 3, 4-058.01 item 1 and 2;

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6. Unauthorized disposal of licensed material in quantities or concentrations in excess of five times the limits of 180 NAC 4-041;

7. Exposure of a worker in a restricted area in excess of five times the limits 180 NAC 4-005;

8. A required system or equipment designed to prevent or mitigate a serious safety event or unnecessary exposure is absent or inoperable;

9. Failure to obtain appropriate Department approval before moving to a new use and/or storage location;

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10. A material false statement. This is a statement that is false by omission and is relevant to the regulatory process;

11. Radiation output on fluoroscopic devices which exceed the limits in 180 NAC 6-005.03, item 1.

12. Absence of patient exposure reduction equipment required by Title 180.

13. Refusing authorized Department personnel access to records during an inspection or investigation upon reasonable notice;

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14. Loss of control of a source of radiation; or

15. Failure to register sources of radiation or services as required by 180 NAC

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C. Severity III - Significant Violations.

APPENDIX 17-A

1. Single exposure of a worker in excess of 30 mSv (3 rems) of radiation to the whole body, or 75 mSv (7.5 rems) to the skin of the whole body, or 187.5 mSv (18.75 rems) to the feet, ankles, hands or forearms;

2. A radiation level in an unrestricted area such that an individual could receive greater than 1.0 mSv (100 millirems)in a one-hour period or 5.0 mSv (500 millirems) in any seven consecutive days;

3. Failure to notify the Department within 24 hours as required by 180 NAC 4-058.02 or failure to notify the Department within 30 days as required by 180 NAC 4-057.01, item 2 or 4-59;

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4. Substantial potential for an exposure or release in excess of the limits of 180 NAC 4 (e.g., entry into high radiation areas without performing an adequate survey; operation of a radiation facility with a nonfunctioning interlock system);

5. Release of radioactive material to an unrestricted area in excess of the limits of 180 NAC 4-014;

6. Unauthorized disposal of licensed material not covered in Severity Levels I or II;

7. Exposure of a worker in restricted areas in excess of the limits of 180 NAC 4-005;

8. Release for unrestricted use of radioactive material or contaminated equipment which poses a potential for significant exposure to members of the public, or which reflects a programmatic rather than isolated weakness in the radiation safety program;

9. Cumulative worker exposure above Title 180 limits when such exposure reflects a programmatic rather than an isolated weakness in the radiation safety program;

10. Conduct of licensee or registrant activities by an unauthorized or an unqualified person;

11. Any noncompliance with posting, labeling, placarding, shipping papers, packaging loading, or other transporting requirements that could result in the following:

    a. Improper identification of the type, quantity, or form of material,

    b. Failure of the carrier or recipient to exercise adequate controls, or

    c. Substantial potential for personnel exposure or contamination, or improper transfer of material;

12. Failure to control access to licensed materials as specified by Department rules;

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13. Possession or use by licensee or registrant of unauthorized radiation machine or radioactive material in conducting registrant or licensee activities;

14. Radiation levels, contamination levels, or releases that exceed the limits specified in the license;

15. Failure to use exposure reduction devices properly (e.g., collimators, filtration); or

16. Failure to hospitalize patients who have sealed source implants or therapeutic quantities of radioactive material in accordance with the license or license conditions;

D. Severity IV - Violations.

1. Exposure in excess of the limits of 180 NAC 4-005 not constituting Severity I, II, or III violations;

2. A radiation level in an unrestricted area such that an individual could receive greater than 0.02 mSv (2 millirems) in any one-hour period or 1.0 mSv (100 millirems) in any year;

3. Failure to notify the Department within 30 days as required by 180 NAC 4-059. Deleted: Agency

4. Failure to make a follow-up written report to the Department as required by 180 NAC 4-057.02, 4-063 or 10-004. Deleted: Agency

5. Failure to conduct required leakage or contamination tests or to use properly calibrated equipment.

6. Unless specified in a more severe category, changes in procedures or other conditions of a license or certificate of registration of which the Department was not informed (e.g., change of address, expiration of certificate of registration); or Deleted: Agency

7. Failure to maintain complete records and/or forms required by Nebraska's Regulations for Control of Radiation - Ionizing.

E. Severity V - Minor Violations.

1. Failure to maintain a current copy of Title 180 and current copies of active licenses and/or certificates of registration;

2. Failure to post Title 180 notices required by 180 NAC 10-002; or

Other violations that have minor safety or environmental significance.

NOTE to Licensees and Registrants:

There is a substantial increase in fees in all categories. The fees for radioactive materials have not been increased since June 13, 1995. The fees for x-ray facilities have not increased since November 25, 1990. These programs will be entirely funded through fees in order to eliminate the need for general funding.

The radioactive materials program costs were based on time allocation and complexity considering areas such as:

- Type of licenses
- Average number of actions for a license type
- Inspection priority which is indicative of the safety risk and resulting regulatory costs associated with the category
- Increased controls on several types of licenses due to security

The x-ray and services fees program costs were based on time allocation and complexity considering areas such as:

- Number of x-ray machines (Allowing for the statutory $70 limit per medical diagnostic x-ray machine.)
- Registrations
- Complexity of Inspections

The environmental surveillance fees were changed to full cost. The samples will be sent to a contract laboratory as the State Laboratory will not be doing the sample analysis.

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TITLE 180 CONTROL OF RADIATION

CHAPTER 18 FEES FOR CERTIFICATES OF REGISTRATION, RADIOACTIVE MATERIAL(S) LICENSES, ENVIRONMENTAL SURVEILLANCE, EMERGENCY RESPONSE AND OTHER REGULATORY SERVICES.

18-001 Scope and Authority 1
18-002 Definitions 1
18-003 Exemptions 2
18-004 Payment of Fees 2
18-005 Schedule of Annual Fees for Radioactive Material Licenses 4
18-006 Fees for Low-Level Radioactive Waste Management Pursuant to 180 NAC 12 7
18-007 Schedule for Annual Fees for Certificates of Registration for Radiation Generating Equipment And Services for Radiation Generating Equipment 7
18-008 Environmental Surveillance Fees 8
18-009 Emergency Response Fees 8
18-010 Nuclear Power Plant Fees 8
18-011 Failure to Pay Prescribed Fees 9

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Appendix 18-A Routine Inspection Intervals for Determination of the Machine Fee, the Routine Inspection Frequency for Radiation Generatring Equipment and the Assigned Priority . 1018¶
Appendix 18-B Example of Fee Calculation . 1019¶
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TITLE 180 CONTROL OF RADIATION

CHAPTER 18 FEES FOR CERTIFICATES OF REGISTRATION, RADIOACTIVE MATERIAL(S) LICENSES, ENVIRONMENTAL SURVEILLANCE, EMERGENCY RESPONSE AND OTHER REGULATORY SERVICES

18-001 SCOPE AND AUTHORITY:

18-001.01 This chapter establishes the fees for licensing, registration, environmental surveillance and implementation, emergency planning, emergency response and implementation, and other regulatory services and provide for their payment. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. sections 71-3501 to 3520.

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18-001.02 Except as otherwise specifically provided, the rules and requirements in this chapter apply to any person who is

1. An applicant for, or holder of:
   a. A radioactive material license issued pursuant to 180 NAC 3, 5, 7, 12, 14 or 19; or

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   b. A certificate of registration for radiation machines/facilities and/or services issued pursuant to180 NAC 2 or 5.
   c. A general license
2. The holder of a fixed nuclear facility construction permit or operating license issued by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR Part 50; or
3. The operator of any other fixed nuclear facility under a license issued by the U.S. Nuclear Regulatory Commission Pursuant to 10 CFR Parts 30, 31, 32, 33, 34, 35, 36, 39, 40 and/or 70.
4. The operator of any other nuclear facility.
5. The operator of any facility that during the course of operation results in the release of radioactive material to the environment.

18-002 DEFINITIONS: For the purposes of 180 NAC 18, the following definitions apply:

Carrier means a person who transports passengers or property in commerce by rail car, aircraft, motor vehicle or vessel.

Deleted: any common carrier, contract carrier, private carrier, railway freight carrier or railway express carrier handling, storing or transporting radioactive material

Emergency Planning, Emergency Response and Implementation means the development and application of those capabilities necessary for the protection of the public and the environment from the effects of an accidental or uncontrolled exposure dose or release of radioactive materials, including the equipping, training and periodic retraining of emergency response personnel.

Environmental Surveillance and Implementation means the development and application of those capabilities necessary to assess the radiological impact of activities conducted by licensees and registrants on public health and safety and the environment.

Facility means any facility other than that defined in this subsection.

Fixed Nuclear Facility means:

Any nuclear reactor(s) at a single site;

Any facility designed or used for the assembly or disassembly of nuclear weapons;

Any other facility using or possessing source material, special nuclear material, byproduct material and/or any other radioactive material for which the Department conducts off-site environmental surveillance to protect the public health and safety or the environment.

18-003 EXEMPTIONS

18-003.01 No application or annual fee will be required for any carrier, transporting any of the materials described in the Radiation Control Act in the ordinary course of such carrier's business.

18-003.02 No fee may be required for the Department of Health and Human Services.

18-004 PAYMENT OF FEES

18-004.01 Application fees: Each application for a license or certificate of registration for which a fee is prescribed will be accompanied by a non-refundable fee.

1. An application for a certificate of registration must be accompanied by the total fee for all applicable categories.
2. Applications for new materials licenses, applications to reinstate expired, terminated or inactive licenses and applications for amendments to licenses that would place the license in a higher fee category or add a new fee category must be accompanied by the prescribed application fee for each category.
3. No application will be accepted for filing or processing prior to full fee payment, as specified, and the application will be returned to the applicant.
4. All application fees will be charged irrespective of the Department's disposition of the application or a withdrawal of the application.

18-004.02 Annual Fees for Licenses and Certificates of Registration

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Shipper means a person who packages the radioactive material and presents the package for transport.¶

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1. A non-refundable fee, pursuant to 180 NAC 18-005, or 18-008 shall must be paid annually for each radioactive material license and for each certificate of registration. The fee must be paid in full each year on or before the last day of the expiration anniversary month of the license or certificate of registration.[1]

2. In the case of a single license which authorizes more than one category of use, an annual fee must be paid for each category applicable to the license.

3. In the case of a registration for radiation generating equipment an annual fee must be paid for each machine at a facility.

4. In the case of services for radiation generating equipment which authorizes more than one category, annual fees must be paid for each category applicable to the registration.

4. An application for an amendment to a license or certificate of registration which results in a change to a category with a higher annual fee will result in a fee being charged equal to the prorated difference between the fee for the current category and the one to which the amended license or certificate will escalate.

   a. The prorated costs will be based on monthly intervals and will be charged from the first day of the month the amendment is effective until the end of the current billing period.
   b. The Department will bill the licensee or registrant for the prorated portion of the applicable annual fee.
   c. The replacement of part(s) for an existing radiation machine will not result in an additional fee.

18-004.03 Reciprocity Fees

1. Each application for reciprocal recognition of an out-of-state radioactive materials license under 180 NAC 3-028 must be accompanied by the applicable annual fee.
2. Each application for recognition of an out-of-state registration under 180 NAC 2-012 must be accompanied by the applicable annual fee, provided that no such

[1]Example: If the license or certificate of registration expires on June 30, 2007, annual fees are due on or before June 30, of each year.

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a. . The fee shall be paid in full each year on or before the last day of the expiration (anniversary) month of the certificate of registration.[2]¶

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fee has been submitted within 12 months of the date of commencement of the proposed activity.

18-004.04 Environmental Surveillance Fees

1. Each holder of a fixed nuclear facility construction permit or operating license, or an operator of any other fixed nuclear facility, or any other facility as defined in 180 NAC 18-002 must submit the fee pursuant to 180 NAC 18-009 for services received.
2. This fee will recover for the, Department of Health and Human Services , the expenses arising from environmental surveillance and implementation activities.
3. Payment must be made within 60 days following the date of invoice.

18-004.05 Emergency Planning, Emergency Response and Implementation Fees

1. Each holder of a fixed nuclear facility construction permit or operating license, or an operator of any other fixed nuclear facility, or any other facility as defined in 180 NAC 18-002 must submit the fee, pursuant to 180 NAC 18-010, for services received.
2. This fee will recover for the Department of Health and Human Services Regulation and Licensure, the expenses arising from emergency planning, emergency response and implementation activities.
3. Payment must be made within 90 days following the date of invoice.

18-004.06 Method of Payment

1. Fee payments must be by check or money order made payable to the Department of Health and Human Services.
2. The payments may be made by personal delivery to the office, State of Nebraska Department of Health and Human Services in Lincoln, Nebraska, or mailed to the, Department of Health and Human Services, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

18-005 SCHEDULE OF FEES FOR RADIOACTIVE MATERIAL LICENSES

18-05.01 Schedule of annual fees:

	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
1.	Reserved		
2.	Reserved		
3.	Manufacturing/Processing of Radioactive Material	$6,500	$3,900
4.	Industrial Radiography	$6,500	$3,900
5.	Broad License (Educational and/or Medical)	$18,000	$3,900

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	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
6.	Irradiator, Unshielded During Irradiation	$11,500	$3,900
7.	Nuclear Pharmacy	$7,200	$3,900
8	License for Distributor to distribute to persons generally licensed, and/or persons specifically licensed.	$5,500	$3,900
9.	Commercial collection and laundry of items contaminated with radioactive, source or special nuclear material.	$18,000	$3,900
10	Manufacturer and distribution of encapsulated radioactive material, byproduct, source, or special nuclear material in source of power.	$6,500	$3,900
11.	Well Logging	$2,500	$3,000
12	Irradiator, Self-Shielded	$2,600	$3,000
13	Mobile Scanning	$3,900	$3,000
14.	Nuclear Medicine/Brachytherapy (Note only one free for any license type 14)	$3,900	$3,000
	a. 7-041 Use of Unsealed Radioactive Material for Uptake, Dilution, and Excretion Studies for Which a Written Directive is Not Required,		
	b. 180 NAC 7-044 Use of Unsealed Radioactive Material for Imaging and Localization Studies for Which a Written Directive is Not Required, and/or		
	c. 180 NAC 7-048 Use of Unsealed Radioactive Material for Which a Written Directive is Required		
	d. 180 NAC 7-055 Use of Sources for Manual Brachytherapy,		
	e. 180 NAC 7-065 Use of Sealed Sources for Diagnosis		
	f. 180 NAC 7-085 Other Medical Uses of Radioactive Material or Radiation from Radioactive Material		
	g. Remote Afterloader Units (HDR's)		
15.	180 NAC 7-067 Use of a Sealed Source in Teletheraphy Units, and Gamma Stereotactic Radiosurgery Units,	$6,000	$3,000

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	TYPE OF LICENSE		ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
16.	Research and development (Human Use).		$6,200	$3,000
17.	Processing or manufacture and distribution of radiopharmaceuticals by other than a nuclear pharmacy		$4,200	$3,000
18.	Possession and use of radioactive materials (Ra-226) in luminous paint		$2,000.00	$3,000
19.	Reserved			
20.	Research and Development (Non-Human Use)		$3,800	$1,600
21.	Educational (Instructional Only)		$1,500	$1,600
22.	Industrial Gauge		$1,500	$1,600
23.	Emergency Management (Civil Defense)		$1,100	$1,600
24.	Services(e.g. Leak Testing, Instrument Calibration, Gauge Installations or Maintenance)		$4,300	$1,600
25.	Gas Chromatograph Detector		$1,500	$1,600
26.	Other Specific License.		$1,200	$1,600
	a.	If license involves use of radioactive material at temporary job sites, an additional fee of:		NA
	b.	If license involves use of radioactive material in other than sealed source form, an additional fee of		NA
27.	Additional permanent sites or mobile coaches where radioactive material is stored or used under same license 50% of applicable fee for each additional site or mobile coach.			NA
28.	General License.		$140	NA
29.	Reciprocity			
	a.	Industrial Radiography	$2,900	NA
	b.	Well Logging.	$1,200	NA
	c.	Mobile Scanning	$1,700	NA
	d.	Industrial Gauge	$750	NA
	e.	Services	$750	NA
	f.	Gas Chromatograph Detector	$750	NA
	g	Waste Disposal (waste receipt/packaging) – Broker	$1,200	NA

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	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
30.	Review of a device, product, or sealed source containing radioactive, byproduct, source or special nuclear material for which no prior review has been performed. Each device, product or sealed source will be considered an individual review.[2]		Full Cost
31.	Reserved[6]		
a.			
b.			
c.			
32.	Department- Approved Training Courses[3]		$650
33.	Receipt of prepackaged waste	$4,000	$3,500
34.	Packaging waste	$5,000	$3,500

18-006 RESERVED

18-007 RESERVED

18-008 SCHEDULE OF ANNUAL FEES FOR CERTIFICATES OF REGISTRATION FOR RADIATION GENERATING EQUIPMENT AND SERVICES FOR RADIATION GENERATING EQUIPMENT:

18-008.01 Annual Fees for Radiation Generating Equipment

1. Registration per unit:

Category of Machine (Radiation Generating Equipment)	Fee Per Unit
a. Healing Arts Diagnostic - General	$70
b. Healing Arts Diagnostic - Dental	$70
c. Healing Arts Therapy	
(1) Superficial	$500
(2) X-ray Deep Therapy	$500
(3) Accelerator – Therapy	$500
(4) Veterinary Therapy	$500
(5) Other – Therapy	$500
d. Non-Healing Arts – Radiation Machines	
(1) Accelerators	$500
(2) Radiographic Cabinet X-ray	$150
(3) Analytic X-ray	$100

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(4) Electron Microscope $100
(5) Airport Baggage X-ray$150(6) Spectroscopy/Spectrography X-ray $100
(7) Particle Size Analyzer X-ray $100
(8) Package X-ray $150
(9) Industrial Gauge X-ray $150
(10) Fluoroscopy X-ray Industrial $250
(11) X-ray Fluorescence $100
(12) X-ray Diffraction $100
(13) Electron Beam Welding $250
(14) Industrial Radiological In-Plant Only $500
(15) Industrial Radiography Temporary Job Site $500
(16) Ion Implantation Device $100
(17) Other Non-Healing Arts $200
(18) Irradiator $500

e. Other
(1) Other $450
(2) Registration of Out-of-State radiation equipment brought into Nebraska for temporary use Annual Fee of Applicable Category

18-008.02 Annual Fees for Radiation Generating Equipment Services

Category of Service	Annual Fee Except As Stated Otherwise
A. Installation/Service	$200.00
B. Calibration	$200.00
C. Consultations	$200.00
D. Reviews	$200.00
E. Demonstration which includes energizing the radiation generating Equipment	$200.00
F. Sales	$200.00
G. Other	$200.00

18-009 ENVIRONMENTAL SURVEILLANCE FEES: Whenever the Department conducts environmental surveillance the full cost of the service will be charged:

18-010 EMERGENCY RESPONSE FEES: Whenever the Department provides emergency response capability a fee will be charged equal to the cost, to include personnel, equipment and supplies.

18-011 NUCLEAR POWER PLANT FEES: Collect a fee for emergency response or environmental surveillance, or both, offsite from each nuclear power plant equal to the cost of completing the emergency response or environmental surveillance and any associated report. In no event will the fee for any nuclear power plant exceed the lesser of the actual costs of such activities

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or $53,000 per annum. Commencing July 1, 1997, the accounting division of the Department of Administrative Services will recommend an inflationary adjustment equivalent which will be based upon the Consumer Price Index for All Urban Consumers of the United States Department of Labor, Bureau of Labor Statistics, and will not exceed 5% per annum. Such adjustment will be applied to the annual fee for nuclear power plants. The fee collected will be credited to the Department of Health and Human Services Cash Fund. This fee will be used solely for the purpose of defraying the direct costs of the emergency response and environmental surveillance at Cooper Nuclear Station and Fort Calhoun Station conducted by the department. The department may charge additional fees when mutually agreed upon for services, training, or equipment that are a part of or in addition to matters in 180 NAC 18-011.

18-012 FAILURE TO PAY PRESCRIBED FEES

18-012.01 In any case where the Department finds that an applicant for a license or certificate of registration has failed to pay the fee prescribed in this chapter, the Department will not process that application until such fee is paid.

18-012.02 In any case where the Department finds that a licensee or registrant has failed to pay a fee prescribed by this chapter by the due date, the Department may implement the appropriate compliance procedures.

18-012.03 In any case where the Department finds that a fixed nuclear facility has failed to pay fees for environmental surveillance and/or emergency planning, emergency response and implementation pursuant to contract within 90 days following date of invoice, the Department may issue an order to show cause why the services should be terminated for breach of contract.

18-012.04 In the event the Department has performed services for or expended funds on behalf of a person who has not reimbursed the Department after demand, then the Department may take appropriate legal action to recover amounts.

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APPENDIX 18-A¶
Routine Inspection Intervals For Determination of the Machine Fee, the Routine Inspection Frequency For Radiation Generating Equipment and the Assigned Priority.¶
¶
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¶
. Examples of Fee Calculation for Uranium Recovery Facility Licenses.¶
¶
This Example is the same for either an In Situ or a Disposal License.¶
¶
1. . New Application - This is a one-time fee paid upon the submission of the license application. This fee may be adjusted by the appropriate amount specified in 180 NAC 18-006.¶
¶
Example:¶
¶
In Situ License Application . $109,200¶
In Situ Satellite . $ 35,875¶
¶
Total for Application . $145,075¶
¶
If this application contains the request for surface discharge then an additional $3,435.00 must also be submitted. The total would then be $148,512.¶
¶
2. . Operational Year Including Renewal. The annual fee consist of the following:¶
¶
Annual Operational Fee . $109,200¶
Long-Term Care Fund Payment . $ 65,000¶
If Surface Discharge is Requested . $ 4,300¶
Long-Term Care Fund Payment . $ 2,580¶
¶
Annual Total . $181,080¶
¶
3. . Site Restoration or Reclamation. The annual fee consists of the following:¶
¶
Annual Restoration Fee . $ 87,360¶
Long-Term Care Fund Payment . $ 65,000¶
If Surface Discharge is Requested . $ 3,435¶
Long-Term Care Fund Payment . $ 2,580¶
¶
Annual Total . $158,375¶
¶
This fee is paid annually starting with the commencement of site restoration or reclamation at the conclusion of the operational licensed activities. The operational fee terminates at the conclusion of the operational licensed activities. The fees for site restoration or reclamation are to be paid annually until the restoration or reclamation has been completed.¶ ... [41]

NOTE to Licensees and Registrants:

There is a substantial increase in fees in all categories. The fees for radioactive materials have not been increased since June 13, 1995. The fees for x-ray facilities have not increased since November 25, 1990. These programs will be entirely funded through fees in order to eliminate the need for general funding.

The radioactive materials program costs were based on time allocation and complexity considering areas such as:

- Type of licenses
- Average number of actions for a license type
- Inspection priority which is indicative of the safety risk and resulting regulatory costs associated with the category
- Increased controls on several types of licenses due to security

The x-ray and services fees program costs were based on time allocation and complexity considering areas such as:

- Number of x-ray machines (Allowing for the statutory $70 limit per medical diagnostic x-ray machine.)
- Registrations
- Complexity of Inspections

The environmental surveillance fees were changed to full cost. The samples will be sent to a contract laboratory as the State Laboratory will not be doing the sample analysis.

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TITLE 180 CONTROL OF RADIATION

CHAPTER 18 FEES FOR CERTIFICATES OF REGISTRATION, RADIOACTIVE MATERIAL(S) LICENSES, ENVIRONMENTAL SURVEILLANCE, EMERGENCY RESPONSE AND OTHER REGULATORY SERVICES.

18-001 Scope and Authority 1
18-002 Definitions 1
18-003 Exemptions 2
18-004 Payment of Fees 2
18-005 Schedule of Annual Fees for Radioactive Material Licenses 4
18-006 Fees for Low-Level Radioactive Waste Management Pursuant to 180 NAC 12 7
18-007 Schedule for Annual Fees for Certificates of Registration for Radiation Generating Equipment And Services for Radiation Generating Equipment 7
18-008 Environmental Surveillance Fees 8
18-009 Emergency Response Fees 8
18-010 Nuclear Power Plant Fees 8
18-011 Failure to Pay Prescribed Fees 9

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Appendix 18-B Example of Fee Calculation . 1019¶
Appendix 18-C Examples of Fee Caluculation for Uranium Recovery Facility Licenses . 1121

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TITLE 180 CONTROL OF RADIATION

CHAPTER 18 FEES FOR CERTIFICATES OF REGISTRATION, RADIOACTIVE MATERIAL(S) LICENSES, ENVIRONMENTAL SURVEILLANCE, EMERGENCY RESPONSE AND OTHER REGULATORY SERVICES

18-001 SCOPE AND AUTHORITY:

18-001.01 This chapter establishes the fees for licensing, registration, environmental surveillance and implementation, emergency planning, emergency response and implementation, and other regulatory services and provide for their payment. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. sections 71-3501 to 3520.

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18-001.02 Except as otherwise specifically provided, the rules and requirements in this chapter apply to any person who is

1. An applicant for, or holder of:
   a. A radioactive material license issued pursuant to 180 NAC 3, 5, 7, 12, 14 or 19; or

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   b. A certificate of registration for radiation machines/facilities and/or services issued pursuant to180 NAC 2 or 5.
   c. A general license
2. The holder of a fixed nuclear facility construction permit or operating license issued by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR Part 50; or
3. The operator of any other fixed nuclear facility under a license issued by the U.S. Nuclear Regulatory Commission Pursuant to 10 CFR Parts 30, 31, 32, 33, 34, 35, 36, 39, 40 and/or 70.
4. The operator of any other nuclear facility.
5. The operator of any facility that during the course of operation results in the release of radioactive material to the environment.

18-002 DEFINITIONS: For the purposes of 180 NAC 18, the following definitions apply:

Carrier means a person who transports passengers or property in commerce by rail car, aircraft, motor vehicle or vessel.

Deleted: any common carrier, contract carrier, private carrier, railway freight carrier or railway express carrier handling, storing or transporting radioactive material

Emergency Planning, Emergency Response and Implementation means the development and application of those capabilities necessary for the protection of the public and the environment from the effects of an accidental or uncontrolled exposure dose or release of radioactive materials, including the equipping, training and periodic retraining of emergency response personnel.

Environmental Surveillance and Implementation means the development and application of those capabilities necessary to assess the radiological impact of activities conducted by licensees and registrants on public health and safety and the environment.

Facility means any facility other than that defined in this subsection.

Fixed Nuclear Facility means:

Any nuclear reactor(s) at a single site;

Any facility designed or used for the assembly or disassembly of nuclear weapons;

Any other facility using or possessing source material, special nuclear material, byproduct material and/or any other radioactive material for which the Department conducts off-site environmental surveillance to protect the public health and safety or the environment.

18-003 EXEMPTIONS

18-003.01 No application or annual fee will be required for any carrier, transporting any of the materials described in the Radiation Control Act in the ordinary course of such carrier's business.

18-003.02 No fee may be required for the Department of Health and Human Services.

18-004 PAYMENT OF FEES

18-004.01 Application fees: Each application for a license or certificate of registration for which a fee is prescribed will be accompanied by a non-refundable fee.

1. An application for a certificate of registration must be accompanied by the total fee for all applicable categories.
2. Applications for new materials licenses, applications to reinstate expired, terminated or inactive licenses and applications for amendments to licenses that would place the license in a higher fee category or add a new fee category must be accompanied by the prescribed application fee for each category.
3. No application will be accepted for filing or processing prior to full fee payment, as specified, and the application will be returned to the applicant.
4. All application fees will be charged irrespective of the Department's disposition of the application or a withdrawal of the application.

18-004.02 Annual Fees for Licenses and Certificates of Registration

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Shipper means a person who packages the radioactive material and presents the package for transport.¶

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1. A non-refundable fee, pursuant to 180 NAC 18-005, or 18-008 shall must be paid annually for each radioactive material license and for each certificate of registration. The fee must be paid in full each year on or before the last day of the expiration anniversary month of the license or certificate of registration.[1]

2. In the case of a single license which authorizes more than one category of use, an annual fee must be paid for each category applicable to the license.

3. In the case of a registration for radiation generating equipment an annual fee must be paid for each machine at a facility.

4. In the case of services for radiation generating equipment which authorizes more than one category, annual fees must be paid for each category applicable to the registration.

4. An application for an amendment to a license or certificate of registration which results in a change to a category with a higher annual fee will result in a fee being charged equal to the prorated difference between the fee for the current category and the one to which the amended license or certificate will escalate.

   a. The prorated costs will be based on monthly intervals and will be charged from the first day of the month the amendment is effective until the end of the current billing period.
   b. The Department will bill the licensee or registrant for the prorated portion of the applicable annual fee.
   c. The replacement of part(s) for an existing radiation machine will not result in an additional fee.

18-004.03 Reciprocity Fees

1. Each application for reciprocal recognition of an out-of-state radioactive materials license under 180 NAC 3-028 must be accompanied by the applicable annual fee.
2. Each application for recognition of an out-of-state registration under 180 NAC 2-012 must be accompanied by the applicable annual fee, provided that no such

[1]Example: If the license or certificate of registration expires on June 30, 2007, annual fees are due on or before June 30, of each year.

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fee has been submitted within 12 months of the date of commencement of the proposed activity.

18-004.04 Environmental Surveillance Fees

1. Each holder of a fixed nuclear facility construction permit or operating license, or an operator of any other fixed nuclear facility, or any other facility as defined in 180 NAC 18-002 must submit the fee pursuant to 180 NAC 18-009 for services received.
2. This fee will recover for the, Department of Health and Human Services , the expenses arising from environmental surveillance and implementation activities.
3. Payment must be made within 60 days following the date of invoice.

18-004.05 Emergency Planning, Emergency Response and Implementation Fees

1. Each holder of a fixed nuclear facility construction permit or operating license, or an operator of any other fixed nuclear facility, or any other facility as defined in 180 NAC 18-002 must submit the fee, pursuant to 180 NAC 18-010, for services received.
2. This fee will recover for the Department of Health and Human Services Regulation and Licensure, the expenses arising from emergency planning, emergency response and implementation activities.
3. Payment must be made within 90 days following the date of invoice.

18-004.06 Method of Payment

1. Fee payments must be by check or money order made payable to the Department of Health and Human Services.
2. The payments may be made by personal delivery to the office, State of Nebraska Department of Health and Human Services in Lincoln, Nebraska, or mailed to the, Department of Health and Human Services, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

18-005 SCHEDULE OF FEES FOR RADIOACTIVE MATERIAL LICENSES

18-05.01 Schedule of annual fees:

	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
1.	Reserved		
2.	Reserved		
3.	Manufacturing/Processing of Radioactive Material	$6,500	$3,900
4.	Industrial Radiography	$6,500	$3,900
5.	Broad License (Educational and/or Medical)	$18,000	$3,900

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	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
6.	Irradiator, Unshielded During Irradiation	$11,500	$3,900
7.	Nuclear Pharmacy	$7,200	$3,900
8	License for Distributor to distribute to persons generally licensed, and/or persons specifically licensed.	$5,500	$3,900
9.	Commercial collection and laundry of items contaminated with radioactive, source or special nuclear material.	$18,000	$3,900
10	Manufacturer and distribution of encapsulated radioactive material, byproduct, source, or special nuclear material in source of power.	$6,500	$3,900
11.	Well Logging	$2,500	$3,000
12	Irradiator, Self-Shielded	$2,600	$3,000
13	Mobile Scanning	$3,900	$3,000
14.	Nuclear Medicine/Brachytherapy (Note only one free for any license type 14)	$3,900	$3,000
	a. 7-041 Use of Unsealed Radioactive Material for Uptake, Dilution, and Excretion Studies for Which a Written Directive is Not Required,		
	b. 180 NAC 7-044 Use of Unsealed Radioactive Material for Imaging and Localization Studies for Which a Written Directive is Not Required, and/or		
	c. 180 NAC 7-048 Use of Unsealed Radioactive Material for Which a Written Directive is Required		
	d. 180 NAC 7-055 Use of Sources for Manual Brachytherapy,		
	e. 180 NAC 7-065 Use of Sealed Sources for Diagnosis		
	f. 180 NAC 7-085 Other Medical Uses of Radioactive Material or Radiation from Radioactive Material		
	g. Remote Afterloader Units (HDR's)		
15.	180 NAC 7-067 Use of a Sealed Source in Teletheraphy Units, and Gamma Stereotactic Radiosurgery Units,	$6,000	$3,000

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	TYPE OF LICENSE		ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
16.	Research and development (Human Use).		$6,200	$3,000
17.	Processing or manufacture and distribution of radiopharmaceuticals by other than a nuclear pharmacy		$4,200	$3,000
18.	Possession and use of radioactive materials (Ra-226) in luminous paint		$2,000.00	$3,000
19.	Reserved			
20.	Research and Development (Non-Human Use)		$3,800	$1,600
21.	Educational (Instructional Only)		$1,500	$1,600
22.	Industrial Gauge		$1,500	$1,600
23.	Emergency Management (Civil Defense)		$1,100	$1,600
24.	Services(e.g. Leak Testing, Instrument Calibration, Gauge Installations or Maintenance)		$4,300	$1,600
25.	Gas Chromatograph Detector		$1,500	$1,600
26.	Other Specific License.		$1,200	$1,600
	a.	If license involves use of radioactive material at temporary job sites, an additional fee of:		NA
	b.	If license involves use of radioactive material in other than sealed source form, an additional fee of		NA
27.	Additional permanent sites or mobile coaches where radioactive material is stored or used under same license 50% of applicable fee for each additional site or mobile coach.			NA
28.	General License.		$140	NA
29.	Reciprocity			
	a.	Industrial Radiography	$2,900	NA
	b.	Well Logging.	$1,200	NA
	c.	Mobile Scanning	$1,700	NA
	d.	Industrial Gauge	$750	NA
	e.	Services	$750	NA
	f.	Gas Chromatograph Detector	$750	NA
	g	Waste Disposal (waste receipt/packaging) – Broker	$1,200	NA

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	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
30.	Review of a device, product, or sealed source containing radioactive, byproduct, source or special nuclear material for which no prior review has been performed. Each device, product or sealed source will be considered an individual review.[2]		Full Cost
31.	Reserved[6]		
a.			
b.			
c.			
32.	Department- Approved Training Courses[3]		$650
33.	Receipt of prepackaged waste	$4,000	$3,500
34.	Packaging waste	$5,000	$3,500

18-006 RESERVED

18-007 RESERVED

18-008 SCHEDULE OF ANNUAL FEES FOR CERTIFICATES OF REGISTRATION FOR RADIATION GENERATING EQUIPMENT AND SERVICES FOR RADIATION GENERATING EQUIPMENT:

18-008.01 Annual Fees for Radiation Generating Equipment

1. Registration per unit:

Category of Machine (Radiation Generating Equipment)	Fee Per Unit
a. Healing Arts Diagnostic - General	$70
b. Healing Arts Diagnostic - Dental	$70
c. Healing Arts Therapy	
(1) Superficial	$500
(2) X-ray Deep Therapy	$500
(3) Accelerator – Therapy	$500
(4) Veterinary Therapy	$500
(5) Other – Therapy	$500
d. Non-Healing Arts – Radiation Machines	
(1) Accelerators	$500
(2) Radiographic Cabinet X-ray	$150
(3) Analytic X-ray	$100

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(4) Electron Microscope $100
(5) Airport Baggage X-ray$150(6) Spectroscopy/Spectrography X-ray $100
(7) Particle Size Analyzer X-ray $100
(8) Package X-ray $150
(9) Industrial Gauge X-ray $150
(10) Fluoroscopy X-ray Industrial $250
(11) X-ray Fluorescence $100
(12) X-ray Diffraction $100
(13) Electron Beam Welding $250
(14) Industrial Radiological In-Plant Only $500
(15) Industrial Radiography Temporary Job Site $500
(16) Ion Implantation Device $100
(17) Other Non-Healing Arts $200
(18) Irradiator $500

e. Other
(1) Other $450
(2) Registration of Out-of-State radiation equipment brought into Nebraska for temporary use Annual Fee of Applicable Category

18-008.02 Annual Fees for Radiation Generating Equipment Services	Annual Fee
Category of Service	Except As Stated Otherwise
A. Installation/Service	$200.00
B. Calibration	$200.00
C. Consultations	$200.00
D. Reviews	$200.00
E. Demonstration which includes energizing the radiation generating Equipment	$200.00
F. Sales	$200.00
G. Other	$200.00

18-009 ENVIRONMENTAL SURVEILLANCE FEES: Whenever the Department conducts environmental surveillance the full cost of the service will be charged:

18-010 EMERGENCY RESPONSE FEES: Whenever the Department provides emergency response capability a fee will be charged equal to the cost, to include personnel, equipment and supplies.

18-011 NUCLEAR POWER PLANT FEES: Collect a fee for emergency response or environmental surveillance, or both, offsite from each nuclear power plant equal to the cost of completing the emergency response or environmental surveillance and any associated report. In no event will the fee for any nuclear power plant exceed the lesser of the actual costs of such activities

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or $53,000 per annum. Commencing July 1, 1997, the accounting division of the Department of Administrative Services will recommend an inflationary adjustment equivalent which will be based upon the Consumer Price Index for All Urban Consumers of the United States Department of Labor, Bureau of Labor Statistics, and will not exceed 5% per annum. Such adjustment will be applied to the annual fee for nuclear power plants. The fee collected will be credited to the Department of Health and Human Services Cash Fund. This fee will be used solely for the purpose of defraying the direct costs of the emergency response and environmental surveillance at Cooper Nuclear Station and Fort Calhoun Station conducted by the department. The department may charge additional fees when mutually agreed upon for services, training, or equipment that are a part of or in addition to matters in 180 NAC 18-011.

18-012 FAILURE TO PAY PRESCRIBED FEES

18-012.01 In any case where the Department finds that an applicant for a license or certificate of registration has failed to pay the fee prescribed in this chapter, the Department will not process that application until such fee is paid.

18-012.02 In any case where the Department finds that a licensee or registrant has failed to pay a fee prescribed by this chapter, by the due date, the Department may implement the appropriate compliance procedures.

18-012.03 In any case where the Department finds that a fixed nuclear facility has failed to pay fees for environmental surveillance and/or emergency planning, emergency response and implementation pursuant to contract within 90 days following date of invoice, the Department may issue an order to show cause why the services should be terminated for breach of contract.

18-012.04 In the event the Department has performed services for or expended funds on behalf of a person who has not reimbursed the Department after demand, then the Department may take appropriate legal action to recover amounts.

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APPENDIX 18-A¶
Routine Inspection Intervals For Determination of the Machine Fee, *the Routine Inspection Frequency For* Radiation Generating Equipment and the Assigned Priority.¶
¶
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¶
. Examples of Fee Calculation for Uranium Recovery Facility Licenses.¶
¶
This Example is the same for either an In Situ or a Disposal License.¶
¶
1. . New Application - This is a one-time fee paid upon the submission of the license application. This fee may be adjusted by the appropriate amount specified in 180 NAC 18-006.¶
¶
Example:¶
¶
In Situ License Application . $109,200¶
In Situ Satellite . $ 35,875¶
¶
Total for Application . $145,075¶
¶
If this application contains the request for surface discharge then an additional $3,435.00 must also be submitted. The total would then be $148,512.¶
¶
2. . Operational Year Including Renewal. The annual fee consist of the following:¶
¶
Annual Operational Fee . $109,200¶
Long-Term Care Fund Payment . $ 65,000¶
If Surface Discharge is Requested . $ 4,300¶
Long-Term Care Fund Payment . $ 2,580¶
¶
Annual Total . $181,080¶
¶
3. . Site Restoration or Reclamation. The annual fee consists of the following:¶
¶
Annual Restoration Fee . $ 87,360¶
Long-Term Care Fund Payment . $ 65,000¶
If Surface Discharge is Requested . $ 3,435¶
Long-Term Care Fund Payment . $ 2,580¶
¶
Annual Total . $158,375¶
¶
This fee is paid annually starting with the commencement of site restoration or reclamation at the conclusion of the operational licensed activities. The operational fee terminates at the conclusion of the operational licensed activities. The fees for site restoration or reclamation are to be paid annually until the restoration or reclamation has been completed.¶ ... [41]

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a. The fee consists of a base fee for all registrants plus a fee for each machine possessed.
b. The machine fee is modified by the inspection interval (years between routine inspections) of the facility category as specified in Appendix 18-A. The formula for calculation is as follows:

$$\text{Annual Fee} = \frac{\text{Base Fee+(Sum of Machine and/or Service Fees)}}{\text{Inspection Interval(s)}^{1}}$$

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License of type listed in 3 through 10 above

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$1,920.00

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License of type listed in 11 through 18 above

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License of type listed in 19 through 26 above

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Agency

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$350.00

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SCHEDULE OF FEES FOR URANIUM RECOVERY FACILITY LICENSES[3]

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18.006.01 Annual Fees

[1]An example of a fee calculation is shown in Appendix 18-B.

[23]The fees for course approvals applies to all training courses regardless of who is offering such courses. There is a one-time fee for course review which is valid as long as the original course remains unchanged. Courses qualifying for deemed status shallwill not be subject to fee.

[3]Examples of the fee calculation are shown in Appendix 18-C.

Category	New Application	Operational Year Including Renewal	Restoration or Reclamation Only	Long Term Care
1. In Situ	$109,200	$109,200	$87,360	$65,000
2. Disposal only	$104,000	$104,000	$87,360	$65,000

18-006.02 Adjustments to Annual Fees

1. If additional non-contiguous uranium recovery facility sites are authorized under the same license, the appropriate annual fee shall be increased by 20 percent for each additional site.
2. Facilities proposing to conduct or conducting irrigation or surface discharge shall pay the following additional annual fee for each irrigation plot or surface discharge point:

New Application	Operational Year	Restoration or Reclamation Only	Long Term Care
$3,435.00	$4,300.00	$3,435.00	$2,580.00

18-006.03 One-time Fee Adjustments for the addition of items listed below after an Environmental Assessment has been completed on a facility, a one-time fee corresponding to the item shall be paid:

1. New In Situ Uranium Recover Facility$35,875.00
2. In Situ Well Field on Non-Contiguous Property$35,875.00
3. In Situ Satellite$35,875.00
4. Well Field on Contiguous Property$14,295.00
5. Irrigation/Surface Discharge$3,345.00
6. Non-Vacuum Dryer$25,315.00

18-006.04 In addition to any other fees, in 180 NAC 18-006, prior to the issuance of the license the applicant shall deposit with the state cash, negotiable government securities, or an irrevocable assignment of certificates of deposit for Site Closure and Reclamation Cash Fund in the amount of $5,000.

18-006.05 The licensee shall pay annually, in addition to all other fees in 180 NAC 18-006 an amount specified in 180 NAC 18-006.01 for deposit by the State Treasurer in the Nebraska Department of Health and Human Services Regulation and Licensure, Radiation Long-Term Care Cash Fund.

18-006.06 Interpretive Rules and Definitions

1. "Contiguous" properties are those locations adjacent to an existing licensed or permitted area.

2. A "new in situ uranium recover facility" is one which has one or more well fields, an ion exchange uranium recovery facility, and facilities for concentrating yellow cake.
3. Once facilities under a license have entered restoration or reclamation, the appropriate annual fee will continue to be the restoration/reclamation annual fee (subject to adjustment for non-contiguous sites) without regard to whether the license term is subject to renewal.
4. The one-time fee adjustment shall apply only to those facilities not licensed as of the effective date of these regulations.

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FEES FOR LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PURSUANT TO 180 NAC 12

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18-007.01 License Processing Fees:

1. A fee

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will be assessed from license applicants to process, issue, amend or renew licenses including amendments for the purpose of site closure and stabilization.

2. In determining the fees, the Agency

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will calculate and itemize the direct costs associated with license evaluation, processing, and monitoring, including application review, meetings and correspondence with the license applicant, license research and drafting time, necessary travel, technical and administrative review of the drafted license, clerical preparation of the license and related tasks, advertising costs for public notice, review of public comments, hearing costs, license processing fee billing, and final license issuance. The Agency

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will apply the current indirect rate to its total direct wages and salary expenses. This method is the approved agency-wide procedure for recovering indirect costs from its federal programs.

3. The Agency

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will maintain itemized records of staff time and costs incurred in the processing of a license application. License processing fees

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will apply without regard to whether a license is issued, denied or requested to be inactivated prior to issuance or thereafter.

4. Each application for a license

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will be accompanied by a filing fee of two-hundred seventy-five thousand dollars ($275,000.).

5. All fees

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must be made payable to the Nebraska Department of Health and Human Services Regulation and Licensure.

a. Where the fees assessed in accordance with 180 NAC 18-00

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6.02, item 2 above are less than the filing fee set forth in 180 NAC 18-

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01, item 4 above, the Agency

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will refund the balance to the applicant.

b. Where the fees assessed in accordance with 180 NAC 18-00

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6.01, item 2 above exceed the filing fee set forth in 180 NAC 18-00

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6.01, item 4 above, the applicant

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will be billed the balance.

18-007.02 Annual License Administration Fees

1. An administration fee

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will be assessed to licensees based upon direct and indirect costs annually during the term of operation and during site closure and stabilization until the license has been terminated.

2. In determining the annual fees, the Agency

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will calculate and itemize the cost of monitoring the licensed facility, inspections of the facility or other site visits, reviewing the compliance of facilities with the associated license conditions, general legal costs incurred by the Agency, or other tasks related to administering the license program.

3. The Agency

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will maintain itemized records of staff time and costs incurred in the administration of a license.

4. An annual fee of $200,000

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must be made payable to the State of Nebraska Department of Health and Human Services Regulation and Licensure and

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are due July 1.

a. Where the fees assessed in accordance with 180 NAC 18-00

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6.02, item 2. above are less then the fee set forth in 180 NAC 18-00

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will refund the balance to the licensee.

b. Where the fees assessed in accordance with 180 NAC 18-00

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6.02, item 2. above exceed the fee set forth in 180 NAC 18-00

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6.02, item 4. above, the licensee

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1. Accelerator$115.00
2. Airport Baggage X-ray$70.00
3. Electron Beam Welding$70.00
4. Chiropractic$70.00
5. CT Scanners$70.00
6. Dental Diagnostic$20.00
7. Radiographic/Fluoroscopic Combination$70.00
8. X-Ray Diffraction$40.00
9. X-Ray Fluorescence$40.00
10. Fluoroscopy Diagnostic$70.00
11. Fluoroscopy X-Ray - Industrial$70.00
12. Industrial Gauge - X-Ray$70.00
13. Ion Implantation Device$70.00
14. Medical Diagnostic X-ray$70.00
15. Electron Microscope$70.00
16. Package X-Ray$70.00
17. Particle Size Analyzer - X-Ray (Analytical)$70.00
18. Podiatric Diagnostic - X-Ray$40.00
19. Spectroscopy/Spectrography X-Ray$70.00
20. Therapeutic X-Ray$70.00
21. Veterinary Diagnostic X-Ray$40.00
22. Radiography Cabinet X-Ray (per registration)$70.00
23. Industrial Radiography - In-Plant Only (per registration)

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$240.00

24. Industrial Radiography - Temporary Field Site Authorization (per registration)[4]$300.00
25. Research and Development$80.00
26. Registration of Out-of-State radiation generating equipment brought into Nebraska for temporary useAnnual Fee of Applicable Category
27. ReciprocityAnnual Fee of Applicable Category
28. Other Registered Sources$95.00

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[4]Ibid. p. 18-14

1. Assembler/Installer - Radiation Generating Equipment$85.00
2. Facility Shielding Review$85.00
3. Calibration - Radiation Generating Equipment$85.00
4. Demonstration/Sales$85.00
5. Health Physics Services
   a. Any Combination of two (2) of the Above$170.00
   b. Any Combination of three (3) of the Above$250.00
   c. Any Combination of four (4) of the Above$300.00
6. Personnel Monitoring Services$ 95.00

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Category	Fees per Analysis Type
1. Air Filter	
Gross Alpha	$20.00
Gross Beta	$20.00
Gross Alpha/Beta	$25.00
Gamma Scan	$60.00
2. Charcoal Cartridge	
Gamma Scan	$60.00
Iodine 131	$60.00
3. Silver Zeolite Cartridge	
Gamma Scan	$60.00
Iodine 131	$60.00
4. Water (Surface/Ground)	
Gross Alpha	$20.00
Gross Beta	$20.00
Gross Alpha/Beta	$25.00
Gamma Scan	$60.00
Tritium	$25.00
Iodine 131	$60.00
Strontium 89/90	$90.00
Strontium 90	$90.00
Radon	$50.00
Total Uranium	$40.00
Thorium	$90.00
Total Radium	$40.00

Radium 226$55.00
Radium 228$55.00

5. Milk
   Strontium 89/90$90.00
   Strontium 90$90.00
   Gamma Scan$60.00
   Iodine 131$60.00

6. Food Product and Vegetation
   Gamma Scan$60.00
   Iodine 131$60.00
   Strontium 89/90$90.00
   Strontium 90$90.00

7. Soil and Sediments
   Gross Alpha$20.00
   Gross Beta$20.00
   Gamma Scan$60.00
   Strontium 89/90$90.00
   Strontium 90$90.00

8. Biota
   Gamma Scan$60.00

9. Any Other Sample
   Gross Alpha$20.00
   Gross Beta$20.00
   Gross Alpha/Beta$25.00
   Gamma Scan$60.00

10. Radon Measurement$50.00

11. Any Other Analysis Not Specified Above[5] As necessary to cover the costs

12. Environmental Dosimetry
    TLD Bulb$50.00 Each
    TLD Bulb Analysis$20.00

13. Personal Services$50.00/Hour

14. Equipment/Supplies — As necessary to cover the cost of adequately assessing the radiological impact of activities conducted by licensees and registrants on public health and safety and the environment.

15. Smears (wipes) for Removable Contamination (Radioactive Material)$20.00

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[5]In determining such fees, the Agency shall, as an objective obtain sufficient funds from the fees to pay for a portion of the direct and indirect costs of administering the Radiation Control Act without loss or reduction of the General Fund Allocation to the Agency.

16. Leak Test of Sealed Sources $20.00

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Any fee(s) collected pursuant to 180 NAC 18-009 and 18-010 from any Nuclear Power Plant,

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will not exceed the lesser of the actual annual costs of such activities or $36,000.

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APPENDIX 18-A

Routine Inspection Intervals For Determination of the Machine Fee, the Routine Inspection Frequency For Radiation Generating Equipment and the Assigned Priority.

	Column 1	Column 2	Column 3
Facility/Type	Priority[6]	Inspection Interval In Years For Fee Determination[7]	Inspection Interval In Years For Radiation Machine[8]
Hospital	I-II	2	1-2
Radiology Clinic	I, II or III	2	1-3
Private Practice	II or III	2	2-3
Chiropractic	II or III	2	2-3
Dental	IV	4	4
Veterinary	IV	4	4
Podiatrists	IV	4	4
Industrial	I-II	1	1-2
Osteopathic	II or III	2	2-3
Colleges & Schools	I or II	2	1-2
Regional Center	II or III	2	2-3

[6]The priority in Column 1 is determined on the basis of facility size, number of patients, number of tubes and personnel. The priority number assigned would coincide with the inspection frequency and may be adjusted in accordance with inspection findings.

[7]The inspection interval in years in Column 2 for fee determination is only used to establish the annual fee that is due. This interval is used in the formula specified in 180 NAC 18-004.02, item 4.b. and is shown in the example of a fee calculation in Appendix 18-B.

[8]The inspection interval in years in Column 3 for radiation machines establishes when the routine inspection frequency is expected. For example, a hospital has a 1-2 year frequency which means that inspections routinely would be conducted within that time frame. However, more frequent inspections may be made if and when conditions and situations warrant the accelerated inspection frequency.

	Column 1	Column 2	Column 3
Miscellaneous	I, II or III	2	1-3

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Appendix 18-B

Example of Fee Calculation.

The Annual Fee For Each Certificate of Registration is Calculated Using the Following Formula:

$$\text{Annual Fee} = \text{Base Fee} + \frac{\text{Sum of machines and/or Service fees}}{\text{Inspection Interval}}$$

The Inspection Interval for the Fee determination is Specified in Column 2 in Appendix 18-A.

Example:

1. There are three machines located in a clinic.
   1 dental diagnostic x-ray unit
   1 diagnostic x-ray unit (radio/fluoro combination)
   1 medical diagnostic x-ray unit

   The fee would be calculated as follows:

   $$\$25 + \frac{(1 \times \$20)}{4} + \frac{(1 \times \$70) + (1 \times \$70)}{2} =$$

   $$\$25 + \frac{\$20}{4} + \frac{\$140}{2} =$$

   $$\$25 + \$5 + \$70 = \$100$$

   The annual fee = $100

2. There are four machines located in a dental office.
   4 dental diagnostic x-ray units

   The fee would be calculated as follows:

   $$25 + \frac{(4 \times \$20)}{4} =$$

   $$\$25 + \frac{\$80}{4} =$$

   $$\$25 + \$20 = \$45$$

   The annual fee = $45

3. There is one machine located in a dental office.
   1 dental diagnostic x-ray unit

   The fee would be calculated as follows:

   $25 + (1 x $20) / 4 =

   $25 + $20 / 4 =

   $25 + $5 = $30

   The annual fee = $30

Page 11: [41] Deleted **Julia Schmitt** **07/13/2005 1:39:00 PM**

Appendix 018-C

Examples of Fee Calculation for Uranium Recovery Facility Licenses.

This Example is the same for either an In Situ or a Disposal License.

1. New Application - This is a one-time fee paid upon the submission of the license application. This fee may be adjusted by the appropriate amount specified in 180 NAC 18-006.

   Example:

   In Situ License Application$109,200
   In Situ Satellite$ 35,875

   Total for Application$145,075

   If this application contains the request for surface discharge then an additional $3,435.00 must also be submitted. The total would then be $148,512.

2. Operational Year Including Renewal. The annual fee consist of the following:

   Annual Operational Fee$109,200
   Long-Term Care Fund Payment$ 65,000
   If Surface Discharge is Requested$ 4,300
   Long-Term Care Fund Payment$ 2,580

   Annual Total$181,080

3. Site Restoration or Reclamation. The annual fee consists of the following:

   Annual Restoration Fee$ 87,360
   Long-Term Care Fund Payment$ 65,000
   If Surface Discharge is Requested$ 3,435

Long-Term Care Fund Payment$ 2,580

Annual Total$158,375

This fee is paid annually starting with the commencement of site restoration or reclamation at the conclusion of the operational licensed activities. The operational fee terminates at the conclusion of the operational licensed activities. The fees for site restoration or reclamation are to be paid annually until the restoration or reclamation has been completed.

The long-term care fees may be assessed by the Agency beyond the cessation of operational licensed activities, site restoration or reclamation, if necessary, but before termination of the license and closure of the site.

NOTE to Licensees and Registrants:

There is a substantial increase in fees in all categories. The fees for radioactive materials have not been increased since June 13, 1995. The fees for x-ray facilities have not increased since November 25, 1990. These programs will be entirely funded through fees in order to eliminate the need for general funding.

The radioactive materials program costs were based on time allocation and complexity considering areas such as:

- Type of licenses
- Average number of actions for a license type
- Inspection priority which is indicative of the safety risk and resulting regulatory costs associated with the category
- Increased controls on several types of licenses due to security

The x-ray and services fees program costs were based on time allocation and complexity considering areas such as:

- Number of x-ray machines (Allowing for the statutory $70 limit per medical diagnostic x-ray machine.)
- Registrations
- Complexity of Inspections

The environmental surveillance fees were changed to full cost. The samples will be sent to a contract laboratory as the State Laboratory will not be doing the sample analysis.

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TITLE 180 CONTROL OF RADIATION

CHAPTER 18 FEES FOR CERTIFICATES OF REGISTRATION, RADIOACTIVE MATERIAL(S) LICENSES, ENVIRONMENTAL SURVEILLANCE, EMERGENCY RESPONSE AND OTHER REGULATORY SERVICES.

18-001 Scope and Authority 1
18-002 Definitions 1
18-003 Exemptions 2
18-004 Payment of Fees 2
18-005 Schedule of Annual Fees for Radioactive Material Licenses 4
18-006 Fees for Low-Level Radioactive Waste Management Pursuant to 180 NAC 12 7
18-007 Schedule for Annual Fees for Certificates of Registration for Radiation Generating Equipment And Services for Radiation Generating Equipment 7
18-008 Environmental Surveillance Fees 8
18-009 Emergency Response Fees 8
18-010 Nuclear Power Plant Fees 8
18-011 Failure to Pay Prescribed Fees 9

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Appendix 18-A Routine Inspection Intervals for Determination of the Machine Fee, the Routine Inspection Frequency for Radiation Generatring Equipment and the Assigned Priority . 1018¶
Appendix 18-B Example of Fee Calculation . 1019¶
Appendix 18-C Examples of Fee Caluculation for Uranium Recovery Facility Licenses . 1121

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TITLE 180 CONTROL OF RADIATION

CHAPTER 18 FEES FOR CERTIFICATES OF REGISTRATION, RADIOACTIVE MATERIAL(S) LICENSES, ENVIRONMENTAL SURVEILLANCE, EMERGENCY RESPONSE AND OTHER REGULATORY SERVICES

18-001 SCOPE AND AUTHORITY:

18-001.01 This chapter establishes the fees for licensing, registration, environmental surveillance and implementation, emergency planning, emergency response and implementation, and other regulatory services and provide for their payment. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. sections 71-3501 to 3520.

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18-001.02 Except as otherwise specifically provided, the rules and requirements in this chapter apply to any person who is

1. An applicant for, or holder of:
   a. A radioactive material license issued pursuant to 180 NAC 3, 5, 7, 12, 14 or 19; or

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   b. A certificate of registration for radiation machines/facilities and/or services issued pursuant to180 NAC 2 or 5.
   c. A general license
2. The holder of a fixed nuclear facility construction permit or operating license issued by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR Part 50; or
3. The operator of any other fixed nuclear facility under a license issued by the U.S. Nuclear Regulatory Commission Pursuant to 10 CFR Parts 30, 31, 32, 33, 34, 35, 36, 39, 40 and/or 70.
4. The operator of any other nuclear facility.
5. The operator of any facility that during the course of operation results in the release of radioactive material to the environment.

18-002 DEFINITIONS: For the purposes of 180 NAC 18, the following definitions apply:

Carrier means a person who transports passengers or property in commerce by rail car, aircraft, motor vehicle or vessel.

Deleted: any common carrier, contract carrier, private carrier, railway freight carrier or railway express carrier handling, storing or transporting radioactive material

Emergency Planning, Emergency Response and Implementation means the development and application of those capabilities necessary for the protection of the public and the environment from the effects of an accidental or uncontrolled exposure dose or release of radioactive materials, including the equipping, training and periodic retraining of emergency response personnel.

Environmental Surveillance and Implementation means the development and application of those capabilities necessary to assess the radiological impact of activities conducted by licensees and registrants on public health and safety and the environment.

Facility means any facility other than that defined in this subsection.

Fixed Nuclear Facility means:

Any nuclear reactor(s) at a single site;

Any facility designed or used for the assembly or disassembly of nuclear weapons;

Any other facility using or possessing source material, special nuclear material, byproduct material and/or any other radioactive material for which the Department conducts off-site environmental surveillance to protect the public health and safety or the environment.

18-003 EXEMPTIONS

18-003.01 No application or annual fee will be required for any carrier, transporting any of the materials described in the Radiation Control Act in the ordinary course of such carrier's business.

18-003.02 No fee may be required for the Department of Health and Human Services,

18-004 PAYMENT OF FEES

18-004.01 Application fees: Each application for a license or certificate of registration for which a fee is prescribed will be accompanied by a non-refundable fee.

1. An application for a certificate of registration must be accompanied by the total fee for all applicable categories.
2. Applications for new materials licenses, applications to reinstate expired, terminated or inactive licenses and applications for amendments to licenses that would place the license in a higher fee category or add a new fee category must be accompanied by the prescribed application fee for each category.
3. No application will be accepted for filing or processing prior to full fee payment, as specified, and the application will be returned to the applicant.
4. All application fees will be charged irrespective of the Department's disposition of the application or a withdrawal of the application.

18-004.02 Annual Fees for Licenses and Certificates of Registration

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Shipper means a person who packages the radioactive material and presents the package for transport.¶

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1. A non-refundable fee, pursuant to 180 NAC 18-005, or 18-008 shall must be paid annually for each radioactive material license and for each certificate of registration. The fee must be paid in full each year on or before the last day of the expiration anniversary month of the license or certificate of registration.[1]

2. In the case of a single license which authorizes more than one category of use, an annual fee must be paid for each category applicable to the license.

3. In the case of a registration for radiation generating equipment an annual fee must be paid for each machine at a facility.

4. In the case of services for radiation generating equipment which authorizes more than one category, annual fees must be paid for each category applicable to the registration.

4. An application for an amendment to a license or certificate of registration which results in a change to a category with a higher annual fee will result in a fee being charged equal to the prorated difference between the fee for the current category and the one to which the amended license or certificate will escalate.

   a. The prorated costs will be based on monthly intervals and will be charged from the first day of the month the amendment is effective until the end of the current billing period.
   b. The Department will bill the licensee or registrant for the prorated portion of the applicable annual fee.
   c. The replacement of part(s) for an existing radiation machine will not result in an additional fee.

18-004.03 Reciprocity Fees

1. Each application for reciprocal recognition of an out-of-state radioactive materials license under 180 NAC 3-028 must be accompanied by the applicable annual fee.
2. Each application for recognition of an out-of-state registration under 180 NAC 2-012 must be accompanied by the applicable annual fee, provided that no such

[1]Example: If the license or certificate of registration expires on June 30, 2007, annual fees are due on or before June 30, of each year.

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¶
a. . The fee shall be paid in full each year on or before the last day of the expiration (anniversary) month of the certificate of registration.[2]¶

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fee has been submitted within 12 months of the date of commencement of the proposed activity.

18-004.04 Environmental Surveillance Fees

1. Each holder of a fixed nuclear facility construction permit or operating license, or an operator of any other fixed nuclear facility, or any other facility as defined in 180 NAC 18-002 must submit the fee pursuant to 180 NAC 18-009 for services received.
2. This fee will recover for the, Department of Health and Human Services , the expenses arising from environmental surveillance and implementation activities.
3. Payment must be made within 60 days following the date of invoice.

18-004.05 Emergency Planning, Emergency Response and Implementation Fees

1. Each holder of a fixed nuclear facility construction permit or operating license, or an operator of any other fixed nuclear facility, or any other facility as defined in 180 NAC 18-002 must submit the fee, pursuant to 180 NAC 18-010, for services received.
2. This fee will recover for the Department of Health and Human Services Regulation and Licensure, the expenses arising from emergency planning, emergency response and implementation activities.
3. Payment must be made within 90 days following the date of invoice.

18-004.06 Method of Payment

1. Fee payments must be by check or money order made payable to the Department of Health and Human Services.
2. The payments may be made by personal delivery to the office, State of Nebraska Department of Health and Human Services in Lincoln, Nebraska, or mailed to the, Department of Health and Human Services, 301 Centennial Mall South, P.O. Box 95026, Lincoln, Nebraska 68509-5026.

18-005 SCHEDULE OF FEES FOR RADIOACTIVE MATERIAL LICENSES

18-05.01 Schedule of annual fees:

	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
1.	Reserved		
2.	Reserved		
3.	Manufacturing/Processing of Radioactive Material	$6,500	$3,900
4.	Industrial Radiography	$6,500	$3,900
5.	Broad License (Educational and/or Medical)	$18,000	$3,900

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	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
6.	Irradiator, Unshielded During Irradiation	$11,500	$3,900
7.	Nuclear Pharmacy	$7,200	$3,900
8	License for Distributor to distribute to persons generally licensed, and/or persons specifically licensed.	$5,500	$3,900
9.	Commercial collection and laundry of items contaminated with radioactive, source or special nuclear material.	$18,000	$3,900
10	Manufacturer and distribution of encapsulated radioactive material, byproduct, source, or special nuclear material in source of power.	$6,500	$3,900
11.	Well Logging	$2,500	$3,000
12	Irradiator, Self-Shielded	$2,600	$3,000
13	Mobile Scanning	$3,900	$3,000
14.	Nuclear Medicine/Brachytherapy (Note only one free for any license type 14)	$3,900	$3,000
	a. 7-041 Use of Unsealed Radioactive Material for Uptake, Dilution, and Excretion Studies for Which a Written Directive is Not Required,		
	b. 180 NAC 7-044 Use of Unsealed Radioactive Material for Imaging and Localization Studies for Which a Written Directive is Not Required, and/or		
	c. 180 NAC 7-048 Use of Unsealed Radioactive Material for Which a Written Directive is Required		
	d. 180 NAC 7-055 Use of Sources for Manual Brachytherapy,		
	e. 180 NAC 7-065 Use of Sealed Sources for Diagnosis		
	f. 180 NAC 7-085 Other Medical Uses of Radioactive Material or Radiation from Radioactive Material		
	g. Remote Afterloader Units (HDR's)		
15.	180 NAC 7-067 Use of a Sealed Source in Teletheraphy Units, and Gamma Stereotactic Radiosurgery Units,	$6,000	$3,000

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	TYPE OF LICENSE		ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
16.	Research and development (Human Use).		$6,200	$3,000
17.	Processing or manufacture and distribution of radiopharmaceuticals by other than a nuclear pharmacy		$4,200	$3,000
18.	Possession and use of radioactive materials (Ra-226) in luminous paint		$2,000.00	$3,000
19.	Reserved			
20.	Research and Development (Non-Human Use)		$3,800	$1,600
21.	Educational (Instructional Only)		$1,500	$1,600
22.	Industrial Gauge		$1,500	$1,600
23.	Emergency Management (Civil Defense)		$1,100	$1,600
24.	Services(e.g. Leak Testing, Instrument Calibration, Gauge Installations or Maintenance)		$4,300	$1,600
25.	Gas Chromatograph Detector		$1,500	$1,600
26.	Other Specific License.		$1,200	$1,600
	a.	If license involves use of radioactive material at temporary job sites, an additional fee of:		NA
	b.	If license involves use of radioactive material in other than sealed source form, an additional fee of		NA
27.	Additional permanent sites or mobile coaches where radioactive material is stored or used under same license 50% of applicable fee for each additional site or mobile coach.			NA
28.	General License.		$140	NA
29.	Reciprocity			
	a.	Industrial Radiography	$2,900	NA
	b.	Well Logging.	$1,200	NA
	c.	Mobile Scanning	$1,700	NA
	d.	Industrial Gauge	$750	NA
	e.	Services	$750	NA
	f.	Gas Chromatograph Detector	$750	NA
	g	Waste Disposal (waste receipt/packaging) – Broker	$1,200	NA

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	TYPE OF LICENSE	ANNUAL FEE	NEW LICENSE APPLICATION FEE (ONE TIME FEE)
30.	Review of a device, product, or sealed source containing radioactive, byproduct, source or special nuclear material for which no prior review has been performed. Each device, product or sealed source will be considered an individual review.[2]		Full Cost
31.	Reserved[6]		
a.			
b.			
c.			
32.	Department- Approved Training Courses[3]		$650
33.	Receipt of prepackaged waste	$4,000	$3,500
34.	Packaging waste	$5,000	$3,500

18-006 RESERVED

18-007 RESERVED

18-008 SCHEDULE OF ANNUAL FEES FOR CERTIFICATES OF REGISTRATION FOR RADIATION GENERATING EQUIPMENT AND SERVICES FOR RADIATION GENERATING EQUIPMENT:

18-008.01 Annual Fees for Radiation Generating Equipment

1. Registration per unit:

Category of Machine (Radiation Generating Equipment)	Fee Per Unit
a. Healing Arts Diagnostic - General	$70
b. Healing Arts Diagnostic - Dental	$70
c. Healing Arts Therapy	
(1) Superficial	$500
(2) X-ray Deep Therapy	$500
(3) Accelerator – Therapy	$500
(4) Veterinary Therapy	$500
(5) Other – Therapy	$500
d. Non-Healing Arts – Radiation Machines	
(1) Accelerators	$500
(2) Radiographic Cabinet X-ray	$150
(3) Analytic X-ray	$100

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(4) Electron Microscope $100
(5) Airport Baggage X-ray$150(6) Spectroscopy/Spectrography X-ray $100
(7) Particle Size Analyzer X-ray $100
(8) Package X-ray $150
(9) Industrial Gauge X-ray $150
(10) Fluoroscopy X-ray Industrial $250
(11) X-ray Fluorescence $100
(12) X-ray Diffraction $100
(13) Electron Beam Welding $250
(14) Industrial Radiological In-Plant Only $500
(15) Industrial Radiography Temporary Job Site $500
(16) Ion Implantation Device $100
(17) Other Non-Healing Arts $200
(18) Irradiator $500

e. Other
(1) Other $450
(2) Registration of Out-of-State radiation equipment brought into Nebraska for temporary use Annual Fee of Applicable Category

18-008.02 Annual Fees for Radiation Generating Equipment Services

Category of Service	Annual Fee Except As Stated Otherwise
A. Installation/Service	$200.00
B. Calibration	$200.00
C. Consultations	$200.00
D. Reviews	$200.00
E. Demonstration which includes energizing the radiation generating Equipment	$200.00
F. Sales	$200.00
G. Other	$200.00

18-009 ENVIRONMENTAL SURVEILLANCE FEES: Whenever the Department conducts environmental surveillance the full cost of the service will be charged:

18-010 EMERGENCY RESPONSE FEES: Whenever the Department provides emergency response capability a fee will be charged equal to the cost, to include personnel, equipment and supplies.

18-011 NUCLEAR POWER PLANT FEES: Collect a fee for emergency response or environmental surveillance, or both, offsite from each nuclear power plant equal to the cost of completing the emergency response or environmental surveillance and any associated report. In no event will the fee for any nuclear power plant exceed the lesser of the actual costs of such activities

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or $53,000 per annum. Commencing July 1, 1997, the accounting division of the Department of Administrative Services will recommend an inflationary adjustment equivalent which will be based upon the Consumer Price Index for All Urban Consumers of the United States Department of Labor, Bureau of Labor Statistics, and will not exceed 5% per annum. Such adjustment will be applied to the annual fee for nuclear power plants. The fee collected will be credited to the Department of Health and Human Services Cash Fund. This fee will be used solely for the purpose of defraying the direct costs of the emergency response and environmental surveillance at Cooper Nuclear Station and Fort Calhoun Station conducted by the department. The department may charge additional fees when mutually agreed upon for services, training, or equipment that are a part of or in addition to matters in 180 NAC 18-011.

18-012 FAILURE TO PAY PRESCRIBED FEES

18-012.01 In any case where the Department finds that an applicant for a license or certificate of registration has failed to pay the fee prescribed in this chapter, the Department will not process that application until such fee is paid.

18-012.02 In any case where the Department finds that a licensee or registrant has failed to pay a fee prescribed by this chapter, by the due date, the Department may implement the appropriate compliance procedures.

18-012.03 In any case where the Department finds that a fixed nuclear facility has failed to pay fees for environmental surveillance and/or emergency planning, emergency response and implementation pursuant to contract within 90 days following date of invoice, the Department may issue an order to show cause why the services should be terminated for breach of contract.

18-012.04 In the event the Department has performed services for or expended funds on behalf of a person who has not reimbursed the Department after demand, then the Department may take appropriate legal action to recover amounts.

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APPENDIX 18-A¶
Routine Inspection Intervals For Determination of the Machine Fee, *the Routine Inspection Frequency For* Radiation Generating Equipment and the Assigned Priority.¶
¶
... [40]

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¶
. Examples of Fee Calculation for Uranium Recovery Facility Licenses.¶
¶
This Example is the same for either an In Situ or a Disposal License.¶
¶
1. . New Application - This is a one-time fee paid upon the submission of the license application. This fee may be adjusted by the appropriate amount specified in 180 NAC 18-006.¶
¶
Example:¶
¶
In Situ License Application . $109,200¶
In Situ Satellite . $ 35,875¶
¶
Total for Application . $145,075¶
¶
If this application contains the request for surface discharge then an additional $3,435.00 must also be submitted. The total would then be $148,512.¶
¶
2. . Operational Year Including Renewal. The annual fee consist of the following:¶
¶
Annual Operational Fee . $109,200¶
Long-Term Care Fund Payment . $ 65,000¶
If Surface Discharge is Requested . $ 4,300¶
Long-Term Care Fund Payment . $ 2,580¶
¶
Annual Total . $181,080¶
¶
3. . Site Restoration or Reclamation. The annual fee consists of the following:¶
¶
Annual Restoration Fee . $ 87,360¶
Long-Term Care Fund Payment . $ 65,000¶
If Surface Discharge is Requested . $ 3,435¶
Long-Term Care Fund Payment . $ 2,580¶
¶
Annual Total . $158,375¶
¶
This fee is paid annually starting with the commencement of site restoration or reclamation at the conclusion of the operational licensed activities. The operational fee terminates at the conclusion of the operational licensed activities. The fees for site restoration or reclamation are to be paid annually until the restoration or reclamation has been completed.¶ ... [41]

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a. The fee consists of a base fee for all registrants plus a fee for each machine possessed.
b. The machine fee is modified by the inspection interval (years between routine inspections) of the facility category as specified in Appendix 18-A. The formula for calculation is as follows:

$$\text{Annual Fee} = \frac{\text{Base Fee+(Sum of Machine and/or Service Fees)}}{\text{Inspection Interval(s)}}$$[1]

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License of type listed in 3 through 10 above

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$1,920.00

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License of type listed in 11 through 18 above

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$1,525.00

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License of type listed in 19 through 26 above

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$955.00

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Agency

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$350.00

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SCHEDULE OF FEES FOR URANIUM RECOVERY FACILITY LICENSES[3]

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18.006.01 Annual Fees

[1]An example of a fee calculation is shown in Appendix 18-B.

[23]The fees for course approvals applies to all training courses regardless of who is offering such courses. There is a one-time fee for course review which is valid as long as the original course remains unchanged. Courses qualifying for deemed status shallwill not be subject to fee.

[3]Examples of the fee calculation are shown in Appendix 18-C.

Category	New Application	Operational Year Including Renewal	Restoration or Reclamation Only	Long Term Care
1. In Situ	$109,200	$109,200	$87,360	$65,000
2. Disposal only	$104,000	$104,000	$87,360	$65,000

18-006.02 Adjustments to Annual Fees

1. If additional non-contiguous uranium recovery facility sites are authorized under the same license, the appropriate annual fee shall be increased by 20 percent for each additional site.
2. Facilities proposing to conduct or conducting irrigation or surface discharge shall pay the following additional annual fee for each irrigation plot or surface discharge point:

New Application	Operational Year	Restoration or Reclamation Only	Long Term Care
$3,435.00	$4,300.00	$3,435.00	$2,580.00

18-006.03 One-time Fee Adjustments for the addition of items listed below after an Environmental Assessment has been completed on a facility, a one-time fee corresponding to the item shall be paid:

1. New In Situ Uranium Recover Facility$35,875.00
2. In Situ Well Field on Non-Contiguous Property$35,875.00
3. In Situ Satellite$35,875.00
4. Well Field on Contiguous Property$14,295.00
5. Irrigation/Surface Discharge$3,345.00
6. Non-Vacuum Dryer$25,315.00

18-006.04 In addition to any other fees, in 180 NAC 18-006, prior to the issuance of the license the applicant shall deposit with the state cash, negotiable government securities, or an irrevocable assignment of certificates of deposit for Site Closure and Reclamation Cash Fund in the amount of $5,000.

18-006.05 The licensee shall pay annually, in addition to all other fees in 180 NAC 18-006 an amount specified in 180 NAC 18-006.01 for deposit by the State Treasurer in the Nebraska Department of Health and Human Services Regulation and Licensure, Radiation Long-Term Care Cash Fund.

18-006.06 Interpretive Rules and Definitions

1. "Contiguous" properties are those locations adjacent to an existing licensed or permitted area.

2. A "new in situ uranium recover facility" is one which has one or more well fields, an ion exchange uranium recovery facility, and facilities for concentrating yellow cake.
3. Once facilities under a license have entered restoration or reclamation, the appropriate annual fee will continue to be the restoration/reclamation annual fee (subject to adjustment for non-contiguous sites) without regard to whether the license term is subject to renewal.
4. The one-time fee adjustment shall apply only to those facilities not licensed as of the effective date of these regulations.

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FEES FOR LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PURSUANT TO 180 NAC 12

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18-007.01 License Processing Fees:

1. A fee

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will be assessed from license applicants to process, issue, amend or renew licenses including amendments for the purpose of site closure and stabilization.

2. In determining the fees, the Agency

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will calculate and itemize the direct costs associated with license evaluation, processing, and monitoring, including application review, meetings and correspondence with the license applicant, license research and drafting time, necessary travel, technical and administrative review of the drafted license, clerical preparation of the license and related tasks, advertising costs for public notice, review of public comments, hearing costs, license processing fee billing, and final license issuance. The Agency

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will apply the current indirect rate to its total direct wages and salary expenses. This method is the approved agency-wide procedure for recovering indirect costs from its federal programs.

3. The Agency

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will maintain itemized records of staff time and costs incurred in the processing of a license application. License processing fees

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will apply without regard to whether a license is issued, denied or requested to be inactivated prior to issuance or thereafter.

4. Each application for a license

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will be accompanied by a filing fee of two-hundred seventy-five thousand dollars ($275,000.).

5. All fees

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must be made payable to the Nebraska Department of Health and Human Services Regulation and Licensure.

a. Where the fees assessed in accordance with 180 NAC 18-00

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6.02, item 2 above are less than the filing fee set forth in 180 NAC 18-

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01, item 4 above, the Agency

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will refund the balance to the applicant.

b. Where the fees assessed in accordance with 180 NAC 18-00

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6.01, item 2 above exceed the filing fee set forth in 180 NAC 18-00

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6.01, item 4 above, the applicant

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will be billed the balance.

18-007.02 Annual License Administration Fees

1. An administration fee

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will be assessed to licensees based upon direct and indirect costs annually during the term of operation and during site closure and stabilization until the license has been terminated.

2. In determining the annual fees, the Agency

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will calculate and itemize the cost of monitoring the licensed facility, inspections of the facility or other site visits, reviewing the compliance of facilities with the associated license conditions, general legal costs incurred by the Agency, or other tasks related to administering the license program.

3. The Agency

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will maintain itemized records of staff time and costs incurred in the administration of a license.

4. An annual fee of $200,000

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must be made payable to the State of Nebraska Department of Health and Human Services Regulation and Licensure and

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are due July 1.

a. Where the fees assessed in accordance with 180 NAC 18-00

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6.02, item 2. above are less then the fee set forth in 180 NAC 18-00

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will refund the balance to the licensee.

b. Where the fees assessed in accordance with 180 NAC 18-00

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6.02, item 2. above exceed the fee set forth in 180 NAC 18-00

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6.02, item 4. above, the licensee

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1. Accelerator$115.00
2. Airport Baggage X-ray$70.00
3. Electron Beam Welding$70.00
4. Chiropractic$70.00
5. CT Scanners$70.00
6. Dental Diagnostic$20.00
7. Radiographic/Fluoroscopic Combination$70.00
8. X-Ray Diffraction$40.00
9. X-Ray Fluorescence$40.00
10. Fluoroscopy Diagnostic$70.00
11. Fluoroscopy X-Ray - Industrial$70.00
12. Industrial Gauge - X-Ray$70.00
13. Ion Implantation Device$70.00
14. Medical Diagnostic X-ray$70.00
15. Electron Microscope$70.00
16. Package X-Ray$70.00
17. Particle Size Analyzer - X-Ray (Analytical)$70.00
18. Podiatric Diagnostic - X-Ray$40.00
19. Spectroscopy/Spectrography X-Ray$70.00
20. Therapeutic X-Ray$70.00
21. Veterinary Diagnostic X-Ray$40.00
22. Radiography Cabinet X-Ray (per registration)$70.00
23. Industrial Radiography - In-Plant Only (per registration)

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$240.00

24. Industrial Radiography - Temporary Field Site Authorization (per registration)[4]$300.00
25. Research and Development$80.00
26. Registration of Out-of-State radiation generating equipment brought into Nebraska for temporary useAnnual Fee of Applicable Category
27. ReciprocityAnnual Fee of Applicable Category
28. Other Registered Sources$95.00

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[4]Ibid. p. 18-14

1. Assembler/Installer - Radiation Generating Equipment$85.00
2. Facility Shielding Review$85.00
3. Calibration - Radiation Generating Equipment$85.00
4. Demonstration/Sales$85.00
5. Health Physics Services
   a. Any Combination of two (2) of the Above$170.00
   b. Any Combination of three (3) of the Above$250.00
   c. Any Combination of four (4) of the Above$300.00
6. Personnel Monitoring Services$ 95.00

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Category	Fees per Analysis Type
1. Air Filter	
Gross Alpha	$20.00
Gross Beta	$20.00
Gross Alpha/Beta	$25.00
Gamma Scan	$60.00
2. Charcoal Cartridge	
Gamma Scan	$60.00
Iodine 131	$60.00
3. Silver Zeolite Cartridge	
Gamma Scan	$60.00
Iodine 131	$60.00
4. Water (Surface/Ground)	
Gross Alpha	$20.00
Gross Beta	$20.00
Gross Alpha/Beta	$25.00
Gamma Scan	$60.00
Tritium	$25.00
Iodine 131	$60.00
Strontium 89/90	$90.00
Strontium 90	$90.00
Radon	$50.00
Total Uranium	$40.00
Thorium	$90.00
Total Radium	$40.00

Radium 226$55.00
Radium 228$55.00

5. Milk
   Strontium 89/90$90.00
   Strontium 90$90.00
   Gamma Scan$60.00
   Iodine 131$60.00

6. Food Product and Vegetation
   Gamma Scan$60.00
   Iodine 131$60.00
   Strontium 89/90$90.00
   Strontium 90$90.00

7. Soil and Sediments
   Gross Alpha$20.00
   Gross Beta$20.00
   Gamma Scan$60.00
   Strontium 89/90$90.00
   Strontium 90$90.00

8. Biota
   Gamma Scan$60.00

9. Any Other Sample
   Gross Alpha$20.00
   Gross Beta$20.00
   Gross Alpha/Beta$25.00
   Gamma Scan$60.00

10. Radon Measurement$50.00

11. Any Other Analysis Not Specified Above[5] As necessary to cover the costs

12. Environmental Dosimetry
    TLD Bulb$50.00 Each
    TLD Bulb Analysis$20.00

13. Personal Services$50.00/Hour

14. Equipment/Supplies — As necessary to cover the cost of adequately assessing the radiological impact of activities conducted by licensees and registrants on public health and safety and the environment.

15. Smears (wipes) for Removable Contamination (Radioactive Material)$20.00

[5]In determining such fees, the Agency shall, as an objective obtain sufficient funds from the fees to pay for a portion of the direct and indirect costs of administering the Radiation Control Act without loss or reduction of the General Fund Allocation to the Agency.

16. Leak Test of Sealed Sources $20.00

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Any fee(s) collected pursuant to 180 NAC 18-009 and 18-010 from any Nuclear Power Plant,

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will not exceed the lesser of the actual annual costs of such activities or $36,000.

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APPENDIX 18-A

Routine Inspection Intervals For Determination of the Machine Fee, the Routine Inspection Frequency For Radiation Generating Equipment and the Assigned Priority.

	Column 1	Column 2	Column 3
Facility/Type	Priority[6]	Inspection Interval In Years For Fee Determination[7]	Inspection Interval In Years For Radiation Machine[8]
Hospital	I-II	2	1-2
Radiology Clinic	I, II or III	2	1-3
Private Practice	II or III	2	2-3
Chiropractic	II or III	2	2-3
Dental	IV	4	4
Veterinary	IV	4	4
Podiatrists	IV	4	4
Industrial	I-II	1	1-2
Osteopathic	II or III	2	2-3
Colleges & Schools	I or II	2	1-2
Regional Center	II or III	2	2-3

[6]The priority in Column 1 is determined on the basis of facility size, number of patients, number of tubes and personnel. The priority number assigned would coincide with the inspection frequency and may be adjusted in accordance with inspection findings.

[7]The inspection interval in years in Column 2 for fee determination is only used to establish the annual fee that is due. This interval is used in the formula specified in 180 NAC 18-004.02, item 4.b. and is shown in the example of a fee calculation in Appendix 18-B.

[8]The inspection interval in years in Column 3 for radiation machines establishes when the routine inspection frequency is expected. For example, a hospital has a 1-2 year frequency which means that inspections routinely would be conducted within that time frame. However, more frequent inspections may be made if and when conditions and situations warrant the accelerated inspection frequency.

	Column 1	Column 2	Column 3
Miscellaneous	I, II or III	2	1-3

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Appendix 18-B

Example of Fee Calculation.

The Annual Fee For Each Certificate of Registration is Calculated Using the Following Formula:

$$\text{Annual Fee} = \text{Base Fee} + \frac{\text{Sum of machines and/or Service fees}}{\text{Inspection Interval}}$$

The Inspection Interval for the Fee determination is Specified in Column 2 in Appendix 18-A.

Example:

1. There are three machines located in a clinic.
   1 dental diagnostic x-ray unit
   1 diagnostic x-ray unit (radio/fluoro combination)
   1 medical diagnostic x-ray unit

   The fee would be calculated as follows:

   $$\$25 + \frac{(1 \times \$20)}{4} + \frac{(1 \times \$70) + (1 \times \$70)}{2} =$$

   $$\$25 + \frac{\$20}{4} + \frac{\$140}{2} =$$

   $$\$25 + \$5 + \$70 = \$100$$

   The annual fee = $100

2. There are four machines located in a dental office.
   4 dental diagnostic x-ray units

   The fee would be calculated as follows:

   $$25 + \frac{(4 \times \$20)}{4} =$$

   $$\$25 + \frac{\$80}{4} =$$

   $$\$25 + \$20 = \$45$$

   The annual fee = $45

3. There is one machine located in a dental office.
   1 dental diagnostic x-ray unit

   The fee would be calculated as follows:

   $25 + (1 x $20) / 4 =

   $25 + $20 / 4 =

   $25 + $5 = $30

   The annual fee = $30

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Appendix 018-C

Examples of Fee Calculation for Uranium Recovery Facility Licenses.

This Example is the same for either an In Situ or a Disposal License.

1. New Application - This is a one-time fee paid upon the submission of the license application. This fee may be adjusted by the appropriate amount specified in 180 NAC 18-006.

   Example:

   In Situ License Application$109,200
   In Situ Satellite$ 35,875

   Total for Application$145,075

   If this application contains the request for surface discharge then an additional $3,435.00 must also be submitted. The total would then be $148,512.

2. Operational Year Including Renewal. The annual fee consist of the following:

   Annual Operational Fee$109,200
   Long-Term Care Fund Payment$ 65,000
   If Surface Discharge is Requested$ 4,300
   Long-Term Care Fund Payment$ 2,580

   Annual Total$181,080

3. Site Restoration or Reclamation. The annual fee consists of the following:

   Annual Restoration Fee$ 87,360
   Long-Term Care Fund Payment$ 65,000
   If Surface Discharge is Requested$ 3,435

Long-Term Care Fund Payment$ 2,580

Annual Total$158,375

This fee is paid annually starting with the commencement of site restoration or reclamation at the conclusion of the operational licensed activities. The operational fee terminates at the conclusion of the operational licensed activities. The fees for site restoration or reclamation are to be paid annually until the restoration or reclamation has been completed.

The long-term care fees may be assessed by the Agency beyond the cessation of operational licensed activities, site restoration or reclamation, if necessary, but before termination of the license and closure of the site.

4TITLE 180 CONTROL OF RADIATION

CHAPTER 19 LICENSES AND RADIATION SAFETY REQUIREMENTS FOR IRRADIATORS

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19-002 Definitions 1

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FORM(S)

Form NRH-5 Application for Radioactive Material License

TITLE 180 CONTROL OF RADIATION

CHAPTER 19 LICENSES AND RADIATION SAFETY REQUIREMENTS FOR IRRADIATORS

19-001 SCOPE AND AUTHORITY

19-001.01 180 NAC 19 contains requirements for the issuance of a license authorizing the use of sealed sources containing radioactive materials in irradiators used to irradiate objects or materials using gamma radiation. 180 NAC 19 also contains radiation safety requirements for operating irradiators. The requirements of 180 NAC 19 are in addition to other requirements of Title 180. In particular, the provisions of 180 NAC 1, 3, 4, 10, 13 17 and 18 apply to applications and licenses subject to this 180 NAC 19. Nothing in 180 NAC 19 relieves the licensee from complying with other applicable Federal, State and local regulations governing the siting, zoning, land use, and building code requirements for industrial facilities. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§71-3501 to 3520.

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19-001.02 180 NAC 19 applies to panoramic irradiators that have either dry or wet storage of the radioactive sealed sources and to underwater irradiators in which both the source and the product being irradiated are under water. Irradiators whose dose rates exceed 5 grays (500 rads) per hour at 1 meter from the radioactive sealed sources in air or in water, as applicable for the irradiator type.

19-001.03 180 NAC 19 does not apply to self contained dry-source-storage irradiators (those in which both the source and the area subject to irradiation are contained within a device and are not accessible by personnel), medical radiology or teletherapy, radiography (the irradiation of materials for nondestructive testing purposes), gauging, or open-field (agricultural) irradiations.

19-001.04 American Concrete Institute Standard ACI 318-89 "Building Code Requirements for Reinforced Concrete," Chapter 21 "Special Provisions for Seismic Design" as referred to in this Chapter is herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

19-002 DEFINITIONS: As used in 180 NAC 19, the following definitions apply:

Annually means either (1) at intervals not to exceed one year or (2) once per year, at about the same time each year (plus or minus one month).

Doubly encapsulated sealed source means a sealed source in which the radioactive material is sealed within a capsule and that capsule is sealed within another capsule.

Irradiator means a facility that uses radioactive sealed sources for the irradiation of objects or materials and in which radiation dose rates exceeding 5 grays (500 rads) per hour exist at 1 meter from the sealed radioactive sources in air or water, as applicable for the irradiator type, but does not include irradiators in which both the sealed source and the area subject to irradiation are contained within a device are not accessible to personnel.

Irradiator operator means an individual who has successfully completed the training and testing described in 180 NAC 19-018 and is authorized by the terms of the license to operate the irradiator without a supervisor present.

Panoramic dry-source-storage irradiator means an irradiator in which the irradiations occur in air in areas potentially accessible to personnel and in which the sources are stored in shields made of solid materials. The term includes beam-type dry-source-storage irradiators in which only a narrow beam of radiation is produced for performing irradiations.

Panoramic irradiator means an irradiator in which the irradiations are done in air in areas potentially accessible to personnel. The term includes beam-type irradiators.

Panoramic wet-source storage irradiator means an irradiator in which the irradiations occur in air in areas potentially accessible to personnel and in which the sources are stored under water in a storage pool.

Pool irradiator means any irradiator at which the sources are stored or used in a pool of water including panoramic wet-source-storage irradiators and underwater irradiators.

Product conveyor system means a system for moving the product to be irradiated to, from, and within the area where irradiation takes place.

Radiation room means a shielded room in which irradiations take place. Underwater irradiators do not have radiation rooms.

Radiation safety officer means an individual with responsibility for the overall radiation safety program at the facility.

Sealed source means any byproduct material that is used as a source of radiation and is encased in a capsule designed to prevent leakage or escape of the byproduct material.

Seismic area means any area where the probability of a horizontal acceleration in rock of more than 0.3 times the acceleration of gravity in 250 years is greater than 10%, as designated by the U.S. Geological Survey.

Underwater irradiator means an irradiator in which the sources always remain shielded under water and humans do not have access to the sealed sources or the space subject to irradiation without entering the pool.

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Deleted: "Panoramic dry-source-storage irradiator" means an irradiator in which the irradiations occur in air in areas potentially accessible to personnel and in which the sources are stored in shields made of solid materials. The term includes beam-type dry-source-storage irradiators in which only a narrow beam of radiation is produced for performing irradiations.

SPECIFIC LICENSING REQUIREMENTS

19-003 APPLI CATION FOR A SPECIFIC LICENSE: A person, as defined in 180 NAC 1-002, may file an application for a specific license authorizing the use of sealed sources in an irradiator on Form NRH-5, "Application for Material License" in 180 NAC 3. Each application for a license, must be accompanied by the fee prescribed in 180 NAC 18-005. The application and a copy must be sent to: Deleted: .

Department of Health and Human Services
Regulation and Licensure
Radioactive Materials Program
P.O. Box 95026 Deleted: 07
301 Centennial Mall South
Lincoln, NE 68509-5026

19-004 SPECIFIC LICENSES FOR IRRADIATORS: The Department will approve an application for a specific license for the use of licensed material in an irradiator if the applicant meets the requirements contained in 180 NAC 19. Deleted: Agency

19-004.01 The applicant must satisfy the general requirement specified in 180 NAC 3-011 and the requirements contained in 180 NAC 19.

19-004.02 The application must describe the training provided to irradiator operators including:

1. Classroom training;
2. On-the-job or simulator training;
3. Safety reviews;
4. Means employed by the applicant to test each operator's understanding of the Department's regulations and licensing requirements and the irradiator operating and emergency procedures; and Deleted: Agency
5. Minimum training and experience of personnel who may provide training.

19-004.03 The application must include an outline of the written operating and emergency procedures listed in 180 NAC 19-019 that describes the radiation safety aspects of the procedures.

19-004.04 The application must describe the organizational structure for managing the irradiator, specifically, the radiation safety responsibilities and authorities of the radiation safety officer and those management personnel who have important radiation safety responsibilities or authorities. In particular, the application must specify who, within the management structure, has the authority to stop unsafe operations. The application must also describe the training and experience required for the position of radiation safety officer.

19-004.05 The application must include a description of the access control systems required by 180 NAC 19-008, the radiation monitors required by 180 NAC 19-011, the method of detecting leaking sources required by 180 NAC 19-022 including the sensitivity of

the method, and a diagram of the facility that shows the locations of all required interlocks and radiation monitors.

19-004.06 If the applicant intends to perform leak testing of dry-source-storage sealed sources, the applicant must establish procedures for leak testing and submit a description of these procedures to the Department. The description must include the:

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1. Instruments to be used;
2. Methods of performing the analysis; and
3. Pertinent experience of the individual who analyzes the samples.

19-004.07 If licensee personnel are to load or unload sources, the applicant must describe the qualifications and training of the personnel and the procedures to be used. If the applicant intends to contract for source loading or unloading of its facility, the loading or unloading must be done by an organization specifically authorized by the Department, U.S. Nuclear Regulatory Commission or an Agreement State to load or unload irradiator sources.

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19-004.08 The applicant must describe the inspection and maintenance checks including the frequency of the checks required by 180 NAC 19-023.

19-005 START OF CONSTRUCTION: The applicant may not begin construction of a new irradiator prior to the submission to the Department of both an application for a license for the irradiator and the fee required by 180 NAC 18-005. As used in 180 NAC 19, the term "construction" includes the construction of any portion of the permanent irradiator structure on the site but does not include: Engineering and design work, purchase of site, site surveys or soil testing, site preparation, site evacuation, construction of warehouse or auxiliary structures, and other similar tasks. Any activities undertaken prior to the issuance of a license are entirely at the risk of the applicant and have no bearing on the issuance of license with respect to the requirements of the Nebraska Radiation Control Act, as amended, and rules, regulations, and orders issued under the Act.

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19-006 APPLICATION FOR EXEMPTIONS: In addition to the exemption in 180 NAC 1-003.01, any application for a license or for amendment of a license authorizing use of teletherapy-type unit for irradiation of materials or objects may include proposed alternatives for the requirements of 180 NAC 19. The Department will approve the proposed alternatives if the applicant provides adequate rationale for the proposed alternatives and demonstrates that they are likely to provide an adequate level of safety for workers and the public.

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DESIGN AND PERFORMANCE REQUIREMENTS FOR IRRADIATORS

19-007 PERFORMANCE CRITERIA FOR SEALED SOURCES

19-007.01 Requirements. Sealed sources installed after October 30, 1996:

1. Must have a certificate of registration issued under the U. S. Nuclear Regulatory Commission or an Agreement State for evaluation of radiation safety information about its product.
2. Must be doubly encapsulated;

3. Must use radioactive material that is as nondispersible as practical and that is as insoluble as practical if the source is used in a wet-source-storage or wet-source-change irradiator;
4. Must be encapsulated in a material resistant to general corrosion and to localized corrosion, such as 316L stainless steel or other material with equivalent resistance if the sources are for use in irradiator pools; and
5. In prototype testing of the sealed source, must have been leak tested and found leak-free after each of the tests described in 180 NAC 19-007.02 through 19-007.07

19-007.02 Temperature; The test source must be held at -40° celsius for 20 minutes, 600° celsius for one hour, and then be subjected to a thermal shock test with a temperature drop from 600° celsius to 20° celsius within 15 seconds.

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19-007.03 Pressure: The test source must be twice subjected for at least five minutes to an external pressure (absolute) of two million newtons per square meter.

19-007.04 Impact: A 2-kilogram steel weight, 2.5 centimeters in diameter, must be dropped from a height of 1 meter onto the test source.

19-007.05 Vibration: The test source must be subjected three times for ten minutes each to vibrations sweeping from 25 hertz to 500 hertz with a peak amplitude of five times the acceleration of gravity. In addition, each test source must be vibrated for 30 minutes at each resonant frequency found.

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19-007.06 Puncture: A 50-gram weight and pin, 0.3-centimeter pin diameter, must be dropped from a height of one meter onto the test source.

19-007.07 Bend: If the length of the source is more than 15 times larger than the minimum cross-sectional dimension, the test source must be subjected to a force of two thousand newtons at its center equidistant from two support cylinders, the distance between which is ten times the minimum cross-sectional dimension of the source.

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19-008 ACCESS CONTROL

19-008.01 Each entrance to a radiation room at a panoramic irradiator must have a door or other physical barrier to prevent inadvertent entry of personnel if the sources are not in the shielded position. Product conveyor systems may serve as barriers as long as they reliably and consistently function as a barrier. It must not be possible to move the sources out of their shielded position if the door or barrier is open. Opening the door or barrier while the sources are exposed must cause the sources to return promptly to their shielded position. The personnel entrance door or barrier must have a lock that is operated by the same key used to move the sources. The doors and barriers must not prevent any individual in the radiation room from leaving.

19-008.02 In addition, each entrance to a radiation room at a panoramic irradiator must have an independent backup access control to detect personnel entry while the sources are exposed. Detection of entry while the sources are exposed must cause the sources to return

to their fully shielded position and must also activate a visible and audible alarm to make the individual entering the room aware of the hazard. The alarm must also alert at least one other individual who is onsite of the entry. That individual must be trained on how to respond to the alarm and prepared to promptly render or summon assistance.

19-008.03 A radiation monitor must be provided to detect the presence of high radiation levels in the radiation room of a panoramic irradiator before personnel entry. The monitor must be integrated with personnel access door locks to prevent room access when radiation levels are high. Attempted personnel entry while the monitor measures high radiation levels, must activate the alarm described in 180 NAC19-008.02. The monitor may be located in the entrance (normally referred to as the maze) but not in the direct radiation beam.

19-008.04 Before the sources move from their shielded position in a panoramic irradiator, the source control must automatically activate conspicuous visible and audible alarms to alert people in the radiation room that the sources will be moved from their shielded position. The alarms must give individuals enough time to leave the room before the sources leave the shielded position.

19-008.05 Each radiation room at a panoramic irradiator must have a clearly visible and readily accessible control that would allow an individual in the room to make the sources return to their fully shielded position.

19-008.06 Each radiation room of a panoramic irradiator must contain a control that prevents the sources from moving from the shielded position unless the control has been activated and the door or barrier to the radiation room has been closed within a preset time after activation of the control.

19-008.07 Each entrance to the radiation room of a panoramic irradiator and each entrance to the area within the personnel access barrier of an underwater irradiator must have a sign bearing the radiation symbol and the words, "CAUTION, RADIOACTIVE MATERIAL(S) "or" DANGER, RADIOACTIVE MATERIAL(S) "or" Panoramic irradiators must also have a sign stating "GRAVE DANGER, VERY HIGH RADIATION AREA," but the sign may be removed, covered, or otherwise made inoperative when the sources are fully shielded.

19-008.08 If the radiation room of a panoramic irradiator has roof plugs or other movable shielding, it must not be possible to operate the irradiator unless the shielding is in its proper location. This requirement may be met by interlocks that prevent operation if shielding is not placed properly or by an operating procedure requiring inspection of shielding before operating.

19-008.09 Underwater irradiators must have a personnel access barrier around the pool which must be locked to prevent access when the irradiator is not attended. Only operators and facility management may have access to keys to the personnel access barrier. There must be an intrusion alarm to detect unauthorized entry when the personnel access barrier is locked. Activation of the intrusion alarm must alert an individual (not necessarily onsite) who is prepared to respond or summon assistance.

19-009 SHIELDING

19-009.01 The radiation dose rate in areas that are normally occupied during operation of a panoramic irradiator may not exceed 0.02 millisievert (2 millirems) per hour at any location 30 centimeters or more from the wall of the room when the sources are exposed. The dose rate must be averaged over any area not to exceed 100 square centimeters having no linear dimension greater than 20 centimeters. Areas where the radiation dose rate exceeds 0.02 millisievert (2 millirems) per hour must be locked, roped off, or posted.

19-009.02 The radiation dose at 30 centimeters over the edge of the pool of a pool irradiator may not exceed 0.02 millisievert (2 millirems) per hour when the sources are in the fully shielded position.

19-009.03 The radiation dose rate at 1 meter from the shield of a dry-source storage panoramic irradiator when the source is shielded may not exceed 0.02 millisievert (2 millirems) per hour and at 5 centimeters from the shield may not exceed 0.2 millisievert (20 millirems) per hour.

19-010 FIRE PROTECTION

19-010.01 The radiation room at a panoramic irradiator must have heat and smoke detectors. The detectors must activate an audible alarm. The alarm must be capable of alerting a person who is prepared to summon assistance promptly. The sources must automatically become fully shielded if a fire is detected.

19-010.02 The radiation room at a panoramic irradiator must be equipped with a fire extinguishing system capable of extinguishing a fire without the entry of personnel into the room. The system for the radiation room must have a shut-off valve to control flooding into unrestricted areas.

19-011 RADIATION MONITORS

19-011.01 Irradiators with automatic product conveyor systems must have a radiation monitor with an audible alarm located to detect loose radioactive sources that are carried toward the product exit. If the monitor detects a source, an alarm must sound and product conveyors must stop automatically. The alarm must be capable of alerting an individual in the facility who is prepared to summon assistance. Underwater irradiators in which the product moves within an enclosed stationary tube are exempt from the requirements of this 180 NAC 19-011.01.

19-011.02 Underwater irradiators that are not in a shielded radiation room must have a radiation monitor over the pool to detect abnormal radiation levels. The monitor must have an audible alarm and a visible indicator at entrances to the personnel access barrier around the pool. The audible alarm may have a manual shut-off. The alarm must be capable of alerting an individual who is prepared to respond promptly.

19-012 CONTROL OF SOURCE MOVEMENT

19-012.01 The mechanism that moves the sources of a panoramic irradiator must require a key to actuate. Actuation of the mechanism must cause an audible signal to indicate that the sources are leaving the shielded position. Only one key may be in use at any time, and only operators or facility management may possess it. The key must be attached to a portable radiation survey meter by a chain or cable. The lock for source control must be designed so that the key may not be removed if the sources are in an unshielded position. The door to the radiation room must require the same key.

19-012.02 The console of a panoramic irradiator must have a source position indicator that indicates when the sources are in the fully shielded position, when they are in transit, and when the sources are exposed.

19-012.03 The control console of a panoramic irradiator must have a control that promptly returns the sources to the shielded position.

19-012.04 Each control for a panoramic irradiator must be clearly marked as to its function.

19-013 IRRADIATOR POOLS

19-013.01 For licenses initially issued after October 30, 1996, irradiators pools must either:

1. Have a water-tight stainless steel liner or a liner metallurgically compatible with other components in the pools; or
2. Be constructed so that there is a low likelihood of substantial leakage and have a surface designed to facilitate decontamination. In either case, the licensee must have a method to safely store the sources during repairs of the pool.

19-013.02 For licenses initially issued after October 30, 1996, irradiator pools must have no outlets more than 0.5 meter below the normal low water level that could allow water to drain out of the pool. Pipes that have intakes more than 0.5 meter below the normal low water level and that could act as siphons must have siphon breakers to prevent the siphoning of pool water.

19-013.03 A means must be provided to replenish water losses from the pool.

19-013.04 A visible indicator must be provided in a clearly visible location to indicate if the pool water level is below the normal low water level or above the normal high water level.

19-013.05 Irradiator pools must be equipped with a purification system designed to be capable of maintaining the water during normal operation at a conductivity of 20 microsiemens (ohms) per centimeter or less and with a clarity so that the sources can be seen clearly.

19-013.06 A physical barrier, such as a railing or cover, must be used around or over irradiator pools during normal operation to prevent personnel from accidentally falling into the pool. The barrier may be removed during maintenance, inspection, and service operations.

19-013.07 If long-handled tools or poles are used in irradiator pools, the radiation dose rate on the handling areas of the tools may not exceed 0.02 millisievert (2 millirems) per hour.

19-014 SOURCE RACK PROTECTION: If the product to be irradiated moves on a product conveyor system, the source rack and the mechanism that moves the rack must be protected by a barrier or guides to prevent products and product carriers from hitting or touching the rack or mechanism.

19-015 POWER FAILURES

19-015.01 If electrical power at a panoramic irradiator is lost for longer than ten seconds, the sources must automatically return to the shielded position.

19-015.02 The lock on the door of the radiation room of a panoramic irradiator may not be deactivated by a power failure.

19-015.03 During a power failure, the area of any irradiator where sources are located may be entered only when using an operable and calibrated radiation survey meter.

19-016 DESIGN REQUIREMENTS: Irradiators whose construction begins after October 30, 1996, must meet the design requirements of 180 NAC 19-016.

19-016.01 Shielding: For panoramic irradiators, the licensee must design shielding walls to meet generally accepted building code requirements for reinforced concrete and design the walls, wall penetrations, and entranceways to meet the radiation shielding requirements of 180 NAC 19-009. If the irradiator will use more than 2×10^{17} becquerels (5 million curies) of activity, the licensee must evaluate the effects of heating of the shielding walls by the irradiator sources.

19-016.02 Foundations: For panoramic irradiators, the licensee must design the foundation, with consideration given to soil characteristics, to ensure it is adequate to support the weight of the facility shield walls.

19-016.03 Pool integrity: For pool irradiators, the licensee must design the pool to assure that it is leak resistant, that it is strong enough to bear the weight of the pool water and shipping casks, that a dropped cask would not fall on sealed sources, that all outlets or pipes meet the requirements of 180 NAC 19-013.02, and that metal components are metallurgically compatible with other components in the pool.

19-016.04 Water handling system: For pool irradiators, the licensee must verify that the design of the water purification system is adequate to meet the requirements of 180 NAC 19-013.05. The system must be designed so that water leaking from the system does not drain to unrestricted areas without being monitored.

19-016.05 Radiation monitors: For all irradiators, the licensee must evaluate the location and sensitivity of the monitor to detect sources carried by the product conveyor system as required by 180 NAC 19-011.01. The licensee must verify that the product conveyor is designed to stop before a source on the product conveyor would cause a radiation

overexposure to any person. For pool irradiators, if the licensee uses radiation monitors to detect contamination under 180 NAC 19-022.02, the licensee must verify that the design of radiation monitoring systems to detect pool contamination includes sensitive detectors *located close to where contamination is likely to concentrate.*

19-016.06 Source rack: For pool irradiators, the licensee must verify that there are no crevices on the source or between the source and source holder that would promote corrosion on a critical area of the source. For panoramic irradiators, the licensee must determine that source rack drops due to loss of power will not damage the source rack and that source rack drops due to failure of cables (or alternate means of support) will not cause loss of integrity of sealed sources. For panoramic irradiators, the licensee must review the design of the mechanism that moves the sources to assure that the likelihood of a stuck source is low and that, if the rack sticks, a means exists to free it with minimal risk to personnel.

19-016.07 Access control: For panoramic irradiators, the licensee must verify from the design and logic diagram that the access control system will meet the requirements of 180 NAC 19-008.

19-016.08 Fire protection: For panoramic irradiators, the licensee must verify that the number, location, and spacing of the smoke and heat detectors are appropriate to detect fires and that the detectors are protected from mechanical and radiation damage. The licensee must verify that the design of the fire extinguishing system provides the necessary discharge patterns, densities, and flow characteristics for complete coverage of the radiation room and that the system is protected from mechanical and radiation damage.

19-016.09 Source return: For panoramic irradiators, the licensee must verify that the source rack will automatically return to the fully shielded position if offsite power is lost for more than 10 seconds.

19-016.10 Seismic: For panoramic irradiators to be built in seismic areas, the licensee must design the reinforced concrete radiation shields to retain their integrity in the event of an earthquake by designing to the seismic requirements of an appropriate source such as American Concrete Institute Standard ACI 318-89, "Building Code Requirements for Reinforced Concrete," Chapter 21, "Special Provisions for Seismic Design," or local building codes, if current.

19-016.11 Wiring. For panoramic irradiators, the licensee must verify that electrical wiring and electrical equipment in the radiation room are selected to minimize failures due to prolonged exposure to radiation.

19-017 CONSTRUCTION MONITORING AND ACCEPTANCE TESTING: The requirements of 180 NAC 19-017 must be met for irradiators whose construction begins after October 30, 1996. The requirements must be met prior to loading sources.

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19-017.01 Shielding: For panoramic irradiators, the licensee must monitor the construction of the shielding to verify that the construction meets design specifications and generally accepted building code requirement for reinforced concrete.

19-017.02 Foundations: For panoramic irradiators, the licensee must monitor the construction of the foundations to verify that their construction meets design specifications.

19-017.03 Pool integrity: For pool irradiators, the licensee must verify that the pool meets design specifications and must test the integrity of the pool. The licensee must verify that outlets and pipes meet the requirements of 180 NAC 19-013.02.

19-017.04 Water handling system: For pool irradiators, the licensee must verify that the water purification system, the conductivity meter, and the water level indicators operate properly.

19-017.05 Radiation monitors: For all irradiators, the licensee must verify the proper operation of the monitor to detect sources carried on the product conveyor system and the related alarms and interlocks required by 180 NAC 19-011.01. For pool irradiators, the licensee must verify the proper operation of the radiation monitors and the related alarm if used to meet 180 NAC 19-022.02. For underwater irradiators, the licensee must verify the proper operation of the over-the-pool monitors, alarms, and interlocks required by 180 NAC 19-011.02.

19-017.06 Source rack: For panoramic irradiators, the licensee must test the movement of the source racks for proper operation prior to source loading; testing must include source rack lowering due to simulated loss of power. For all irradiators with product conveyor systems, the licensee must observe and test the operation of the conveyor system to assure that the requirements in 180 NAC 19-014 are met for protection of the source rack and the mechanism that moves the rack; testing must include tests of any limit switches and interlocks used to protect the source rack and mechanism that moves the rack from moving product carriers.

19-017.07 Access control: For panoramic irradiators, the licensee must test the completed access control system to assure that it functions as designed and that all alarms, controls, and interlocks work properly.

19-017.08 Fire protection: For panoramic irradiators, the licensee must test the ability of the heat and smoke detectors to detect a fire, to activate alarms, and to cause the source rack to automatically become fully shielded. The licensee must test the operability of the fire extinguishing systems.

19-017.09 Source return: For panoramic irradiators, the licensee must demonstrate that the source racks can be returned to their fully shielded positions without offsite power.

19-017.10 Computer systems: For panoramic irradiators that use a computer system to control the access control system, the licensee must verify that the access control system will operate properly if offsite power is lost and must verify that the computer has security features that prevent an irradiator operator from commanding the computer to override the access control system when it is required to be operable.

19-017.11 Wiring: For panoramic irradiators, the licensee must verify that the electrical wiring and electrical equipment that were installed meet the design specifications.

OPERATION OF IRRADIATORS

19-018 TRAINING

19-018.01 Before an individual is permitted to operate an irradiator without a supervisor present, the individual must be instructed in:

1. The fundamentals of radiation protection applied to irradiators (including the differences between external radiation and radioactive contamination, units of radiation dose, Department dose limits, why large radiation doses must be avoided, how shielding and access controls prevent large doses, how a irradiator is designed to prevent contamination, the proper use of survey meters and personnel dosimeters, other radiation safety features of an irradiator, and the basic function of the irradiator);
2. The requirements of 180 NAC 10 and 180 NAC 19 that are relevant to the irradiator;
3. The operation of the irradiator;
4. Those operating and emergency procedures listed in 180 NAC 19-019 that the individual is responsible for performing; and
5. Case histories of accidents or problems involving irradiators.

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19-018.02 Before an individual is permitted to operate an irradiator without a supervisor present, the individual must pass a written test on the instruction received consisting primarily of questions based on the licensee's operating and emergency procedures that the individuals responsible for performing and other operations necessary to safely operate the irradiator without supervision.

19-018.03 Before an individual is permitted to operate an irradiator without a supervisor present, the individual must have received on-the-job training or simulator training in the use of the irradiator as described in the license application. The individual must also demonstrate the ability to perform those portions of the operating and emergency procedures that s/he is to perform.

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19-018.04 The licensee must conduct safety reviews for irradiator operators at least annually. The licensee must give each operator a brief written test on the information. Each safety review must include, to the extent appropriate, each of the following:

1. Changes in operating and emergency procedures since the last review, if any;
2. Changes in regulations and license conditions since the last review, if any;
3. Reports on recent accidents, mistakes, or problems that have occurred at irradiators, if any;
4. Relevant results of inspections of operator safety performance;
5. Relevant results of the facility's inspection and maintenance checks; and
6. A drill to practice an emergency or abnormal event procedure.

19-018.05 The licensee must evaluate the safety performance of each irradiator operator at least annually to ensure that regulations, license conditions, and operating and emergency procedures are followed. The licensee must discuss the results of the evaluation with the operator and must instruct the operator on how to correct any mistakes or deficiencies observed.

19-018.06 Individuals that will be permitted unescorted access to the radiation room of the irradiator or the area around the pool of an underwater irradiator, but who have not received the training required for operators and the radiation safety officer, must be instructed and tested in any precautions they should take to avoid radiation exposure, any procedures or parts of procedures listed in 180 NAC 19-019 that they are expected to perform or comply with, and their proper response to alarms required in 180 NAC 19. Tests may be oral.

19-018.07 Individuals who must be prepared to respond to alarms required by 180 NAC 19-008.02, 19-008.09, 19-010.01, 19-011.01, 19-011.02 and 19-022.02 must be trained and tested on how to respond. Each individual must be retested at least once a year. Tests may be oral.

19-019 OPERARTING AND EMERGENCY PROCEDURES

19-019.01 The licensee must have and follow written operating procedures for:

1. Operation of the irradiator, including entering and leaving the radiation room;
2. Use of personnel dosimeters;
3. Surveying the shielding of panoramic irradiators;
4. Monitoring pool water for contamination while the water is in the pool and before release of pool water to unrestricted areas;
5. Leak testing of sources;
6. Inspection and maintenance checks required by 180 NAC 19-023;
7. Loading, unloading, and repositioning sources, if the operations will be performed by the licensee; and
8. Inspection of movable shielding required by 180 NAC 19-008.08, if applicable.

19-019.02 The licensee must have and follow emergency or abnormal event procedures, appropriate for the irradiator type, for:

1. Sources stuck in the unshielded position;
2. Personnel overexposures;
3. A radiation alarm from the product exit portal monitor or pool monitor;
4. Detection of leaking sources, pool contamination, or alarm caused by contamination of pool water;
5. A low or high water level indicator, an abnormal water loss, or leakage from the source storage pool;
6. A prolonged loss of electrical power;
7. A fire alarm or explosion in the radiation room;

8. An alarm indicating unauthorized entry into the radiation room, area around pool, or another alarmed area;
9. Natural phenomena, including an earthquake, a tornado, flooding, or other phenomena as appropriate for the geographical location of the facility; and
10. The jamming of automatic conveyor systems.

19-019.03 The licensee may revise operating and emergency procedures without Department approval only if all of the following conditions are met: Deleted: Agency

1. The revisions do not reduce the safety of the facility,
2. The revisions are consistent with the outline or summary of procedures submitted with the license application,
3. The revisions have been reviewed and approved by the radiation safety officer; and
4. The users or operators are instructed and tested on the revised procedures before they are put into use.

19-020 PERSONNEL MONITORING

19-020.01 Irradiator operators must wear either a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor while operating a panoramic irradiator or while in the area around the pool of an underwater irradiator. The personnel dosimeter processor must be accredited for high energy photons in the normal and accident dose ranges (see 180 NAC 4-021.03). Each personnel dosimeter must be assigned to and worn by only one individual. Film badges must be processed at least monthly, and other dosimeters must be processed at least quarterly.

19-020.02 Other individuals who enter the radiation room of a panoramic irradiator must wear a dosimeter, which may be a pocket dosimeter. For groups of visitors, only two people who enter the radiation room are required to wear dosimeters. If pocket dosimeters are used to meet the requirements of this subsection, a check of their response to radiation must be done at least annually. Acceptable dosimeters must read within ±30% of the true radiation dose. Deleted: part Deleted: plus or minus thirty percent

19-021 RADIATION SURVEYS

19-021.01 A radiation survey of the area outside the shielding of the radiation room of a panoramic irradiator must be conducted with the sources in the exposed position before the facility starts to operate. A radiation survey of the area above the pool of pool irradiators must be conducted after the sources are loaded but before the facility starts to operate. Additional radiation surveys of the shielding must be performed at intervals not to exceed three years and before resuming operation after addition of new sources or any modifications to the radiation room shielding or structure that might increase dose rates.

19-021.02 If the radiation levels specified in 180 NAC 19-009 are exceeded, the facility must be modified to comply with the requirements in 180 NAC 19-009.

19-021.03 Portable radiation survey meters must be calibrated at least annually to an accuracy of ± 20% for the gamma energy of the sources in use. The calibration must be done at two points on each scale or, for digital instruments, at one point per decade over the range that will be used. Portable radiation survey meters must be of a type that does not saturate and read zero at high radiation dose rates.

19-021.04 Water from the irradiator pool, other potentially contaminated liquids, and sediments from pool vacuuming must be monitored for radioactive contamination before release to unrestricted areas. Radioactive concentrations must not exceed those specified in 180 NAC 4, Table 2, Column 2 or Table 3 of Appendix 4-B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage."

19-021.05 Before releasing resins for unrestricted use, they must be monitored before release in an area with a background level less than 0.5 microsievert (0.05 millirem) per hour. The resins may be released only if the survey does not detect radiation levels above background radiation levels. The survey meter used must be capable of detecting radiation levels of 0.5 microsievert (0.05 millirem) per hour.

19-022 DETECTION OF LEAKING SOURCES

19-022.01 Each dry-source-storage sealed source must be tested for leakage at intervals not to exceed six months using a leak test kit or method approved by the Department, U.S. Nuclear Regulatory Commission or an Agreement State. In the absence of a certificate from a transferor that a test has been made within the six months before the transfer, the sealed source may not be used until tested. The test must be capable of detecting the presence of 200 becquerels (0.005 microcurie) of radioactive material and must be performed by a person approved by the Department, U.S. Nuclear Regulatory Commission or an Agreement State to perform the test.

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19-022.02 For pool irradiators, sources may not be put into the pool unless the licensee tests the sources for leaks or has a certificate from a transferor that leak test has been done within the six months before the transfer. Water from the pool must be checked for contamination each day the irradiator operates. The check may be done either by using a radiation monitor on a pool water circulating system or by analysis of a sample of pool water. If a check for contamination is done by analysis of a sample of pool water, the results of the analysis must be available within 24 hours. If the licensee uses a radiation monitor on a pool water circulating system, the detection of above normal radiation levels must activate an alarm. The alarm set-point must be set as low as practical, but high enough to avoid false alarms. The licensee may reset the alarm set-point to a higher level if necessary to operate the pool water purification system to clean up contamination in the pool if specifically provided for in written emergency procedures.

19-022.03 If a leaking source is detected, the licensee must arrange to remove the leaking source from service and have it decontaminated, repaired, or disposed of by the Department, U. S. Nuclear Regulatory Commission or an Agreement State licensee that is authorized to

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perform these functions. The licensee must promptly check its personnel, equipment, facilities, and irradiated product for radioactive contamination. No product may be shipped until the product has been checked and found free of contamination. If a product has been shipped that may have been inadvertently contaminated, the licensee must arrange to locate and survey that product for contamination. If any personnel are found to be contaminated, decontamination must be performed promptly. If contaminated equipment, facilities, or product are found, the licensee must arrange to have them decontaminated or disposed of by the Department, U.S. Nuclear Regulatory Commission or an Agreement State licensee that is authorized to perform these functions. If a pool is contaminated, the licensee must arrange to clean the pool until the contamination levels do not exceed the appropriate concentration in 180 NAC 4, Table 2, Column 2. Appendix 4-B. (See 180 NAC 3-026 for reporting requirements.)

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19-023 INSPECTION AND MAINTENANCE

19-023.01 The licensee must perform inspection and maintenance checks that include, as a minimum, each of the following at the frequency specified in the license or license application:

1. Operability of each aspect of the access control system required by 180 NAC 19-008.
2. Functioning of the source position indicator required by 180 NAC 19-012.02.
3. Operability of the radiation monitor for radioactive contamination in pool water required by 180 NAC 19-022.02 using a radiation check source, if applicable.
4. Operability of the over-pool radiation monitor at underwater irradiators as required by 180 NAC 19-011.02.
5. Operability of the product exit monitor required by 180 NAC 19-011.01.
6. Operability of the emergency source return control required by 180 NAC 19-012.03.
7. Leak-tightness of systems through which pool water circulates (visual inspection).
8. Operability of the heat and smoke detectors and extinguisher system required by 180 NAC 19-010 (but without turning extinguishers on).
9. Operability of the means of pool water replenishment required by 180 NAC 19-013.03.
10. Operability of the indicators of high and low pool water levels required by 180 NAC 19-013.04.
11. Operability of the intrusion alarm required by 180 NAC 19-008.09, if applicable.
12. Functioning and wear of the systems, mechanisms, and cables used to raise and lower sources.
13. Condition of the barrier to prevent products from hitting the sources or source mechanism as required by 180 NAC 19-014.
14. Amount of water added to the pool to determine if the pool is leaking.
15. Electrical wiring on required safety systems for radiation damage.
16. Pool water conductivity measurements and analysis as required by 180 NAC 19-024.02.

19-023.02 Malfunctions and defects found during inspection and maintenance checks must be repaired without undue delay.

19-024 POOL WATER PURITY

19-024.01 Pool water purification system must be run sufficiently to maintain the conductivity of the pool water below 20 microsiemens per centimeter under normal circumstances. If pool water conductivity rises above 20 microsiemens per centimeter, the licensee must take prompt actions to lower the pool water conductivity and must take corrective actions to prevent future recurrences.

19-024.02 The licensee must measure the pool water conductivity frequently enough, but no less than weekly, to assure that the conductivity remains below 20 microsiemens per centimeter. Conductivity meters must be calibrated at least annually.

19-025 ATTENDANCE DURING OPERATION

19-025.01 Both an irradiator operator and at least one other individual, who is trained on how to respond and prepared to promptly render or summon assistance if the access control alarm sounds, must be present onsite;

1. Whenever the irradiator is operated using an automatic product conveyor system; and
2. Whenever the product is moved into or out of the radiation room when the irradiator is operated in a batch mode.

19-025.02 At a panoramic irradiator at which static irradiations (no movement of the product) are occurring, a person who has received the training on how to respond to alarms described in 180 NAC 19-018.07 must be onsite.

19-025.03 At an underwater irradiator, an irradiator operator must be present at the facility whenever the product is moved into or out of the pool. Individuals who move the product into or out of the pool of an underwater irradiator need not be qualified as irradiator operators; however, they must have received the training described in 180 NAC 19-018.06 and 19-018.07. Static irradiations may be performed without a person present at the facility.

19-026 ENTERING AND LEAVING THE RADIATION ROOM

19-026.01 Upon first entering the radiation room of a panoramic irradiator after an irradiation, the irradiator operator must use a survey meter to determine that the source has returned to its fully shielded position. The operator must check the functioning of the survey meter with a radiation check source prior to entry.

19-026.02 Before exiting from and locking the door to the radiation room of a panoramic irradiator prior to a planned irradiation, the irradiator operator must:

1. Visually inspect the entire radiation room to verify that no one else is in it; and

2. Activate a control in the radiation room that permits the sources to be moved from the shielded position only if the door to the radiation room is locked within a preset time after setting the control.

19-026.03 During a power failure, the area around the pool of an underwater irradiator may not be entered without using an operable and calibrated radiation survey meter unless the over-the-pool monitor required by 180 NAC 19-011.02 is operating with backup power.

19-027 IRRADIATION OF EXPLOSIVE OR FLAMMABLE MATERIALS

19-027.01 Irradiation of explosive material is prohibited unless the licensee has received prior written authorization from the Department. Authorization will not be granted unless the licensee can demonstrate that detonation of the explosive would not rupture the sealed sources, injure personnel, damage safety systems, or cause radiation overexposures of personnel.

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19-027.02 Irradiation of more than small quantities of flammable material (flash point below 140°F) is prohibited in panoramic irradiators unless the licensee has received prior written authorization from the Department. Authorization will not be granted unless the licensee can demonstrate that a fire in the radiation room could be controlled without damage to sealed sources or safety systems and without radiation overexposures of personnel.

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RECORDS

19-028 RECORDS AND RETENTION PERIODS: The licensee must maintain the following records at the irradiator for the periods specified.

19-028.01 A copy of the license, license conditions, documents incorporated into a license by reference, and amendments thereto until superseded by new documents or until the Department terminates the license for documents not superseded.

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19-028.02 Records of each individual's training, tests, and safety reviews provided to meet the requirements of 180 NAC 19-018.01 thru 19-018.04, 19-018.06 and 19-018.07 until three years after the individual terminates work.

19-028.03 Records of the annual evaluations of the safety performance of irradiator operators required by 180 NAC 19-018.05 for three years after the evaluation.

19-028.04 A copy of the current operating and emergency procedures required by 19-019 until superseded or the Department terminates the license. Records of the radiation safety officer's review and approval of changes in procedures as required by 180 NAC 19-019.03, item three retained for three years from the date of the change.

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19-028.05 Evaluations of personnel dosimeters required by 180 NAC 19-020 must be retained until the Department terminates the license.

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19-028.06 Records of radiation surveys required by 180 NAC 19-021 for three years from the date of the survey.

19-028.07 Records of radiation survey meter calibrations required by 180 NAC 19-021 and pool water conductivity meter calibrations required by 180 NAC 19-024.02 until three years from the date of calibration.

19-028.08 Records of the results of leak tests required by 180 NAC 19-022.01 and the results of contamination checks required by 180 NAC 19-022.02 for three years from the date of each test. Deleted: 14

19-028.09 Records of inspection and maintenance checks required by 180 NAC 19-023 for three years.

19-028.10 Records of major malfunctions, significant defects, operating difficulties or irregularities, and major operating problems that involve required radiation safety equipment for three years after repairs are completed.

19-028.11 Records of the receipt, transfer and disposal, of all licensed sealed sources as required by 180 NAC 3-025 and 3-030.

19-028.12 Records on the design checks required by 180 NAC 19-016 and the construction control checks as required by 180 NAC 19-017 until the license is terminated. The records must be signed and dated. The title or qualification of the person signing must be included.

19-028.13 Records related to decommissioning of the irradiator as required by 180 NAC 3-018.07.

19-029 REPORTS

19-029.01 In addition to the reporting requirements in other parts of Department regulations, the licensee must report the following events if not reported under of parts of Department regulations: Deleted: Agency Deleted: Agency

1. Source stuck in an unshielded position.
2. Any fire or explosion in a radiation room.
3. Damage to the source racks.
4. Failure of the cable or drive mechanism used to move the source racks.
5. Inoperability of the access control system.
6. Detection of radiation source by the product exit monitor.
7. Detection of radioactive contamination attributable to licensed radioactive material.
8. Structural damage to the pool liner or walls.
9. Abnormal water loss or leakage from the source storage pool.
10. Pool water conductivity exceeding 100 microsiemens (ohms) per centimeter.

19-029.02 The report must include a telephone report within 24 hours as described in 180 NAC 3-026.03, item 1 and a written report within 30 days as described in 180 NAC 3-026.03, item 2.

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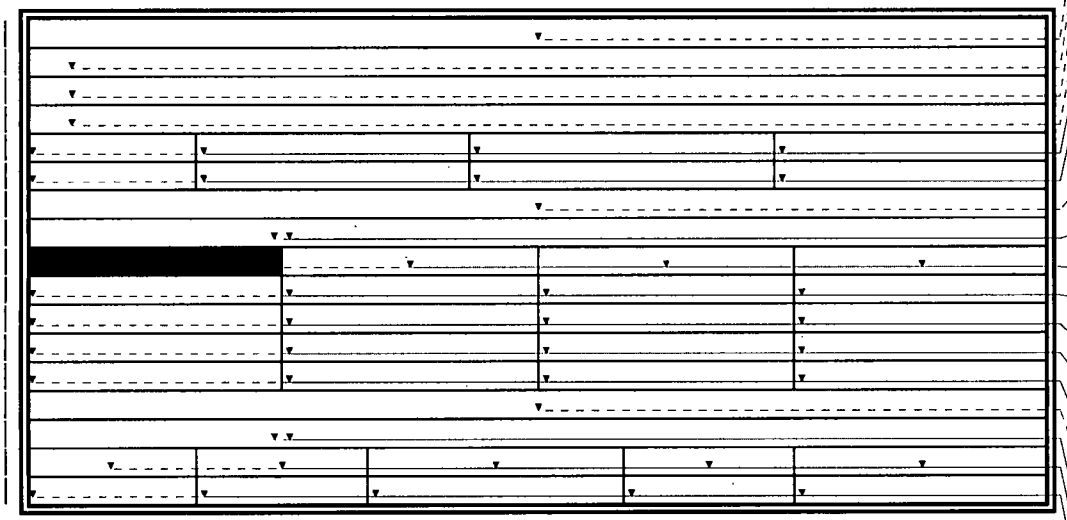
. **DIVISION OF PUBLIC HEALTH ASSURANCE - RADIOACTIVE MATERIALS PROGRAM**¶
¶
. **APPLICATION FOR RADIOACTIVE MATERIAL LICENSE**¶
¶
INSTRUCTIONS - (Use additional sheets where necessary.)¶
New or Renewal Application - Complete Items 1. through 15.¶
Amendment to License - Complete Items1.a, 3., and 15. And indicate other changes as appropriate.¶
Retain one copy for your files and submit original application to: Department of Health and Human Services Regulation and Licensure, Division of Public Health Assurance, 301 Centennial Mall South, P.O. Box 95007, Lincoln, NE 68509-5007.¶
Upon approval of this application, the applicant will receive a Radioactive Material License, issued in accordance with the requirements contained in Title 180, Regulations for the Control of Radiation and the Nebraska Radiation Control Act.¶
¶
¶
1.a . **Legal Name and Street address of Applicant (Institution, Firm, Person, etc.)** ... [1]



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6. Radioactive Material Data

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☐ Type B Broad Scope, 180 NAC 3-013.01, item 2

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☐ Type C Broad Scope, 180 NAC 3-013.01, item 3

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☐ Specific License, Radioactive Material Listed below:

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6.a. Element and Mass Numbe ... [2]

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7. Training of Individuals in Items 4. and 5.

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Name of Individual: ... [4]

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7.a. . Radiation Physics and Instrumentation ... [6]

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7.b. . Radiation Protection ... [7]

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7.c. . Mathematics Pertaining to the Use and Measurement of Radioactivity ... [8]

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7.d. . Biological Effects of Radi ... [9]

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8. Experience with Radiation of Individuals in Items 4. and 5.¶
(Actual use of Radioisotopes or Equivalent Experience)

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Name of Individual: ... [10]

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Isotope ... [11]

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¶ ... [12]

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9. Radiation Detection Instru ... [13]

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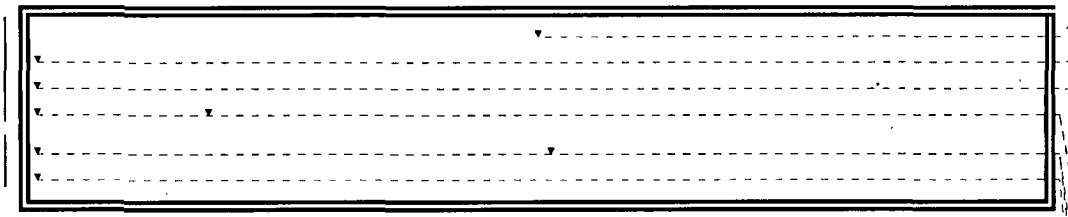
¶
Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Attach an explanatory sketch of the facility.¶
¶
13. . Radiation Protection Program¶
¶
Describe the radiation protection program as appropriate for the material to be used, including: the duties and responsibilities of the Radiation Safety Officer (RSO); control measures; bioassay procedures (if needed); day-to-day general safety instructions to be followed; etc. If the application is for sealed sources also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.¶
¶
14. . Waste Disposal¶
¶
If a commercial waste disposal service is employed, specify the name and address of the company. Otherwise, submit a detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. If the application is for sealed sources and devices and they will be returned to the manufacturer, so state.¶



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15. CERTIFICATION¶
(This item must be completed by applicant.)

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The applicant and any official executing this document on behalf of the applicant named in Item 1.a., certify that this application is prepared in conformity with the Nebraska Department of Health and Human Services Regulation and Licensure, Title 180, Regulations for the Control of Radiation and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.¶
¶
¶

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_____¶
Applicant Name From Item 1.a.¶
¶

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By: _____¶
Signature¶
¶

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Date: _____

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_____
_____¶
Print Name and Title of certifying official authorized to act on behalf of the applicant¶

NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES REGULATION AND LICENSURE
DIVISION OF PUBLIC HEALTH ASSURANCE - RADIOACTIVE MATERIALS PROGRAM

APPLICATION FOR RADIOACTIVE MATERIAL LICENSE

INSTRUCTIONS - (Use additional sheets where necessary.)
New or Renewal Application - Complete Items 1. through 15.
Amendment to License - Complete Items1.a, 3., and 15. And indicate other changes as appropriate.
Retain one copy for your files and submit original application to: Department of Health and Human Services Regulation and Licensure, Division of Public Health Assurance, 301 Centennial Mall South, P.O. Box 95007, Lincoln, NE 68509-5007.
Upon approval of this application, the applicant will receive a Radioactive Material License, issued in accordance with the requirements contained in Title 180, Regulations for the Control of Radiation and the Nebraska Radiation Control Act.

1.a Legal Name and Street address of Applicant (Institution, Firm, Person, etc.)

Applicant Name: _____

Address: _____

_____

City, State Zip +4: _____

Telephone #: _____

FAX #: _____

EMail Address: _____

1.b Street address(es) at which Radioactive Material will be used. (If different than 1.a)

(1) Permanent Address: _____

_____

City, State Zip+4: _____

(2) Temporary Job Sites Throughout Nebraska? ☐ Yes ☐ No

2. Department to Use Radioactive Material

_____

Person to Contact: _____

Telephone #: _____

3. This is an application for:

☐ New License

☐ Amendment to License No. _____

☐ Renewal of License No. _____

4. Individual User(s)

☐ Individual users approved by the Licensee's radiation safety committee.

☐ Individual users approved by the Licensee's radiation safety officer.

☐ Individual users satisfy the requirements of 180 NAC 3-013

OR

☐ Name and Title of individual(s) who will use or directly supervise use of, Radioactive Materials. Give training and experience in Items 7. And 8.

First Name + Middle Initial Last Name Title

5. Radiation Safety Officer (RSO)
(Name and Title of Individual designated as Radiation Safety Officer.

_____

Telephone #: _____

Attach documentation of his/her training and experience as in Items 7. and 8.

Agency Use Only

1.a Legal Name and Street address of Applicant (Institution, Firm, Person, etc.)	
	Date Received Stamp

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6.a. Element and Mass Number

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6.b. Chemical or Physical Form
(Make and Model if sealed source)

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6.c. Maximum Activity Requested
(Expressed as Curies, Millicuries or Microcuries)

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6.d. Use of Each Form
(If sealed source, also give Make and Model Number of the storage and/or device in which sealed source will be stored and/or used)

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Name of Individual:

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Formal Course Title

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Location and Date(s) of Training

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Clock Hours in Lecture or Laboratory

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7.a. Radiation Physics and Instrumentation

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7.b. Radiation Protection

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7.c. Mathematics Pertaining to the Use and Measurement of Radioactivity

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7.d. Biological Effects of Radiation

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Name of Individual:

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Isotope

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Maximum Activity

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Where Experience Was Gained

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Months/Years

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Type of Use

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9. Radiation Detection Instruments

Type of Instrument	Manufacturer's Name	Model Number	Number Available	Radiation Detected	Sensitivity Range

10. Calibration of Instruments Listed in Item 9.

☐ **a. Calibrated by Service Company** Name and Address of Service Company and Frequency of Calibration	☐ **b. Calibrated by Applicant**

11. Personnel Monitoring Devices

(Check and/or complete as appropriate)

Type	Supplier (Service Company)	Exchange Frequency
☐ Film Badge		☐ Monthly
☐ TLD		☐ Quarterly

9. Radiation Detection Instruments		
☐ DOSL ☐ Other (Specify): _____		☐ Other (Specify): _____

Information to be Submitted on Additional Sheets

TITLE 180 CONTROL OF RADIATION

CHAPTER 14 RADIATION SAFETY REQUIREMENTS FOR WELL LOGGING AND SUBSURFACE TRACER STUDIES

14-001 Scope and Authority 1
14-002 Definitions 1
14-003 Agreement with Well Owner or Operator 3

EQUIPMENT

14-004 Labels, Security and Transportation Precautions 4
14-005 Radiation Survey Instruments 5
14-006 Leak Testing of Sealed Sources 6
14-007 Physical Inventory 7
14-008 Records of Material Use 7
14-009 Design, Performance Criteria for Sealed Sources 7
14-010 Inspection Maintenance and Opening of a Source or Source Holder 8
14-011 Subsurface Tracer Studies 9
14-012 Uranium Sinker Bars 9
14-013 Use of a Sealed Source 9
14-014 Energy Compensation Source 10
14-015 Tritium Neutron Generator Target Source 10

RADIATION SAFETY REQUIREMENT

14-016 Training and Experience Qualification Requirements for Well Logging Personnel 10
14-017 Operating and Emergency Procedures 12
14-018 Personnel Monitoring 13
14-019 Radiation Surveys 13
14-020 Radioactive Contamination Control 14

PRECAUTIONARY PROCEDURES IN LOGGING AND SUBSURFACE TRACER

14-021 Handling Tools 14
14-022 Particle Accelerators 14

SECURITY, RECORDS, NOTIFICAITONS

14-023 Security 14
14-024 Documents and Records Required at Field Stations 15
14-025 Documents and Records Required at Temporary Jobsites 15
14-026 Notification of Incidents and Lost Sources; Abandonment Procedures for Irretrievable Sources 16

Copies of the Code of Federal Regulations (CFR) cited in this Chapter are available for inspection at the Department of Health and Human Services Regulation and Licensure, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska.

40 CFR 190 through 259 (July 1, 2002)

Or at http://www.access.gpo.gov/nara/cfr/index.html

Or copies of CFR's can be ordered from:

U.S. Government Printing Office
Superintendent of Documents
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Pittsburgh, PA 15250-7954
Or Call Order Desk in Washington, D.C. (202)512-1800
Or On the internet at http://www.bookstore.gpo.gov

TITLE 180 CONTROL OF RADIATION

CHAPTER 14 RADIATION SAFETY REQUIREMENTS FOR WELL LOGGING AND SUBSURFACE TRACER STUDIES:

14-001 SCOPE AND AUTHORITY

14-001.01 180 NAC 14 establishes radiation safety requirements for persons using sources of radiation in these operations. 180 NAC 14 applies to all licensees who use radioactive material including sealed sources, radioactive tracers, radioactive markers, and uranium sinker bars in well logging in a single well. The regulations are authorized by and implement the Nebraska Radiation Control Act, Neb. Stat. Rev. §§ 71-3501 to 3520.

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14-001.02 The provisions and requirements of 180 NAC 14 are in addition to, and not in substitution for, other requirements of these regulations. In particular, the provisions of 180 NAC 1, 2, 3, 4, 10, 13, 15 17 and 18 apply to applicants and licensees subject to this 180 NAC 14.

4-001.04 40 CFR as published July 1, 2002 and referred throughout this Chapter is herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services Regulation and Licensure, Public Health Assurance Division, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

4-001.05 American National Standard Institute (ANSI) ANSI N43.6 and United States of America Standard Institute (USASI) USASI N 5.10-1968 as referred to in this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Office of Radiological Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

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14-002 DEFINITIONS: As used in this 180 NAC 14, the following definitions apply:

Energy compensation source (ECS) means a small sealed source, with an activity not exceeding 3.7 MBq (100 microcuries), used within a logging tool, or other tool components, to provide a reference standard to maintain the tool's calibration when in use.

Field station means a facility where radioactive sources may be stored or used and from which equipment is dispatched to temporary jobsites.

Fresh water aquifer means a geologic formation that is capable of yielding fresh water to a well or spring, except those aquifers exempted pursuant to 40 CFR 122.35.

Injection tool means a device used for controlled subsurface injection of radioactive tracer material.

Irretrievable well logging source means any sealed source containing radioactive material that is pulled off or not connected to the wireline that suspends the source in the well and for which all reasonable effort at recovery has been expended.

Logging assistant means any individual who, under the personal supervision of a logging supervisor, handles sealed sources or tracers that are not in logging tools or shipping containers or who performs surveys required by 180 NAC 14-019.

Logging supervisor means an individual who uses radioactive material or provides personal supervision in the use of radioactive material at a temporary jobsite and who is responsible to the licensee for assuring compliance with the requirements of the regulations and the conditions of the license.

Logging tool means a device used subsurface to perform well logging.

Personal supervision means guidance and instruction by a logging supervisor, who is physically present at a temporary jobsite, who is in personal contact with logging assistants, and who can give immediate assistance.

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Radioactive marker means radioactive material used for depth determination or direction orientation. This term includes radioactive collar markers and radioactive iron nails.

Safety review means a periodic review provided by the licensee for its employees on radiation safety aspects of well logging. The review may include, as appropriate, the results of internal inspections, new procedures or equipment, accidents or errors that have been observed, and opportunities for employees to ask safety questions.

Source holder means a housing or assembly into which a sealed source is placed to facilitate the handling and use of the source in well logging.

Subsurface tracer study means the release of unsealed radioactive material or a substance labeled with radioactive material in a single well for the purpose of tracing the movement or position of the material or substance in the well or adjacent formation.

Surface casing for protecting fresh water aquifers means a pipe or tube used as a lining in a well to isolate fresh water aquifers from the well.

Temporary jobsite means a place where radioactive material are present for the purpose of performing well logging or subsurface tracer studies.

Tritium neutron generator target source means a tritium source used within a neutron generator tube to produce neutrons for use in well logging applications.

Uranium sinker bar means a weight containing depleted uranium used to pull a logging tool toward the bottom of a well.

Well means a drilled hole in which well logging may be performed. "Well" includes drilled holes for the purpose of oil, gas, mineral, groundwater, or geological exploration.

Well logging means all operations involving the lowering and raising of measuring devices or tools which contain radioactive material or are used to detect radioactive materials in wells for the purpose of obtaining information about the well or adjacent formations which may be used in oil, gas, mineral, groundwater, or geological exploration.

14-003 AGREEMENT WITH WELL OWNER OR OPERATOR

14-003.01 A licensee may perform well logging with a sealed source only after the licensee has a written agreement with the employing well owner or operator. This written agreement must identify who will meet the following requirements.

1. If a sealed source becomes lodged in the well, a reasonable effort will be made to recover it;
2. A person may not attempt to recover a sealed source in a manner which, in the licensee's opinion, could result in its rupture;
3. The radiation monitoring required in 180 NAC 14-020.01 will be performed;
4. If the environment, any equipment, or personnel are contaminated with radioactive material, they must be decontaminated before release from the site or release for unrestricted use; and
5. If the sealed source is classified as irretrievable after reasonable efforts at recovery have been expended, the following requirements must be implemented within 30 days:

    a. Each irretrievable well logging source must be immobilized and sealed in place with a cement plug.
    b. A means to prevent inadvertent intrusion on the source, unless the source is not accessible to any subsequent drilling operations and
    c. A permanent identification plaque, constructed of long lasting material such as stainless steel, brass, bronze, or monel, must be mounted at the surface of the well, unless the mounting of the plaque is not practical. The size of the plaque must be at least 17 cm (7 inches) square and 3 mm (1/8 inch) thick. The plaque must contain:

        (1) The word "Caution";
        (2) The radiation symbol (the color requirement in 180 NAC 4-033.01 need not be met);
        (3) The date the source was abandoned;
        (4) The name of the well owner or well operator as appropriate;
        (5) The well name and well identification number(s) or other designation;
        (6) An identification of the sealed source(s) by radionuclide and quantity;
        (7) The depth of the source and depth to the top of the plug; and
        (8) An appropriate warning such as "DO NOT RE-ENTER THIS WELL".

d. If a radioactive source is classified as irretrievably lost in any well or test hole, the licensee must, within 15 days, file with the Register of Deeds of the County in which the well or test hole is located, a map of the location, including the legal description where the source was irretrievably lost, and a statement identifying the type and quantity of the radioactive source. Certified copies of the filing must be submitted to the Department within 30 days of the filing.

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14-003.02 The licensee must retain a copy of the written agreement for three years after the completion of the well logging operation.

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14-003.03 If a radioactive source is irretrievably lost in a fresh water aquifer or down a liquefied petroleum products storage cavity, then a drilling safety zone must be established by the Department upon review of the geology and hydrology of the site. All wells and storage cavities in the drilling safety zone must be abandoned and no fluids may be removed except upon approval by the Department. In addition of the notice requirements in 180 NAC 14-003.01, item 5, within 15 days after receipt of notice of the establishment of a drilling safety zone by the Department, the licensee must prepare a map of the drilling safety zone indicating the type and quantity of radioactive source, and the map must be filed with the Register of Deeds of any County which forms a portion of the drilling safety zone. Certified copies of the filing must be submitted to the Department within 30 days after the filing.

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14-003.04 A written agreement between the licensee and the well owner or operator is not required if the licensee and the well owner or operator are part of the same corporate structure or otherwise similarly affiliated. However, the licensee must still otherwise meet the requirements in 180 NAC 14-003.01, item 1 through item 5.

EQUIPMENT

14-004 LABELS, SECURITY AND TRANSPORTATION PRECAUTIONS

14-004.01 Labels

1. The licensee may not use a source, source holder, or logging tool that contains radioactive material unless the smallest component that is transported as a separate piece of equipment with the radioactive material inside bears a durable, legible, and clearly visible marking or label. The marking or label must contain the radiation symbol specified in 180 NAC 4-033.01, without the conventional color requirements, and the wording:

CAUTION[1]
RADIOACTIVE MATERIAL

[1]Or "Danger".

2. The licensee may not use a container to store radioactive material unless the container has securely attached to it a durable, legible, and clearly visible label. The label must contain the radiation symbol specified in and the wording:

CAUTION[2]
RADIOACTIVE MATERIAL
NOTIFY CIVIL AUTHORITIES (or NAME OF COMPANY)

3. The licensee may not transport radioactive material unless the material is packaged, labeled, marked, and accompanied with appropriate shipping papers in accordance with regulations set out in 180 NAC 13.

14-004.02 Security, Precautions During Storage and Transportation

1. The licensee must store each source containing radioactive material in a storage container or transportation package. The container or package must be locked and physically secured to prevent tampering or removal of radioactive material from storage by unauthorized personnel. The licensee must store radioactive material in a manner that will minimize danger from explosion or fire.
2. The licensee must lock and physically secure the transport package containing radioactive material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal of the radioactive material from the vehicle.

14-005 RADIATION SURVEY INSTRUMENTS

14-005.01 The licensee must keep a calibrated and operable radiation survey instrument capable of detecting beta and gamma radiation at each field station and temporary jobsite to make the radiation surveys required by 180 NAC 14 and by 180 NAC 4. To satisfy this requirement, the radiation survey instrument must be capable of measuring 0.001 mSv (0.1 mrem) per hour through at least 0.5 mSV (50 mrem) per hour.

14-005.02 The licensee must have available additional calibrated and operable radiation survey instruments sensitive enough to detect the low radiation and contamination levels that could be encountered if a sealed source ruptured. The licensee may own the instruments or may have a procedure to obtain them quickly from a second party.

14-005.03 The licensee must have each radiation survey instrument required under 180 NAC 14-005.01 calibrated:

1. At intervals not to exceed six months and after instrument servicing;
2. For linear scale instruments, at two points located approximately 1/3 and 2/3 of full scale on each scale; for logarithmic scale instruments, at midrange of each decade, and at two points of at least one decade; and for digital instruments, at approximate points;

Deleted: [2]Ibid. p. 14 - 5

3. So that an accuracy within plus or minus 20% of the calibration standard can be demonstrated on each scale; and
4. At energies and radiation levels appropriate for use.

14-005.04 The licensee must retain calibration records for a period of three years after the date of calibration for inspection by the Department. Deleted: 3 Deleted: Agency

14-006 LEAK TESTING OF SEALED SOURCES

14-006.01 Requirements: Each licensee using sealed sources of radioactive material must have the sources tested for leakage. Records of leak test results must be kept in units of microcuries and maintained for inspection by the Department. Deleted: Agency

14-006.02 Method of Testing: The wipe of a sealed source must be performed using a leak test kit or method approved by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State. The wipe sample must be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample must be analyzed for radioactive contamination. The analysis must be capable of detecting the presence of 185 Bq (0.005 microcuries) of radioactive material on the test sample and must be performed by a person approved by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State to perform the analysis. Deleted: Agency Deleted: Agency

14-006.03 Testing Frequency

1. Each sealed source (except an energy compensation source (ECS) must be tested at intervals not to exceed six months. In the absence of a certificate from a transferor that a test has been made within the six months before the transfer, the sealed source may not be used until tested. Deleted: 6
2. Each ECS that is not exempt from testing in accordance with 180 NAC 14-006.05 must be tested at intervals not to exceed three years. In the absence of a certificate from a transferor that a test has been made within the three years before the transfer, the ECS may not be used until tested.

14-006.04 Removal of Leaking Source from Service

1. If the test conducted pursuant to 180 NAC 14-006.01 and 14-006.02 reveals the presence of 185 Bq (0.005 microcuries) or more of removable radioactive material, the licensee must remove the sealed source from service immediately and have it decontaminated, repaired, or disposed of by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State licensee that is authorized to perform these functions. The licensee must check the equipment associated with the leaking source for radioactive contamination and, if contaminated, have it decontaminated or disposed of by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State licensee that is authorized to perform these functions. Deleted: Agency Deleted: Agency
2. The licensee must submit a report to the Department within five days of receiving the test results. The report must describe the equipment involved in the leak test, Deleted: Agency Deleted: 5

the test results, any contamination which resulted from the leaking source, and the corrective actions taken up to the time the report is made.

14-006.05 Exemptions from Testing Requirements: The following sealed sources are exempt from the periodic leak test requirements set out in 180 NAC 14-006.01 through 14-006.04:

1. Hydrogen-3 (tritium) sources;
2. Sources containing radioactive material with a half-life of 30 days or less;
3. Sealed sources containing radioactive material in gaseous form;
4. Sources of beta- or gamma- emitting radioactive material with an activity of 3.7 MBq (100 microcuries) or less; and
5. Sources of alpha- or neutron- emitting radioactive material with an activity of 0.37 MBq (10 microcuries) or less.

14-007 PHYSICAL INVENTORY: Each licensee must conduct a quarterly physical inventory to account for all radioactive material received and possessed under the license. The licensee must retain records of the inventory for three years from the date of the inventory for inspection by the Department. The inventory must indicate the quantity and kind of radioactive material, the location of the radioactive material, the date of the inventory, and the name of the individual conducting the inventory. Physical inventory records may be combined with leak test records.

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14-008 RECORDS OF MATERIAL USE

14-008.01 Each licensee must maintain records for each use of radioactive material showing:

1. The make, model number, and a serial number or a description of each sealed source used;
2. In the case of unsealed radioactive material used for subsurface tracer studies, the radionuclide and quantity of activity used in a particular well and the disposition of any unused tracer materials;
3. The identity of the logging supervisor who is responsible for the radioactive material and the identity of logging assistants present; and
4. The location and date of use of the radioactive material.

14-008.02 The licensee must make the records required by 180 NAC 14-008.01 available for inspection by the Department. The licensee must retain the records for three years from the date of the recorded event.

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14-009 DESIGN, PERFORMANCE CRITERIA FOR SEALED SOURCES

14-009.01 A licensee may use a sealed source for use in well logging applications if:

1. The sealed source is doubly encapsulated;
2 The sealed source contains radioactive material whose chemical and physical forms are as insoluble and nondispersible as practical; and
2. Meets the requirements of 180 NAC 14-009.02, 14-009.03 or 14-009.04.

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14-009.02 For a sealed source manufactured on or before July 14, 1989, a licensee may use the sealed source, for use in well logging applications if it meets the requirements of USASI N5.10-1968, "Classification of Sealed Radioactive Sources", or the requirements in 180 NAC 14-009.03 and 14-009.04.

14-009.03 For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source, for use in well logging applications if it meets the oil-well logging requirements of ANSI/HPS N43.6-1997, "Sealed Radioactive Sources - Classification."

14-009.04 For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source, for use in well logging applications, if:

1. The sealed source's prototype has been tested and found to maintain its integrity after each of the following tests:

    a. Temperature. The test source must be held at -40°C (-40°F) for 20 minutes, 600°C (1112°F) for 1 hour, and then be subject to a thermal shock test with a temperature drop from 600°C (1112°F) to 20°C (68°F) within 15 seconds.
    b. Impact Test. A 5 kg steel hammer, 2.5 cm in diameter, must be dropped from a height of 1 m onto the test source.
    c. Vibration Test. The test source must be subject to a vibration from 25 Hz to 500 Hz at 5 g amplitude for 30 minutes.
    d. Puncture Test. A 1 gram hammer and pin, 0.3 cm pin diameter, must be dropped from a height of 1 m onto the test source.
    e. Pressure Test. The test source must be subjected to an external pressure of 1.695E+7 pascals (24,600 pounds per square inch absolute).

14-009.05 The requirements in 180 NAC 14-009.01, 14-009.02, 14-009.03 and 14-009.04 do not apply to sealed sources that contain radioactive material in gaseous form. Deleted: licensed

14-009.06 The requirements in 180 NAC 14-009.01, 14-009.02, 14-009.03 and 14-009.04 do not apply to energy compensation sources (ECS). ECSs must be registered with the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or with an Agreement State.

14-010 INSPECTION MAINTENANCE AND OPENING OF A SOURCE OR SOURCE HOLDER

14-010.01 Each licensee must visually check source holders, logging tools, and source handling tools, for defects before each use to ensure that the equipment is in good working condition and that required labeling is present. If defects are found, the equipment must be removed from service until repaired and a record must be made listing: the date of check, name of inspector, equipment involved, defects found, and repairs made. These records must be retained for three years after the defect is found.

14-010.02 Each licensee must conduct, at intervals not to exceed six months, a program of visual inspection and routine maintenance of source holders, logging tools, injection tools, source handling tools, storage containers, transport containers, and uranium sinker bars to

ensure that the required labeling is legible and that no physical damage is visible. If defects are found, the equipment must be removed from service until repaired, and a record must be made listing: date, equipment involved, inspection and maintenance operations performed, any defects found, and any actions taken to correct the defects. These records must be retained for three years after the defect is found.

14-010.03 Removal of a sealed source from a source holder or logging tool, and maintenance on sealed sources or holders in which sealed sources are contained may not be performed by the licensee unless a written procedure pursuant to 180 NAC 14-017 has been developed by the licensee and approved by the Department based upon compliance with 180 NAC 4 and 10. Deleted: Agency

14-010.04 If a sealed source is stuck in the source holder, the licensee may not perform any operation on the source holder, such as drilling, cutting, or chiseling, unless the licensee is specifically approved by the Department; approval is based upon training and experience of the licensee and upon compliance with 180 NAC 4 and 10. Deleted: Agency

14-010.05 The opening, repair, or modification of any sealed source must be performed by persons specifically approved to do so by the Department, U.S. Nuclear Regulatory Commission, or an Agreement State. Deleted: Agency

14-011 SUBSURFACE TRACER STUDIES

14-011.01 The licensee must require all personnel handling radioactive tracer material to use protective gloves and, if required by the licensee, other protective clothing and equipment. The licensee must take precautions to avoid ingestion or inhalation of radioactive tracer material and to avoid contamination of field stations and temporary jobsites.

14-011.02 A licensee may not knowingly inject radioactive material into fresh water aquifers.

14-012 URANIUM SINKER BARS: The licensee may use a uranium sinker bar in well logging applications only if it is legibly impressed with the words "CAUTION - RADIOACTIVE - DEPLETED URANIUM" and "NOTIFY CIVIL AUTHORITIES (or COMPANY NAME) IF FOUND".

14-013 USE OF A SEALED SOURCE

14-013.01 In a Well with a Surface Casing: No sealed source may be used in any well unless the well is cased pursuant to the rules and regulations of the Nebraska Oil and Gas Conservation Commission Title 267 Chapter 3, 012.01 through 012.03 and 012.09 and Chapter 4, 006.01B, except as pursuant to 14-013.02.

14-013.02 In a Well without a Surface Casing: The licensee may use a sealed source in a well without a surface casing for protecting fresh water aquifers only if the licensee follows a procedure for reducing the probability of the source becoming lodged in the well. The procedure must be approved by the Department, the U.S. Nuclear Regulatory Commission, or another Agreement State. Deleted: Agency Deleted: licensee

14-014 ENERGY COMPENSATION SOURCE: The licensee may use an energy compensation source (ECS) which is contained within a logging tool, or other tool components, only if the ECS contains quantities of licensed material not exceeding 3.7 MBq (100 microcuries):

14-014.01 For well logging applications with a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of 180 NAC 14-006,14-007 and 14-008.

14-014.02 For well logging applications without the surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of 180 NAC 14-003, 14-006, 14-007, 14-008, 14-013, and 14-026.

14-015 TRITIUM NEUTRON GENERATOR TARGET SOURCE

14-015.01 Use of a tritium neutron generator target source, containing quantities not exceeding 1,110 MBq (30 curies) and in a well with a surface casing to protect fresh water aquifers, is subject to the requirements of 180 NAC 14 except 180 NAC 14-003, 14-009 and 14-02426.

14-015.02 Use of a tritium neutron generator target source, containing quantities exceeding 1,110 MBq (30 curies) or in a well without a surface casing to protect fresh water aquifers, is subject to the requirements of 180 NAC 14 except 180 NAC 14-009.

RADIATION SAFETY REQUIREMENTS

14-016 TRAINING AND EXPERIENCE QUALIFICATION REQUIREMENTS FOR WELL LOGGING PERSONNEL

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14-016.01 Radiation Safety Officer:

1. A college degree at the bachelor level, or equivalent training and experience in the physical or biological sciences or in engineering;
2. Qualified well logger or six weeks on-the-job training under an authorized user; and
3. Forty hours of formal instruction in:

    a. Principles and practices of radiation protection;
    b. Radioactivity measurements standardization and monitoring techniques and instruments;
    c. Mathematics and calculations basic to the use of and measurement of radioactivity;
    d. Biological effects of radiation, and
    e. Operating and emergency procedures and federal and state radiation control regulations.

14-016.02 The licensee must not permit an individual to act as a logging supervisor until that person:

1. Has completed forty hours of formal training in the subjects outlined in 180 NAC 14-016.06;
2. Has received copies of, and instruction in:

    a. 180 NAC 4, 10, and 14;
    b. The license under which the logging supervisor will perform well logging; and
    c. The licensee's operating and emergency procedures required by 180 NAC 14-018;

3. Has completed six weeks of on-the-job training under a logging supervisor and demonstrated competence in the use of radioactive materials, remote handling tools, and radiation survey instruments by a field evaluation; and
4. Has demonstrated understanding of the requirements in 180 NAC 14-016.02 and 14-016.02, items 1 and 2 by successfully completing a written test.

14-016.03 The licensee must not permit an individual to act as a logging assistant until that person:

1. Has received instruction in applicable parts of 180 NAC 4, and 10;
2. Has received copies of, and instruction in, the licensee's operating and emergency procedures required by 180 NAC 14-017;
3. Has demonstrated understanding of the materials listed in 180 NAC 14-016.03 item 1 and 2 by successfully completing the test; and
4. Has received instruction in the use of radioactive materials, remote handling tools, and radiation survey instruments, as appropriate for the logging assistant's intended job responsibilities.

14-016.04 The licensee must provide safety reviews for logging supervisors and logging assistants at least once during each calendar year.

14-016.05 The licensee must maintain a record on each logging supervisor's and logging assistant's training and annual safety review. The training records must include copies of written tests and dates of oral tests. The training records must be retained for three years following the termination of employment. Records of annual safety reviews must list the topics discussed and be retained for three years.

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14-016.06 The licensee must include the following subjects in the training required in 180 NAC 14-016.02:

1. Fundamentals of radiation safety including:

    a. Characteristics of radiation;
    b. Units of radiation dose and quantity of radioactivity;
    c. Hazards of exposure to radiation;
    d. Levels of radiation from radioactive material;
    e. Methods of controlling radiation dose (time, distance, and shielding); and

f. Radiation safety practices, including prevention of contamination, and methods of decontamination.

2. Radiation detection instruments including:

a. Use, operation, calibration, and limitations of radiation survey instruments;
b. Survey techniques; and
c. Use of personnel monitoring equipment;

3. Equipment to be used including:

a. Operation of equipment, including source handling equipment and remote handling tools;
b. Storage, control, and disposal of radioactive material; and
c. Maintenance of equipment.

4. The requirements of pertinent regulations. And
5. Case histories of accidents in well logging.

14-017 OPERATING AND EMERGENCY PROCEDURES: Each licensee must develop and follow written operating and emergency procedures that cover:

1. The handling and use of radioactive materials including the use of sealed sources in wells without surface casing for protecting fresh water aquifers, if appropriate; Deleted: 14-017.01

2. The use of remote handling tools for handling sealed sources and radioactive tracer material except low-activity calibration sources; Deleted: 14-017.02

3. Methods and occasions for conducting radiation surveys, including surveys for detecting contamination, as required by 180 NAC 14-019.02 through 14-019.05; Deleted: 14-017.03

4. Minimizing personnel exposure including exposures from inhalation and ingestion of radioactive tracer materials; Deleted: 14-017.04

5. Methods and occasions for locking and securing stored radioactive materials; Deleted: 14-017.05

6. Personnel monitoring and the use of personnel monitoring equipment; Deleted: 14-017.06

7. Transportation of sources of radiation to field stations or temporary jobsites, packaging of sources of radiation for transport in vehicles, placarding of vehicles when needed, and physically securing sources of radiation in transport vehicles during transportation to prevent accidental loss, tampering or unauthorized removal; Deleted: 14-017.07

8. Picking up, receiving, and opening packages containing radioactive materials, in accordance with 180 NAC 4-038; Deleted: 14-017.08

9. For the use of tracers, decontamination of the environment, equipment, and personnel; Deleted: 14-017.09

10. Maintenance of records generated by logging personnel at temporary jobsites; Deleted: 14-017.10

11. The inspection and maintenance of sealed sources, source holders, logging tools, injection tools, source handling tools, storage containers, transport containers, and uranium sinker bars as required by 180 NAC 14-010; Deleted: 14-017.11

12. Actions to be taken if a sealed source is lodged in a well; Deleted: 14-017.12

13. Notifying proper persons in the event of an accident; and Deleted: 14-017.13

14. Actions to be taken if a sealed source is ruptured including actions to prevent the spread of contamination, to minimize inhalation and ingestion of radioactive materials, and actions to obtain suitable radiation survey instruments as required by 180 NAC 14-005.02. Deleted: 14-017.14

14-018 PERSONNEL MONITORING

14-018.01 The licensee may not permit an individual to act as a logging supervisor or logging assistant unless that person wears, at all times during the handling of licensed radioactive materials, a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor. Each personnel dosimeter must be assigned to and worn by only one individual. Film badges must be replaced at least monthly and other personnel dosimeters at least quarterly. After replacement, each personnel dosimeter must be promptly processed.

14-018.02 The licensee must provide bioassay services to individuals using radioactive materials in subsurface tracer studies if required by the license.

14-018.03 The licensee must retain records of personnel dosimeters required by 14-018.01 and bioassay results for inspection until the Department authorizes disposition of records. Deleted: Agency

14-019 RADIATION SURVEYS

14-019.01 The licensee must make radiation surveys, including but not limited to the surveys required under 180 NAC 14-019.02 through 14-019.05, of each area where radioactive materials are used and stored.

14-019.02 Before transporting radioactive materials, the licensee must make a radiation survey of the position occupied by each individual in the vehicle and of the exterior of each vehicle used to transport the radioactive materials.

14-019.03 If the sealed source assembly is removed from the logging tool before departure from the temporary jobsite, the licensee must confirm that the logging tool is free of contamination by energizing the logging tool detector or by using a survey meter.

14-019.04 If the licensee has reason to believe that, as a result of any operation involving a sealed source, the encapsulation of sealed source could be damaged by the operation, the licensee must conduct a radiation survey, including a contamination survey, during and after the operation.

14-019.05 The licensee must make a radiation survey at the temporary jobsite before and after each subsurface tracer study to confirm the absence of contamination.

14-019.06 The results of surveys required under 180 NAC 14-019.01 through 14-019.05 must be recorded and must include the date of the survey, the name of the individual making the survey, the identification of the survey instrument used, and the location of the survey. The licensee must retain records of survey for inspection by the Department for three years after they are made.

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14-020 RADIOACTIVE CONTAMINATION CONTROL

14-020.01 If the licensee detects evidence that a sealed source has ruptured or radioactive materials have caused contamination, the licensee may initiate immediately the emergency procedures required by 180 NAC 14-017.

14-020.02 If contamination results from the use of radioactive material in well logging, the licensee must decontaminate all work areas, equipment, and unrestricted areas.

14-020.03 During efforts to recover a sealed source lodged in the well, the licensee must continuously monitor, with an appropriate radiation detection instrument or a logging tool with a radiation detector, the circulating fluids from the well, if any, to check for contamination resulting from damage to the sealed source.

PRECAUTIONARY PROCEDURES IN LOGGING AND SUBSURFACE TRACER

14-021 HANDLING TOOLS: The licensee must provide and require the use of tools that will assure remote handling of sealed sources other than low-activity calibration sources.

14-022 PARTICLE ACCELERATORS: No licensee or registrant must permit above-ground testing of particle accelerators, designed for use in well logging, which results in the production of radiation, except in areas or facilities controlled or shielded so that the requirements of 180 NAC 4-005 and 4-013, as appropriate, are met.

SECURITY, RECORDS, NOTIFICATIONS

14-023 SECURITY

14-023.01 A logging supervisor must be physically present at a temporary jobsite whenever radioactive material is being handled or are not stored and locked in a vehicle or storage place. The logging supervisor may leave the jobsite in order to obtain assistance if a source becomes lodged in a well.

14-023.02 During well logging, except when radiation sources are below ground or in shipping or storage containers, the logging supervisor or other individual designated by the *logging supervisor must maintain direct surveillance of the operation to prevent unauthorized* entry into a restricted area, as defined 180 NAC 1-002.

14-024 DOCUMENTS AND RECORDS REQUIRED AT FIELD STATIONS: Each licensee must maintain the following documents and records at the field station:

1. A copy of 180 NAC 4, 10 and 14; Deleted: 14-024.01
2. The license authorizing the use of radioactive material; Deleted: 14-024.02
3. Operating and emergency procedures required by 180 NAC 14-017; Deleted: 14-024.03
4. The record of radiation survey instrument calibrations required by 180 NAC 14-005; Deleted: 14-024.04
5. The record of leak tests required by 180 NAC 14-006; Deleted: 14-024.05
6. Physical inventory records required by 180 NAC 14-007; Deleted: 14-024.06
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7. Utilization records required by 180 NAC 14-008; Deleted: 14-024.07
8. Records of inspection and maintenance required by 180 NAC 14-010; Deleted: 14-024.08
9. Training records required by 180 NAC 14-016; and Deleted: 14-024.09
10. Survey records required by 180 NAC 14-019. Deleted: 14-024.10

14-025 DOCUMENTS AND RECORDS REQUIRED AT TEMPORARY JOBSITES: Each licensee conducting operations at a temporary jobsite must maintain the following documents and records at the temporary jobsite until the well logging operation is completed:

1. Operating and emergency procedures required by 180 NAC 14-017; Deleted: 14-025.01
2. Evidence of latest calibration of the radiation survey instruments in use at the site required by 180 NAC 14-005; Deleted: 14-025.02
3. Latest survey records required by 180 NAC 14-019.02, 14-019.03 and 14-019.05; Deleted: 14-025.03
4. The shipping papers for the transportation of radioactive materials required by 180 NAC 13-005; and Deleted: 14-025.04
5. When operating under reciprocity pursuant to 180 NAC 3-028, a copy of the U.S. Nuclear Regulatory Commission or Agreement State License authorizing use of radioactive materials. Deleted: 14-025.05

14-026 NOTIFICATION OF INCIDENTS AND LOST SOURCES; ABANDONMENT PROCEDURES FOR IRRETRIEVABLE SOURCES

14-026.01 The licensee must immediately notify the Department by telephone and subsequently, within 30 days, by confirmatory letter if the licensee knows or has reason to believe that a sealed source has been ruptured. The letter must designate the well or other location, describe the magnitude and extent of the escape of radioactive materials, assess the consequences of the rupture, and explain efforts planned or being taken to mitigate these consequences.

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14-026.02 The licensee must notify the Department of the theft or loss of radioactive materials, radiation overexposures, excessive levels and concentrations of radiation, and certain other accidents as required by 180 NAC 4-057, 4-058, 4-059 and 180 NAC 3-026.

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14-026.03 If a sealed source becomes lodged in a well, and when it becomes apparent that efforts to recover the sealed source will not be successful, the licensee must:

1. Notify the appropriate Department by telephone of the circumstances that resulted in the inability to retrieve the source and
   a. Obtain Department approval to implement abandonment procedures; or
   b. That the licensee implemented abandonment before receiving Department approval because the licensee believed there was an immediate threat to public health and safety; and
2. Advise the well owner or operator, as appropriate, of the abandonment procedures under 180 NAC 14-003.01 or 14-003.03; and
3. Either ensure that abandonment procedures are implemented within 30 days after the sealed source has been classified as irretrievable or request an extension of time if unable to complete the abandonment procedures.

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14-026.04 The licensee must, within 30 days after a sealed source has been classified as irretrievable, make a report in writing to the Department. The report must contain the following information:

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1. Date of occurrence;
2. A description of the irretrievable well logging source involved including the radionuclide and its quantity, chemical, and physical form;
3. Surface location and identification of the well;
4. Results of efforts to immobilize and seal the source in place;
5. A brief description of the attempted recovery effort;
6. Depth of the source;
7. Depth of the top of the cement plug;
8. Depth of the well; and
9. The immediate threat to public health and safety justification for implementing abandonment if prior to Department approval was not obtained in accordance with 180 NAC 14-026.03, item 1.b.
10. Any other information, such as a warning statement, contained on the permanent identification plaque.

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