From: "Barbara Davis" <bdavis4@mail.state.tn.us>
To: <fcc@nrc.gov>
Date: 2/28/01 11:41AM
Subject: TN compatibility amendment

Sorry for the confusion. Thanks

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Notice of Rulemaking Hearing
Department of Environment and Conservation
Division of Radiological Health

There will be a hearing before the Tennessee Department of Environment and Conservation to consider the promulgation of new rules and amendments pursuant to T.C.A. 68-202-101 et seq. and 68-202-201 et seq. The hearing will be conducted in the manner prescribed by the Uniform Administrative Procedures Act, Tennessee Code Annotated, Section 4-5-204 and will take place in the 17th Floor Conference Room of the L & C Tower located at 401 Church Street, Nashville, Tennessee at 10:00 a.m. (CST), on the 23rd day of April, 2001.

Individuals with disabilities who wish to participate in these proceedings or to review these filings should contact the Tennessee Department of Environment and Conservation to discuss any auxiliary aids or services needed to facilitate such participation. Such contact may be made in person, by writing, telephone or other means and should be made no less than ten (10) days prior to April 23, 2001, or ten (10) days prior to the date such party intends to review such filings, to allow time for the Department to determine how it may reasonably provide such aids or services. Contact the Tennessee Department of Environment and Conservation, ADA Coordinator, Isaac Okoreeh-Baah, 401 Church Street, L & C Annex, Seventh Floor; Nashville, TN 37243; (615) 532-0009 or 1-888-867-2757. Hearing impaired callers may use the Tennessee Relay Service (1-800-848-0298).

For a copy of this notice of rulemaking hearing, contact: Barbara A. Davis; Division of Radiological Health, L & C Annex, Third Floor; 401 Church Street; Nashville, TN 37243-1532, 615-532-0364.

New Rules

Chapter 1200-2-4

General Provisions

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1200-2-4-.11 Posting of Notices to Workers.

(1) Each licensee or registrant shall post current copies of the following documents, as applicable, in a sufficient number of places to permit workers to observe them on the way to or from any particular licensed or registered activity location to which the document applies. Documents shall be placed in a conspicuous position and replaced if removed or altered:

(a) "State Regulations for Protection Against Radiation;"

(b) Radioactive material license, license conditions, documents incorporated into a license by reference and amendments thereto;

(c) Certified registration and amendments thereto;

(d) Registration of x−ray producing equipment;

(e) Operating and emergency procedures applicable to licensed or registered activities;

(f) Any written notice that these regulations have been violated shall be posted within two (2) working days after receipt of the documents from the Division and the licensee's or registrant's response, if any, shall be posted within two (2) working days after dispatch from the licensee or registrant. These documents shall remain posted for a minimum of five (5) working days or until action correcting the violation has been completed, whichever is later.

(g) Form RHS 8−3 (Notice to Employees). Copies of this form may be obtained by writing the Division of Radiological Health at the address given in Rule 1200−2−4−.07.

(2) Instead of posting a document specified in subparagraphs 1200−2−4−.11(1)(a) through (e), the licensee or registrant may post a notice that describes the document and states where it may be examined.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−101 et seq.

1200−2−4−.12 Instructions to Workers.

(1) Each licensee or registrant is responsible that all individuals who in the course of employment are likely to receive in a year an occupational dose in excess of 100 mrem (1mSv):

1. Shall be kept informed of the storage, transfer or use of sources of radiation;

2. Shall be instructed:

(i) In the health protection problems associated with exposure to sources of radiation,

(ii) In precautions or procedures to minimize radiation exposure, and

(iii) In the purposes and functions of protective devices employed;

3. Shall be instructed in, and required to observe, to the extent within the worker's control, the applicable Division regulations, registrations and licenses for the protection of individuals from sources of radiation;

4. Shall be instructed in any operating and emergency procedures applicable to the licensed or registered activities in which the individual is involved;

5. Shall be instructed of their responsibility to report promptly to the licensee or registrant any condition that may lead to or cause a violation of Division regulations, registration and licenses or unnecessary exposure to sources of radiation;

6. Instructed in the appropriate response to warnings made in case of any unusual occurrence or malfunction that may involve exposure to sources of radiation;

7. Shall be advised that workers may request radiation exposure reports under Rule 1200−2−5−.142.

(2) In determining individuals subject to paragraph (1), licensees and registrants shall consider assigned activities during normal and abnormal situations involving exposure to sources of radiation that can reasonably occur during the life of a licensed or registered facility. The extent of these instructions shall be commensurate with potential radiological health protection problems in the work place.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

1200–2–4–.13 Deliberate Misconduct.

(1) Any licensee, registrant, applicant for a license or registration, employee of a licensee, registrant or applicant; or any contractor (including a supplier or consultant), subcontractor, employee of a contractor or subcontractor of any licensee or registrant or applicant for a license or registration is subject to this rule.

(2) A person 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 under these regulations, shall not:

(a) 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 Division; or

(b) Deliberately submit to the Division, a licensee, a registrant, an applicant, or a licensee's or registrant's contractor or subcontractor, information that the person submitting the information knows to be incomplete or inaccurate in some respect material to the Division.

(3) A person who violates subparagraph 1200–2–4–.13(2)(a) or (b) may be subject to possible civil and criminal penalties.

(4) For the purposes of subparagraph 1200–2–4–.13(2)(a), deliberate misconduct by a person means an intentional act or omission that the person knows:

(a) Would cause 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 Division; or

(b) Constitutes a violation of a requirement, procedure, instruction, contract, purchase order or policy of a licensee, registrant, applicant, contractor or subcontractor.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–203 and 206.

Chapter 1200–2–8

Radiation Safety Requirements for Industrial Radiography Operations

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1200–2–8–.13 Schedule RHS 8–35: Radiographer Certification.

(1) Requirements for an independent certifying organization. An independent certifying organization shall:

(a) Be an organization such as a society or association, whose members participate in, or have an interest in, the fields of industrial radiography;

(b) Make its membership available to the general public nationwide that is not restricted because of race, color, religion, sex, age, national origin or disability;

(c) Have a certification program open to nonmembers, as well as members;

(d) Be an incorporated, nationally recognized organization that is involved in setting national standards of practice within its fields of expertise;

(e) Have an adequate staff, a viable system for financing its operations, and a policy–and decision–making review board;

(f) 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;

(g) 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;

(h) Have a committee, whose members can carry out their responsibilities impartially, to review complaints against certified individuals and to determine appropriate sanctions;

(i) 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;

(j) 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;

(k) Have procedures for proctoring examinations, including qualifications for proctors. These procedures must ensure that the same company or corporation (or a wholly owned subsidiary of such company or corporation) does not employ the individuals proctoring each examination as any of the examinees;

(l) Exchange information about certified individuals with the Division and other independent certifying organizations and/or Agreement States and allow periodic review of its certification program and related records; and

(m) Provide a description to the Division of its procedures for choosing examination sites and for providing an appropriate examination environment.

(2) Requirements for certification programs. All certification programs shall:

(a) Require applicants for certification to:

1. Receive training in the topics set forth in Rule 1200–2–8–.07; and

2. Satisfactorily complete a written examination covering these topics;

(b) Require applicants for certification to provide documentation that demonstrates that the applicant has:

1. Received training in the topics set forth in Rule 1200–2–8–.07;

2. Satisfactorily completed a minimum period of on–the–job training; and

3. Received verification by an Agreement State or a U.S. NRC licensee that the applicant has demonstrated the capability of independently working as a radiographer;

(c) Include procedures to ensure that all examination questions are protected from disclosure;

(d) Include procedures for denying an application, revoking, suspending and reinstating a certificate;

(e) Provide a certification period of not less than three (3) years or more than five (5) years;

(f) Include procedures for renewing certifications and, if the procedures allow renewals without examination, require evidence of recent full–time employment and annual refresher training in industrial radiography.

(h) Provide a timely response to inquiries, by telephone or letter, from members of the public, about an individual's certification status.

(3) Requirements for written examinations. All examinations shall be:

(a) Designed to test an individual's knowledge and understanding of the topics listed in Rule 1200–2–8–.07;

(b) Written in a multiple–choice format;

(c) Have test items drawn from a question bank containing psychometrically valid questions based on the material in Rule 1200–2–8–.07.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–203 and 206.

Chapter 1200–2–10

Licensing and Registration

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1200–2–10–.35 Training for an Authorized Nuclear Pharmacist.

(1) Training for an authorized nuclear pharmacist.

(a) Except as provided below in subparagraph (b), a licensee shall require the authorized nuclear pharmacist to be a pharmacist who:

1. Has current board certification as a nuclear pharmacist by the Board of Pharmaceutical Specialties, or

2. Has completed 700 hours in a structured educational program consisting of both:

(i) Didactic training in the following areas:

(I) Radiation physics and instrumentation;

(II) Radiation protection;

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

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

(V) Radiation biology; and

(ii) Supervised experience in a nuclear pharmacy involving the following:

(I) Shipping, receiving and performing related radiation surveys;

(II) Using and performing checks for proper operation of dose calibrators, survey meters and, if appropriate, instruments used to measure alpha– or beta–emitting radionuclides;

(III) Calculating, assaying and safely preparing dosages for individuals;

(IV) Using administrative controls to avoid mistakes in the administration of radioactive material;

(V) Using procedures to prevent or minimize contamination and using proper decontamination procedures; and

3. Has obtained written certification, signed by a preceptor authorized nuclear pharmacist, that the above training has been satisfactorily completed and that the individual has achieved a level of competency sufficient to operate independently a nuclear pharmacy.

(b) Training for experienced nuclear pharmacists. A licensee may apply for and must receive a license amendment identifying an experienced nuclear pharmacist as an authorized nuclear pharmacist before it allows this individual to work as an authorized nuclear pharmacist. A pharmacist who has completed a structured educational program as specified in part 1200–2–10–.35(1)(a)2 before {effective date of amendment}, and who is working in a nuclear pharmacy would qualify as an experienced nuclear pharmacist. An experienced nuclear pharmacist need not comply with the requirements on preceptor statement (see part 1200–2–10–.35(1)(a)3) to qualify as an authorized nuclear pharmacist.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 and 206

1200–2–10–.36 Radiological Criteria for License Termination.

(1) General provisions and scope.

(a) The criteria in this rule apply to the decommissioning of facilities licensed under Chapter 1200–2–10 and Chapters 1200–2–7, 1200–2–8, 1200–2–9, 1200–2–11 and 1200–2–12. For low–level waste disposal facilities (Chapter 1200–2–11), the criteria apply only to ancillary surface facilities that support radioactive waste disposal activities.

(b) Reserved.

(c) After a site has been decommissioned and the license terminated in accordance with the criteria in this rule, the Division will require additional cleanup if, based on new information, it determines that the criteria of this rule were not met and residual radioactivity remaining at the site could result in a significant threat to public health and safety.

(d) When calculating TEDE to the average member of the critical group the licensee shall determine the peak annual TEDE dose expected within the first 1,000 years after decommissioning.

(2) Radiological criteria for unrestricted use. A site will be considered acceptable for unrestricted use if:

(a) 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

(b) The residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels that are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, potentially expected to result from decontamination and waste disposal.

(3) Criteria for license termination under restricted conditions. A site will be considered acceptable for license termination under restricted conditions if:

(a) A licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of paragraph 1200–2–10–.36(2):

1. Would result in net public or environmental harm or

2. Were not being made because the residual levels associated with restricted conditions are ALARA. Determination of the levels that are ALARA must take into account consideration of any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal;

(b) 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;

(c) 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 specified in paragraph 1200–2–10–.12(4); and

(d) 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 ALARA and would not exceed either:

1. 100 mrem (1 mSv) per year; or

2. 500 mrem (5 mSv) per year provided the licensee:

(i) Demonstrates that further reductions in residual radioactivity necessary to comply with the 100 mrem/y (1 mSv/y) value of part 1 above:

1. Are not technically achievable,

2. Would be prohibitively expensive or

3. Would result in net public or environmental harm;

(ii) Makes provisions for durable institutional controls;

(iii) 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 and to assume and carry out responsibilities for any necessary control and maintenance of those controls. Periodic rechecks shall be carried out no less frequently than every five (5) years to assure that the institutional controls remain in place as necessary to meet the criteria of subparagraph 1200–2–10–.36(3)(b). Acceptable financial assurance mechanisms are those in subparagraph 1200–2–10–.12(4)(d).

(4) Alternate criteria for license termination.

(a) The Division may terminate a license using alternate criteria greater than the dose criterion of paragraph 1200–2–10–.36(2) and subparagraph 1200–2–10–.36(3)(b), if the licensee:

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 Rules 1200–2–5–.60 and 1200–2–5–.61, by submitting an analysis of possible sources of exposure;

2. Has employed to the extent practicable restrictions on site use according to the provisions of paragraph 1200–2–10–.36(3) in minimizing exposures at the site; and

(i) Reduces doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal.

(ii) Reserved.

(b) The use of alternate criteria to terminate a license requires the approval of the Division. The Division will consider staff recommendations to address any comments provided by the Environmental Protection Agency and any public comments submitted under paragraph (5) below.

(5) Public notification and public participation. Whenever the Division deems such notice to be in the public interest, the Division may:

(a) Notify and solicit comments from:

1. Local governments and other State government agencies in the vicinity of the site that could be affected by the decommissioning; and

2. The Environmental Protection Agency for cases where the licensee proposes to release a site under paragraph 1200–2–10–.36(4).

(b) Publish a notice in the Tennessee Administrative Register, and in another appropriate forum that is readily accessible to individuals near the site, and solicit comments from affected parties. Another appropriate forum may include local newspapers and letters to State or local organizations.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

1200–2–10–.37 Schedule 10–6: Determination of A_1 and A_2.

(1) 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) 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 (0.1 %) 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.

(2) For individual radionuclides whose identities are known, but which are not listed in Table A–1, the determination of the values of A_1 and A_2 requires Division approval, except that the values of A_1 and A_2 in Table A–2 may be used without obtaining Division approval.

(3) 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 nuclide has a half–life either longer than ten (10) days or longer than that of the parent nuclide, shall be considered as a single radionuclide. The activity to be taken into account, and the A_1 or A_2 value to be applied, shall be those corresponding to the parent nuclide of that chain. In the case of radioactive decay chains in which any daughter nuclide has a half–life either longer than ten (10) days or greater than that of the parent nuclide, the parent and those daughter nuclides shall be considered as mixtures of different nuclides.

(4) 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:

$$\sum_{I} \frac{B(i)}{A_1(i)} \text{ less than or equal to } 1$$

(b) For normal form radioactive material, the maximum quantity transported in a Type A package:

$$\sum_{I} \frac{B(i)}{A_2(i)} \text{ less than or equal to } 1$$

Where B(i) is the activity of radionuclide I and $A_1(i)$ and $A_2(i)$ are the A_1 and A_2 values for radionuclide I, respectively.

Alternatively, an 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 of nuclide I in the mixture and $A_1(i)$ is the appropriate A_1 value for nuclide I.

An A_1 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 nuclide I in the mixture and $A_2(i)$ is the appropriate A_2 value for nuclide I.

(5) 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. 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 (4). 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.

Table A–1: A_1 and A_2 Values for Radionuclides

Symbol of radio–nuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	Specific activity (TBq/g)	Specific activity (Ci/g)
Ac–225	Actinium(89)	0.6	16.2	1×10^{-2}	0.270	2.1×10^{3}	5.8×10^{4}
Ac–227		40	1080	2×10^{-5}	5.41×10^{-4}	2.7	7.2×10^{1}
Ac–228		0.6	16.2	0.4	10.8	8.4×10^{4}	2.2×10^{6}
Ag–105	Silver(47)	2	54.1	2	54.1	1.1×10^{3}	3.0×10^{4}
Ag–108m		0.6	16.2	0.6	16.2	9.7×10^{-1}	2.6×10^{1}
Ag–110m		0.4	10.8	0.4	10.8	1.8×10^{2}	4.7×10^{3}
Ag–111		0.6	16.2	0.5	13.5	5.8×10^{3}	1.6×10^{5}
Al–26	Aluminum(13)	0.4	10.8	0.4	10.8	7.0×10^{-4}	1.9×10^{-2}
Am–241	Americium(95)	2	54.1	2×10^{-4}	5.41×10^{-3}	1.3×10^{-1}	3.4
Am–242m		2	54.1	2×10^{-4}	5.41×10^{-3}	3.6×10^{-1}	1.0×10^{1}
Am–243		2	54.1	2×10^{-4}	5.41×10^{-3}	7.4×10^{-3}	2.0×10^{-1}
Ar–37	Argon(18)	40	1080	40	1080	3.7×10^{3}	9.9×10^{4}
Ar–39		20	541	20	541	1.3	3.4×10^{1}
Ar–41		0.6	16.2	0.6	16.2	1.5×10^{6}	4.2×10^{7}
Ar–42		0.2	5.41	0.2	5.41	9.6	2.6×10^{2}

Symbol of radio-nuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	(TBq/g)	(Ci/g)
As-72	Arsenic(33)	0.2	5.41	0.2	5.41	6.2×10^{4}	1.7×10^{6}
As-73		40	1080	40	1080	8.2×10^{2}	2.2×10^{4}
As-74		1	27.0	0.5	13.5	3.7×10^{3}	9.9×10^{4}
As-76		0.2	5.41	0.2	5.41	5.8×10^{4}	1.6×10^{6}
As-77		20	541	0.5	13.5	3.9×10^{4}	1.0×10^{6}
At-211	Astatine(85)	30	811	2	54.1	7.6×10^{4}	2.1×10^{6}
Au-193	Gold(79)	6	162	6	162	3.4×10^{4}	9.2×10^{5}
Au-194		1	27.0	1	27.0	1.5×10^{4}	4.1×10^{5}
Au-195		10	270	10	270	1.4×10^{2}	3.7×10^{3}
Au-196		2	54.1	2	54.1	4.0×10^{3}	1.1×10^{5}
Au-198		3	81.1	0.5	13.5	9.0×10^{3}	2.4×10^{5}
Au-199		10	270	0.9	24.3	7.7×10^{3}	2.1×10^{5}
Ba-131	Barium(56)	2	54.1	2	54.1	3.1×10^{3}	8.4×10^{4}
Ba-133m		10	270	0.9	24.3	2.2×10^{4}	6.1×10^{5}
Ba-133		3	81.1	3	81.1	9.4	2.6×10^{2}
Ba-140		0.4	10.8	0.4	10.8	2.7×10^{3}	7.3×10^{4}
Be-7	Beryllium(4)	20	541	20	541	1.3×10^{4}	3.5×10^{5}
Be-10		20	541	0.5	13.5	8.3×10^{-4}	2.2×10^{-2}
Bi-205	Bismuth(83)	0.6	16.2	0.6	16.2	1.5×10^{-3}	4.2×10^{4}
Bi-206		0.3	8.11	0.3	8.11	3.8×10^{3}	1.0×10^{5}
Bi-207		0.7	18.9	0.7	18.9	1.9	5.2×10^{1}
Bi-210m		0.3	8.11	3×10^{-2}	0.811	2.1×10^{-5}	5.7×10^{-4}
Bi-210		0.6	16.2	0.5	13.5	4.6×10^{3}	1.2×10^{5}
Bi-212		0.3	8.11	0.3	8.11	5.4×10^{5}	1.5×10^{7}
Bk-247	Berkelium(97)	2	54.1	2×10^{-4}	5.41×10^{-3}	3.8×10^{-2}	1.0
Bk-249		40	1080	8×10^{-2}	2.16	6.1×10^{1}	1.6×10^{3}
Br-76	Bromine(35)	0.3	8.11	0.3	8.11	9.4×10^{4}	2.5×10^{6}
Br-77		3	81.1	3	81.1	2.6×10^{4}	7.1×10^{5}
Br-82		0.4	10.8	0.4	10.8	4.0×10^{4}	1.1×10^{6}
C-11	Carbon(6)	1	27	0.5	13.5	3.1×10^{7}	8.4×10^{8}
C-14		40	1080	2	54.1	1.6×10^{-1}	4.5
Ca-41	Calcium(20)	40	1080	40	1080	3.1×10^{-3}	8.5×10^{-2}
Ca-45		40	1080	0.9	24.3	6.6×10^{2}	1.8×10^{4}
Ca-47		0.9	24.3	0.5	13.5	2.3×10^{4}	6.1×10^{5}
Cd-109	Cadmium(48)	40	1080	1	27.0	9.6×10^{1}	2.6×10^{3}
Cd-113m		20	541	9×10^{-2}	2.43	8.3	2.2×10^{2}
Cd-115m		0.3	8.11	0.3	8.11	9.4×10^{2}	2.5×10^{4}
Cd-115		4	108	0.5	13.5	1.9×10^{4}	5.1×10^{5}
Ce-139	Cerium(58)	6	162	6	162	2.5×10^{2}	6.8×10^{3}
Ce-141		10	270	0.5	13.5	1.1×10^{3}	2.8×10^{4}
Ce-143		0.6	16.2	0.5	13.5	2.5×10^{4}	6.6×10^{5}
Ce-144		0.2	5.41	0.2	5.41	1.2×10^{2}	3.2×10^{3}
Cf-248	Californium(98)	30	811	3×10^{-3}	8.11×10^{-2}	5.8×10^{1}	1.6×10^{3}
Cf-249		2	54.1	2×10^{-4}	5.41×10^{-3}	1.5×10^{-1}	4.1
Cf-250		5	135	5×10^{-4}	1.35×10^{-2}	4.0	1.1×10^{2}
Cf-251		2	54.1	2×10^{-4}	5.41×10^{-3}	5.9×10^{-2}	1.6
Cf-252		0.1	2.70	1×10^{-3}	2.70×10^{-2}	2.0×10^{1}	5.4×10^{2}
Cf-253		40	1080	6×10^{-2}	1.62	1.1×10^{3}	2.9×10^{4}
Cf-254		3×10^{-3}	8.11×10^{-2}	6×10^{-4}	1.62×10^{-2}	3.1×10^{2}	8.5×10^{3}
Cl-36	Chlorine(17)	20	541	0.5	13.5	1.2×10^{-3}	3.3×10^{-2}
Cl-38		0.2	5.41	0.2	5.41	4.9×10^{6}	1.3×10^{8}
Cm-240	Curium(96)	40	1080	2×10^{-2}	0.541	7.5×10^{2}	2.0×10^{4}
Cm-241		2	54.1	0.9	24.3	6.1×10^{2}	1.7×10^{4}
Cm-242		40	1080	1×10^{-2}	0.270	1.2×10^{2}	3.3×10^{3}
Cm-243		3	81.1	3×10^{-4}	8.11×10^{-3}	1.9	5.2×10^{1}
Cm-244		4	108	4×10^{-4}	1.08×10^{-2}	3.0	8.1×10^{1}
Cm-245		2	54.1	2×10^{-4}	5.41×10^{-3}	6.4×10^{-3}	1.7×10^{-1}
Cm-246		2	54.1	2×10^{-4}	5.41×10^{-3}	1.1×10^{-2}	3.1×10^{-1}
Cm-247		2	54.1	2×10^{-4}	5.41×10^{23}	3.4×10^{-6}	9.3×10^{-5}
Cm-248		4×10^{-2}	1.08	5×10^{-5}	1.35×10^{-3}	1.6×10^{-4}	4.2×10^{-3}
Co-55	Cobalt(27)	0.5	13.5	0.5	13.5	1.1×10^{5}	3.1×10^{6}
Co-56		0.3	8.11	0.3	8.11	1.1×10^{3}	3.0×10^{4}

Symbol of radio-nuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)	A_2 (TBq)	A_2 (Ci)	(TBq/g)	(Ci/g)
Co-57		8	216	8	216	3.1×10^{2}	8.4×10^{3}
Co-58m		40	1080	40	1080	2.2×10^{5}	5.9×10^{6}
Co-58		1	27.0	1	27.0	1.2×10^{3}	3.2×10^{4}
Co-60		0.4	10.8	0.4	10.8	4.2×10^{1}	1.1×10^{3}
Cr-51	Chromium(24)	30	811	30	811	3.4×10^{3}	9.2×10^{4}
Cs-129	Cesium(55)	4	108	4	108	2.8×10^{4}	7.6×10^{5}
Cs-131		40	1080	40	1080	3.8×10^{3}	1.0×10^{5}
Cs-132		1	27.0	1	27.0	5.7×10^{3}	1.5×10^{5}
Cs-134m		40	1080	9	243	3.0×10^{5}	8.0×10^{6}
Cs-134		0.6	16.2	0.5	13.5	4.8×10^{1}	1.3×10^{3}
Cs-135		40	1080	0.9	24.3	4.3×10^{-5}	1.2×10^{-3}
Cs-136		0.5	13.5	0.5	13.5	2.7×10^{3}	7.3×10^{4}
Cs-137		2	54.1	0.5	13.5	3.2	8.7×10^{1}
Cu-64	Copper(29)	5	135	0.9	24.3	1.4×10^{5}	3.9×10^{6}
Cu-67		9	243	0.9	24.3	2.8×10^{4}	7.6×10^{5}
Dy-159	Dysprosium(66)	20	541	20	541	2.1×10^{2}	5.7×10^{3}
Dy-165		0.6	16.2	0.5	13.5	3.0×10^{5}	8.2×10^{6}
Dy-166		0.3	8.11	0.3	8.11	8.6×10^{3}	2.3×10^{5}
Er-169	Erbium(68)	40	1080	0.9	24.3	3.1×10^{3}	8.3×10^{4}
Er-171		0.6	16.2	0.5	13.5	9.0×10^{4}	2.4×10^{6}
Es-253	Einsteinium(99) [a]	200	5400	2×10^{-2}	5.41×10^{-1}	—.	—.
Es-254		30	811	3×10^{-3}	8.11×10^{-2}	—.	—.
Es-254m		0.6	16.2	0.4	10.8	—.	—.
Es-255							
Eu-147	Europium(63)	2	54.1	2	54.1	1.4×10^{3}	3.7×10^{4}
Eu-148		0.5	13.5	0.5	13.5	6.0×10^{2}	1.6×10^{4}
Eu-149		20	541	20	541	3.5×10^{2}	9.4×10^{3}
Eu-150		0.7	18.9	0.7	18.9	6.1×10^{4}	1.6×10^{6}
Eu-152m		0.6	16.2	0.5	13.5	8.2×10^{4}	2.2×10^{6}
Eu-152		0.9	24.3	0.9	24.3	6.5	1.8×10^{2}
Eu-154		0.8	21.6	0.5	13.5	9.8	2.6×10^{2}
Eu-155		20	541	2	54.1	1.8×10^{1}	4.9×10^{2}
Eu-156		0.6	16.2	0.5	13.5	2.0×10^{3}	5.5×10^{4}
F-18	Fluorine(9)	1	27.0	0.5	13.5	3.5×10^{6}	9.5×10^{7}
Fe-52	Iron(26)	0.2	5.41	0.2	5.41	2.7×10^{5}	7.3×10^{6}
Fe-55		40	1080	40	1080	8.8×10^{1}	2.4×10^{3}
Fe-59		0.8	21.6	0.8	21.6	1.8×10^{3}	5.0×10^{4}
Fe-60		40	1080	0.2	5.41	7.4×10^{-4}	2.0×10^{-2}
Fm-255	Fermium(100) [b]	40	1080	0.8	21.6		
Fm-257		10	270	8×10^{-3}	2.16×10^{-1}		
Ga-67	Gallium(31)	6	162	6	162	2.2×10^{4}	6.0×10^{5}
Ga-68		0.3	8.11	0.3	8.11	1.5×10^{6}	4.1×10^{7}
Ga-72		0.4	10.8	0.4	10.8	1.1×10^{5}	3.1×10^{6}
Gd-146	Gadolinium(64)	0.4	10.8	0.4	10.8	6.9×10^{2}	1.9×10^{4}
Gd-148		3	81.1	3×10^{24}	8.11×10^{-3}	1.2	3.2×10^{1}
Gd-153		10	270	5	135	1.3×10^{2}	3.5×10^{3}
Gd-159		4	108	0.5	13.5	3.9×10^{4}	1.1×10^{6}
Ge-68	Germanium(32)	0.3	8.11	0.3	8.11	2.6×10^{2}	7.1×10^{3}
Ge-71		40	1080	40	1080	5.8×10^{3}	1.6×10^{5}
Ge-77		0.3	8.11	0.3	8.11	1.3×10^{5}	3.6×10^{6}
H-3	Hydrogen(1)		See T-Tritium				
Hf-172	Hafnium(72)	0.5	13.5	0.3	8.11	4.1×10^{1}	1.1×10^{3}
Hf-175		3	81.1	3	81.1	3.9×10^{2}	1.1×10^{4}
Hf-181		2	54.1	0.9	24.3	6.3×10^{2}	1.7×10^{4}
Hf-182		4	108	3×10^{-2}	0.811	8.1×10^{-6}	2.2×10^{-4}
Hg-194	Mercury(80)	1	27.0	1	27.0	1.3×10^{-1}	3.5
Hg-195m		5	135	5	135	1.5×10^{4}	4.0×10^{5}
Hg-197m		10	270	0.9	24.3	2.5×10^{4}	6.7×10^{5}
Hg-197		10	270	10	270	9.2×10^{3}	2.5×10^{5}
Hg-203		4	108	0.9	24.3	5.1×10^{2}	1.4×10^{4}
Ho-163	Holmium(67)	40	1080	40	1080	2.7	7.6×10^{1}
Ho-166m		0.6	16.2	0.3	8.11	6.6×10^{-2}	1.8

Ho−166		0.3	8.11	0.3	8.11	2.6×10^{4}	7.0×10^{5}
I−123	Iodine(53)	6	162	6	162	7.1×10^{4}	1.9×10^{6}
I−124		0.9	24.3	0.9	24.3	9.3×10^{3}	2.5×10^{5}
I−125		20	541	2	54.1	6.4×10^{2}	1.7×10^{4}
I−126		2	54.1	0.9	24.3	2.9×10^{3}	8.0×10^{4}
I−129		Unlimited	Unlimited	Unlimited	Unlimited	6.5×10^{-6}	1.8×10^{-4}
I−131		3	81.1	0.5	13.5	4.6×10^{3}	1.2×10^{5}
I−132		0.4	10.8	0.4	10.8	3.8×10^{5}	1.0×10^{7}
I−133		0.6	16.2	0.5	13.5	4.2×10^{4}	1.1×10^{6}
I−134		0.3	8.11	0.3	8.11	9.9×10^{5}	2.7×10^{7}
I−135		0.6	16.2	0.5	13.5	1.3×10^{5}	3.5×10^{6}
In−111	Indium(49)	2	54.1	2	54.1	1.5×10^{4}	4.2×10^{5}
In−113m		4	108	4	108	6.2×10^{5}	1.7×10^{7}
In−114m		0.3	8.11	0.3	8.11	8.6×10^{2}	2.3×10^{4}
In−115m		6	162	0.9	24.3	2.2×10^{5}	6.1×10^{6}
Ir−189	Iridium(77)	10	270	10	270	1.9×10^{3}	5.2×10^{4}
Ir−190		0.7	18.9	0.7	18.9	2.3×10^{3}	6.2×10^{4}
Ir−192		1	27.0	0.5	13.5	3.4×10^{2}	9.2×10^{3}
Ir−193m		10	270	10	270	2.4×10^{3}	6.4×10^{4}
Ir−194		0.2	5.41	0.2	5.41	3.1×10^{4}	8.4×10^{5}
K−40	Potassium(19)	0.6	16.2	0.6	16.2	2.4×10^{-7}	6.4×10^{-6}
K−42		0.2	5.41	0.2	5.41	2.2×10^{5}	6.0×10^{6}
K−43		1.0	27.0	0.5	13.5	1.2×10^{5}	3.3×10^{6}
Kr−81	Krypton(36)	40	1080	40	1080	7.8×10^{-4}	2.1×10^{22}
Kr−85m		6	162	6	162	3.0×10^{5}	8.2×10^{6}
Kr−85		20	541	10	270	1.5×10^{1}	3.9×10^{2}
Kr−87		0.2	5.41	0.2	5.41	1.0×10^{6}	2.8×10^{7}
La−137	Lanthanum(57)	40	1080	2	54.1	1.6×10^{-3}	4.4×10^{-2}
La−140		0.4	10.8	0.4	10.8	2.1×10^{4}	5.6×10^{5}
Lu−172	Lutetium(71)	0.5	13.5	0.5	13.5	4.2×10^{3}	1.1×10^{5}
Lu−173		8	216	8	216	5.6×10^{1}	1.5×10^{3}
Lu−174m		20	541	8	216	2.0×10^{2}	5.3×10^{3}
Lu−174		8	216	4	108	2.3×10^{1}	6.2×10^{2}
Lu−177		30	811	0.9	24.3	4.1×10^{3}	1.1×10^{5}
MFP	For mixed fission products, use formula for mixtures or Table A−2						
Mg−28	Magnesium(12)	0.2	5.41	0.2	5.41	2.0×10^{5}	5.4×10^{6}
Mn−52	Manganese(25)	0.3	8.11	0.3	8.11	1.6×10^{4}	4.4×10^{5}
Mn−53		Unlimited	Unlimited	Unlimited	Unlimited	6.8×10^{-5}	1.8×10^{-3}
Mn−54		1	27.0	1	27.0	2.9×10^{2}	7.7×10^{3}
Mn−56		0.2	5.41	0.2	5.41	8.0×10^{5}	2.2×10^{7}
Mo−93	Molybdenum(42)	40	1080	7	189	4.1×10^{-2}	1.1
Mo−99		0.6	16.2	0.5	13.5 [c]	1.8×10^{4}	4.8×10^{5}
N−13	Nitrogen(7)	0.6	16.2	0.5	13.5	5.4×10^{7}	1.5×10^{9}
Na−22	Sodium(11)	0.5	13.5	0.5	13.5	2.3×10^{2}	6.3×10^{3}
Na−24		0.2	5.41	0.2	5.41	3.2×10^{5}	8.7×10^{6}
Nb−92m	Niobium(41)	0.7	18.9	0.7	18.9	5.2×10^{3}	1.4×10^{5}
Nb−93m		40	1080	6	162	8.8	2.4×10^{2}
Nb−94		0.6	16.2	0.6	16.2	6.9×10^{-3}	1.9×10^{-1}
Nb−95		1	27.0	1	27.0	1.5×10^{3}	3.9×10^{4}
Nb−97		0.6	16.2	0.5	13.5	9.9×10^{5}	2.7×10^{7}
Nd−147	Neodymium(60)	4	108	0.5	13.5	3.0×10^{3}	8.1×10^{4}
Nd−149		0.6	16.2	0.5	13.5	4.5×10^{5}	1.2×10^{7}
Ni−59	Nickel(28)	40	1080	40	1080	3.0×10^{-3}	8.0×10^{-2}
Ni−63		40	1080	30	811	2.1	5.7×10^{1}
Ni−65		0.3	8.11	0.3	8.11	7.1×10^{5}	1.9×10^{7}
Np−235	Neptunium(93)	40	1080	40	1080	5.2×10^{1}	1.4×10^{3}
Np−236		7	189	1×10^{-3}	2.70×10^{-2}	4.710−4^{-4}	1.3×10^{-2}
Np−237		2	54.1	2×10^{-4}	5.41×10^{-3}	2.6×10^{-5}	7.1×10^{-4}
Np−239		6	162	0.5	13.5	8.6×10^{3}	2.3×10^{5}
Os−185	Osmium(76)	1	27.0	1	27.0	2.8×10^{2}	7.5×10^{3}
Os−191m		40	1080	40	1080	4.6×10^{4}	1.3×10^{6}
Os−191		10	270	0.9	24.3	1.6×10^{3}	4.4×10^{4}
Os−193		0.6	16.2	0.5	13.5	2.0×10^{4}	5.3×10^{5}
Os−194		0.2	5.41	0.2	5.41	1.1×10^{1}	3.1×10^{2}

P–32	Phosphorus(15)	0.3	8.11	0.3	8.11	1.1×10^{4}	2.9×10^{5}
P–33		40	1080	0.9	24.3	5.8×10^{3}	1.6×10^{5}
Pa–230	Protactinium(91)	2	54.1	0.1	2.70	1.2×10^{3}	3.3×10^{4}
Pa–231		0.6	16.2	6×10^{-5}	1.62×10^{-3}	1.7×10^{-3}	4.7×10^{-2}
Pa–233		5	135	0.9	24.3	7.7×10^{2}	2.1×10^{4}
Pb–201	Lead(82)	1	27.0	1	27.0	6.2×10^{4}	1.7×10^{6}
Pb–202		40	1080	2	54.1	1.2×10^{-4}	3.4×10^{-3}
Pb–203		3	81.1	3	81.1	1.1×10^{4}	3.0×10^{5}
Pb–205		Unlimited	Unlimited	Unlimited	Unlimited	4.5×10^{-6}	1.2×10^{-4}
Pb–210		0.6	16.2	9×10^{-3}	0.243	2.8	7.6×10^{1}
Pb–212		0.3	8.11	0.3	8.11	5.1×10^{4}	1.4×10^{6}
Pd–103	Palladium(46)	40	1080	40	1080	2.8×10^{3}	7.5×10^{4}
Pd–107		Unlimited	Unlimited	Unlimited	Unlimited	1.9×10^{-5}	5.1×10^{-4}
Pd–109		0.6	16.2	0.5	13.5	7.9×10^{4}	2.1×10^{6}
Pm–143	Promethium(61)	3	81.1	3	81.1	1.3×10^{2}	3.4×10^{3}
Pm–144		0.6	16.2	0.6	16.2	9.2×10^{1}	2.5×10^{3}
Pm–145		30	811	7	189	5.2	1.4×10^{2}
Pm–147		40	1080	0.9	24.3	3.4×10^{1}	9.3×10^{2}
Pm–148m		0.5	13.5	0.5	13.5	7.9×10^{2}	2.1×10^{4}
Pm–149		0.6	16.2	0.5	13.5	1.5×10^{4}	4.0×10^{5}
Pm–151		3	81.1	0.5	13.5	2.7×10^{4}	7.3×10^{5}
Po–208	Polonium(84)	40	1080	2×10^{-2}	0.541	2.2×10^{1}	5.9×10^{2}
Po–209		40	1080	2×10^{-2}	0.541	6.2×10^{-1}	1.7×10^{1}
Po–210		40	1080	2×10^{-2}	0.541	1.7×10^{2}	4.5×10^{3}
Pr–142	Praseodymium(59)	0.2	5.41	0.2	5.41	4.3×10^{4}	1.2×10^{6}
Pr–143		4	108	0.5	13.5	2.5×10^{3}	6.7×10^{4}
Pt–188	Platinum(78)	0.6	16.2	0.6	16.2	2.5×10^{3}	6.8×10^{4}
Pt–191		3	81.1	3	81.1	8.7×10^{3}	2.4×10^{5}
Pt–193m		40	1080	9	243	5.8×10^{3}	1.6×10^{5}
Pt–193		40	1080	40	1080	1.4	3.7×10^{1}
Pt–195m		10	270	2	54.1	6.2×10^{3}	1.7×10^{5}
Pt–197m		10	270	0.9	24.3	3.7×10^{5}	1.0×10^{7}
Pt–197		20	541	0.5	13.5	3.2×10^{4}	8.7×10^{5}
Pu–236	Plutonium(94)	7	189	7×10^{-4}	1.89×10^{-2}	2.0×10^{1}	5.3×10^{2}
Pu–237		20	541	20	541	4.5×10^{2}	1.2×10^{4}
Pu–238		2	54.1	2×10^{-4}	5.41×10^{-3}	6.3×10^{-1}	1.7×10^{1}
Pu–239		2	54.1	2×10^{-4}	5.41×10^{-3}	2.3×10^{-3}	6.2×10^{-2}
Pu–240		2	54.1	2×10^{-4}	5.41×10^{-3}	8.4×10^{-3}	2.3×10^{-1}
Pu–241		40	1080	1×10^{-2}	0.270	3.8	1.0×10^{2}
Pu–242		2	54.1	2×10^{-4}	5.41×10^{-3}	1.5×10^{-4}	3.9×10^{-3}
Pu–244		0.3	8.11	2×10^{-4}	5.41×10^{-3}	6.7×10^{-7}	1.8×10^{-5}
Ra–223	Radium(88)	0.6	16.2	3×10^{-2}	0.811	1.9×10^{3}	5.1×10^{4}
Ra–224		0.3	8.11	6×10^{-2}	1.62	5.9×10^{3}	1.6×10^{5}
Ra–225		0.6	16.2	2×10^{-2}	0.541	1.5×10^{3}	3.9×10^{4}
Ra–226		0.3	8.11	2×10^{-2}	0.541	3.7×10^{-2}	1.0
Ra–228		0.6	16.2	4×10^{b}	1.08	1.0×10^{1}	2.7×10^{2}
Rb–81	Rubidium(37)	2	54.1	0.9	24.3	3.1×10^{5}	8.4×10^{6}
Rb–83		2	54.1	2	54.1	6.8×10^{2}	1.8×10^{4}
Rb–84		1	27.0	0.9	24.3	1.8×10^{3}	4.7×10^{4}
Rb–86		0.3	8.11	0.3	8.11	3.0×10^{3}	8.1×10^{4}
Rb–87		Unlimited	Unlimited	Unlimited	Unlimited	3.2×10^{-9}	8.6×10^{-8}
Rb (natural)		Unlimited	Unlimited	Unlimited	Unlimited	6.7×10^{6}	1.8×10^{8}
Re–183	Rhenium(75)	5	135	5	135	3.8×10^{2}	1.0×10^{4}
Re–184m		3	81.1	3	81.1	1.6×10^{2}	4.3×10^{3}
Re–184		1	27.0	1	27.0	6.9×10^{2}	1.9×10^{4}
Re–186		4	108	0.5	13.5	6.9×10^{3}	1.9×10^{5}
Re–187		Unlimited	Unlimited	Unlimited	Unlimited	1.4×10^{-9}	3.8×10^{-8}
Re–188		0.2	5.41	0.2	5.41	3.6×10^{4}	9.8×10^{5}
Re–189		4	108	0.5	13.5	2.5×10^{4}	6.8×10^{5}
Re (natural)		Unlimited	Unlimited	Unlimited	Unlimited	2.4×10^{-8}	
Rh–99	Rhodium(45)	2	54.1	2	54.1	3.0×10^{3}	8.2×10^{4}
Rh–101		4	108	4	108	4.1×10^{1}	1.1×10^{3}
Rh–102m		2	54.1	0.9	24.3	2.3×10^{2}	6.2×10^{3}
Rh–102		0.5	13.5	0.5	13.5	4.5×10^{1}	1.2×10^{3}

Rh−103m		40	1080	40	1080	1.2×10^{6}	3.3×10^{7}
Rh−105		10	270	0.9	24.3	3.1×10^{4}	8.4×10^{5}
Rn−222	Radon(86)	0.2	5.41	4×10^{-3}	0.108	5.7×10^{3}	1.5×10^{5}
Ru−97	Ruthenium(44)	4	108	4	108	1.7×10^{4}	4.6×10^{5}
Ru−103		2	54.1	0.9	24.3	1.2×10^{3}	3.2×10^{4}
Ru−105		0.6	16.2	0.5	13.5	2.5×10^{5}	6.7×10^{6}
Ru−106		0.2	5.41	0.2	5.41	1.2×10^{2}	3.3×10^{3}
S−35	Sulfur(16)	40	1080	2	54.1	1.6×10^{3}	4.3×10^{4}
Sb−122	Antimony(51)	0.3	8.11	0.3	8.11	1.5×10^{4}	4.0×10^{5}
Sb−124		0.6	16.2	0.5	13.5	6.5×10^{2}	1.7×10^{4}
Sb−125		2	54.1	0.9	24.3	3.9×10^{1}	1.0×10^{3}
Sb−126		0.4	10.8	0.4	10.8	3.1×10^{3}	8.4×10^{4}
Sc−44	Scandium(21)	0.5	13.5	0.5	13.5	6.7×10^{5}	1.8×10^{7}
Sc−46		0.5	13.5	0.5	13.5	1.3×10^{3}	3.4×10^{4}
Sc−47		9	243	0.9	24.3	3.1×10^{4}	8.3×10^{5}
Sc−48		0.3	8.11	0.3	8.11	5.5×10^{4}	1.5×10^{6}
Se−75	Selenium(34)	3	81.1	3	81.1	5.4×10^{2}	1.5×10^{4}
Se−79		40	1080	2	54.1	2.6×10^{-3}	7.0×10^{-2}
Si−31	Silicon(14)	0.6	16.2	0.5	13.5	1.4×10^{6}	3.9×10^{7}
Si−32		40	1080	0.2	5.41	3.9	1.1×10^{2}
Sm−145	Samarium(62)	20	541	20	541	9.8×10^{1}	2.6×10^{3}
Sm−147		Unlimited	Unlimited	Unlimited	Unlimited	8.5×10^{-1}	2.3×10^{-8}
Sm−151		40	1080	4	108	9.7×10^{-1}	2.6×10^{1}
Sm−153		4	108	0.5	13.5	1.6×10^{4}	4.4×10^{5}
Sn−113	Tin(50)	4	108	4	108	3.7×10^{2}	1.0×10^{4}
Sn−117m		6	162	2	54.1	3.0×10^{3}	8.2×10^{4}
Sn−119m		40	1080	40	1080	1.4×10^{2}	3.7×10^{3}
Sn−121m		40	1080	0.9	24.3	2.0	5.4×10^{1}
Sn−123		0.6	16.2	0.5	13.5	3.0×10^{2}	8.2×10^{3}
Sn−125		0.2	5.41	0.2	5.41	4.0×10^{3}	1.1×10^{5}
Sn−126		0.3	8.11	0.3	8.11	1.0×10^{-3}	2.8×10^{-2}
Sr−82	Strontium(38)	0.2	5.41	0.2	5.41	2.3×10^{3}	6.2×10^{4}
Sr−85m		5	135	5	135	1.2×10^{6}	3.3×10^{7}
Sr−85		2	54.1	2	54.1	8.8×10^{2}	2.4×10^{4}
Sr−87m		3	81.1	3	81.1	4.8×10^{5}	1.3×10^{7}
Sr−89		0.6	16.2	0.5	13.5	1.1×10^{3}	2.9×10^{4}
Sr−90		0.2	5.41	0.1	2.70	5.1	1.4×10^{2}
Sr−91		0.3	8.11	0.3	8.11	1.3×10^{5}	3.6×10^{6}
Sr−92		0.8	21.6	0.5	13.5	4.7×10^{5}	1.3×10^{7}
T	Tritium(1)	40	1080	40	1080	3.6×10^{2}	9.7×10^{3}
Ta−178	Tantalum(73)	1	27.0	1	27.0	4.2×10^{6}	1.1×10^{8}
Ta−179		30	811	30	811	4.1×10^{1}	1.1×10^{3}
Ta−182		0.8	21.6	0.5	13.5	2.3×10^{2}	6.2×10^{3}
Tb−157	Terbium(65)	40	1080	10	270	5.6×10^{-1}	1.5×10^{1}
Tb−158		1	27.0	0.7	18.9	5.6×10^{-1}	1.5×10^{1}
Tb−160		0.9	24.3	0.5	13.5	4.2×10^{2}	1.1×10^{4}
Tc−95m	Technetium(43)	2	54.1	2	54.1	8.3×10^{2}	2.2×10^{4}
Tc−96m		0.4	10.8	0.4	10.8	1.4×10^{6}	3.8×10^{7}
Tc−96	.	0.4	10.8	0.4	10.8	1.2×10^{4}	3.2×10^{5}
Tc−97m		40	1080	40	1080	5.6×10^{2}	1.5×10^{4}
Tc−97	.	Unlimited	Unlimited	Unlimited	Unlimited	5.2×10^{-5}	1.4×10^{-3}
Tc−98	.	0.7	18.9	0.7	18.9	3.2×10^{-5}	8.7×10^{-4}
Tc−99m		8	216	8	216	1.9×10^{5}	5.3×10^{6}
Tc−99		40	1080	0.9	24.3	6.3×10^{-4}	1.7×10^{-2}
Te−118	Tellurium(52)	0.2	5.41	0.2	5.41	6.8×10^{3}	1.8×10^{5}
Te−121m		5	135	5	135	2.6×10^{2}	7.0×10^{3}
Te−121		2	54.1	2	54.1	2.4×10^{3}	6.4×10^{4}
Te−123m		7	189	7	189	3.3×10^{2}	8.9×10^{3}
Te−125m		30	811	9	243	6.7×10^{2}	1.8×10^{4}
Te−127m		20	541	0.5	13.5	3.5×10^{2}	9.4×10^{3}
Te−127		20	541	0.5	13.5	9.8×10^{4}	2.6×10^{6}
Te−129m		0.6	16.2	0.5	13.5	1.1×10^{3}	3.0×10^{4}
Te−129		0.6	16.2	0.5	13.5	7.7×10^{5}	2.1×10^{7}
Te−131m		0.7	18.9	0.5	13.5	3.0×10^{4}	8.0×10^{5}

Te−132		0.4	10.8	0.4	10.8	1.1×10^{4}	3.0×10^{5}
Th−227	Thorium(90)	9	243	1×10^{-2}	0.270	1.1×10^{3}	3.1×10^{4}
Th−228		0.3	8.11	4×10^{-4}	1.08×10^{-2}	3.0×10^{1}	8.2×10^{2}
Th−229		0.3	8.11	3×10^{-5}	8.11×10^{-4}	7.9×10^{-3}	2.1×10^{-1}
Th−230		2	54.1	2×10^{-4}	5.41×10^{-3}	7.6×10^{-4}	2.1×10^{-2}
Th−231		40	1080	0.9	24.3	2.0×10^{4}	5.3×10^{5}
Th−232		Unlimited	Unlimited	Unlimited	Unlimited	4.0×10^{-9}	1.1×10^{-7}
Th−234		0.2	5.41	0.2	5.41	8.6×10^{2}	2.3×10^{4}
Th (natural)		Unlimited	Unlimited	Unlimited	Unlimited	8.1×10^{-9}	2.2×10^{-7}
Ti−44	Titanium(22)	0.5	13.5	0.2	5.41	6.4	1.7×10^{2}
Tl−200	Thallium(81.1)	0.8	21.6	0.8	21.6	2.2×10^{4}	6.0×10^{5}
Tl−201		10	270	10	270	7.9×10^{3}	2.1×10^{5}
Tl−202		2	54.1	2	54.1	2.0×10^{3}	5.3×10^{4}
Tl−204		4	108	0.5	13.5	1.7×10^{1}	4.6×10^{2}
Tm−167	Thulium(69)	7	189	7	189	3.1×10^{3}	8.5×10^{4}
Tm−168		0.8	21.6	0.8	21.6	3.1×10^{2}	8.3×10^{3}
Tm−170		4	108	0.5	13.5	2.2×10^{2}	6.0×10^{3}
Tm−171		40	1080	10	270	4.0×10^{1}	1.1×10^{3}
U−230	Uranium(92)	40	1080	1×10^{-2}	0.270	1.0×10^{3}	2.7×10^{4}
U−232	.	3	81.1	3×10^{-4}	8.11×10^{-3}	8.3×10^{-1}	2.2×10^{1}
U−233	.	10	270	1×10^{-3}	2.70×10^{-2}	3.6×10^{-4}	9.7×10^{-3}
U−234	.	10	270	1×10^{-3}	2.70×10^{-2}	2.3×10^{-4}	6.2×10^{-3}
U−235	.	Unlimited	Unlimited	Unlimited	Unlimited	8.0×10^{-8}	2.2×10^{-6}
U−236	.	10	270	1×10^{-3}	2.70×10^{-2}	2.4×10^{-6}	6.5×10^{-5}
U−238	.	Unlimited	Unlimited	Unlimited	Unlimited	1.2×10^{-8}	3.4×10^{-7}
U (natural)		Unlimited	Unlimited	Unlimited	Unlimited	2.6×10^{-8}	7.1×10^{-7}
U (enriched 5% or less)		Unlimited	Unlimited	Unlimited	Unlimited	(See Table A−3)	
U (enriched more than 5%)		10	270	1×10^{-3}	2.70×10^{-2}	(See Table A−3)	
U (depleted)		Unlimited	Unlimited	Unlimited	Unlimited	(See Table A−3)	
V−48	Vanadium(23)	0.3	8.11	0.3	8.11	6.3×10^{3}	1.7×10^{5}
V−49		40	1080	40	1080	3.0×10^{2}	8.1×10^{3}
W−178	Tungsten(74)	1	27.0	1	27.0	1.3×10^{3}	3.4×10^{4}
W−181	.	30	811	30	811	2.2×10^{2}	6.0×10^{3}
W−185	.	40	1080	0.9	24.3	3.5×10^{2}	9.4×10^{3}
W−187	.	2	54.1	0.5	13.5	2.6×10^{4}	7.0×10^{5}
W−188	.	0.2	5.41	0.2	5.41	3.7×10^{2}	1.0×10^{4}
Xe−122	Xenon(54)	0.2	5.41	0.2	5.41	4.8×10^{4}	1.3×10^{6}
Xe−123		0.2	5.41	0.2	5.41	4.4×10^{5}	1.2×10^{7}
Xe−127		4	108	4	108	1.0×10^{3}	2.8×10^{4}
Xe−131m		40	1080	40	1080	3.1×10^{3}	8.4×10^{4}
Xe−133		20	541	20	541	6.9×10^{3}	1.9×10^{5}
Xe−135		4	108	4	108	9.5×10^{4}	2.6×10^{6}
Y−87	Yttrium(39)	2	54.1	2	54.1	1.7×10^{4}	4.5×10^{5}
Y−88		0.4	10.8	0.4	10.8	5.2×10^{2}	1.4×10^{4}
Y−90		0.2	5.41	0.2	5.41	2.0×10^{4}	5.4×10^{5}
Y−91m	.	2	54.1	2	54.1	1.5×10^{6}	4.2×10^{7}
Y−91		0.3	8.11	0.3	8.11	9.1×10^{2}	2.5×10^{4}
Y−92		0.2	5.41	0.2	5.41	3.6×10^{5}	9.6×10^{6}
Y−93		0.2	5.41	0.2	5.41	1.2×10^{5}	3.3×10^{6}
Yb−169	Ytterbium(70)	3	81.1	3	81.1	8.9×10^{2}	2.4×10^{4}
Yb−175		30	811	0.9	24.3	6.6×10^{3}	1.8×10^{5}
Zn−65	Zinc(30)	2	54.1	2	54.1	3.0×10^{2}	8.2×10^{3}
Zn−69m		2	54.1	0.5	13.5	1.2×10^{5}	3.3×10^{6}
Zn−69		4	108	0.5	13.5	1.8×10^{6}	4.9×10^{7}
Zr−88	Zirconium(40)	3	81.1	3	81.1	6.6×10^{2}	1.8×10^{4}
Zr−93		40	1080	0.2	5.41	9.3×10^{-5}	2.5×10^{-3}
Zr−95		1	27.0	0.9	24.3	7.9×10^{2}	2.1×10^{4}
Zr−97		0.3	8.11	0.3	8.11	7.1×10^{4}	1.9×10^{6}

a International shipments of einsteinium require multilateral approval of A_1 and A_2 values.

b International shipments of fermium require multilateral approval of A_1 and A_2 values.

c 20 Ci for Mo−99 for domestic use.

Table A−2: General Values for A_1 and A_2

Contents	A_1 (TBq)		A_2 (TBq)	
Only beta– or gamma–emitting nuclides are known to be present.	0.2	5	0.02	0.5
Alpha–emitting nuclides are known to be present, or no relevant data are available	0.10	2.70	2×10^{-5}	5.41×10^{-4}

Table A–3: Activity–mass Relationships for Uranium

	Specific Activity	
Uranium Enrichment[1] wt % U–235 present		
	TBq/g	Ci/g
0.45	1.8×10^{-8}	5.0×10^{-7}
0.72	2.6×10^{-8}	7.1×10^{-7}
1.0	2.8×10^{-8}	7.6×10^{-7}
1.5	3.7×10^{-8}	1.0×10^{-6}
5.0	1.0×10^{-8}	2.7×10^{-6}
10.0	1.8×10^{-8}	4.8×10^{-6}
20.0	3.7×10^{-8}	1.0×10^{-5}
35.0	7.4×10^{-8}	2.0×10^{-5}
50.0	9.3×10^{-8}	2.5×10^{-5}
90.0	2.2×10^{-6}	5.8×10^{-5}
93.0	2.6×10^{-6}	7.0×10^{-5}
95.0	3.4×10^{-6}	9.1×10^{-5}

1 The figures for uranium include representative values for the activity of the uranium–234 that is concentrated during the enrichment process.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Amendments

Rule 1200–2–4–.04 Definitions is amended by deleting the rule and substituting the following, so that as amended the rule shall read:

1200–2–4–.04 Definitions.

(1) As used in these regulations, these terms have the definitions set forth below. (For additional definitions used only in Chapters 1200–2–5, 1200–2–6, 1200–2–8 and 1200–2–9, see Rules 1200–2–5–.03, 1200–2–6–.03, 1200–2–8–.03 and 1200–2–9–.03.) [4-.04(1)]

(a) 'A_1' means the maximum activity of special form radioactive material permitted in a Type A package. 'A_2' means the maximum activity of radioactive material, other than special form, LSA and SCO material, permitted in a Type A package. The values either are listed in Table A–1 of Appendix A to 10 CFR 71, as amended April 1, 1996, or may be derived in accordance with the procedures prescribed in Schedule 10–6, Rule 1200–2–10–.37.

(b) 'Accelerator–produced material' means any material made radioactive by an accelerator. [4-.04(1)(fff)]

(c) 'Agreement State' means any state with which the U.S. Nuclear Regulatory Commission has entered into an effective agreement under Section 274 b. of the Atomic Energy Act of 1954, as amended (73 Statute 689). [4-.04(1)(b)]

(d) 'Alert' means a classification for events which are in progress, may occur or have occurred that could lead to a release of radioactive material(s) but that the release is not expected to require a response by an offsite response organization to protect persons offsite. [4-.04(1)(hhh)]

(e) 'Authorized nuclear pharmacist' means a pharmacist who is:

1. Board certified as a nuclear pharmacist by the Board of Pharmaceutical Specialties; or

2. Identified as an authorized nuclear pharmacist on a license issued by the Division, the U.S. Nuclear Regulatory Commission (U.S. NRC), or another Agreement State, that authorizes the use of radioactive material in the practice of nuclear pharmacy.

(f) 'Authorized user' means a physician, dentist or podiatrist who is:

1. Board certified by at least one of the boards listed in subparagraph 1200–2–10–.33(1)(e), 1200–2–10–.33(4)(d), or 1200–2–10–.33(5)(a); or

2. Identified as an authorized user on a license issued by the Division, the U.S. Nuclear Regulatory Commission (U.S. NRC), or another Agreement State, that authorizes the medical use of radioactive material.

(g) 'Barrier' means attenuating materials used to reduce radiation exposure.

1. Primary. Barrier sufficient to attenuate the useful beam to the required degree at a distance no greater than 8 centimeters beyond the barrier. 4-.04(1)(e)1]

2. Secondary. Barrier sufficient to attenuate scattered and leakage radiation to the required degree at a distance no greater than 8 centimeters beyond the barrier. * [4-.04(1)(e)2]

(h) '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. [4-.04(1)(ccc)]

(i) '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.

(j) '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

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* *It is reasonable to assume that individuals will not occupy the area within 8 centimeters of the barrier continuously.*

3. For transport by aircraft: any aircraft.

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

(l) 'Curie.' Defined in 1200–2–5–.34. [4-.04(1)(h)]

(m) 'Decommission' means to remove a facility or site safely from service and reduce residual radioactivity to a level that permits:

1. Release of the property for unrestricted use and termination of the license; or

2. Release of the property under restricted conditions and the termination of the license.

(n) 'Disposal facility' means a land disposal site that is used for the isolation of radioactive waste from the biosphere. [o5-.17(3)(a)1]

(o) '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.

(p) Reserved.

(q) 'Dose.' Defined in 1200–2–5–.32(22). [4-.04(1)(j)]

(r) 'Emergency procedures' means the written pre–planned steps to be taken in the event of actual or suspected exposure of individuals to excessive radiation. This procedure should include the names and telephone numbers of individuals to be contacted as well as directives for processing the film badge or other personnel–monitoring device. [4-.04(1)(l)]

(s) 'Exclusive use' (or 'sole use' or 'full load') means sole use by a single consignor of a conveyance 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 shall ensure that personnel having radiological training and resources appropriate for safe handling of the consignment perform any loading or unloading. The consignor shall issue specific written instructions for maintenance of exclusive use shipment controls and include them with the shipping paper information provided to the carrier by the consignor.

(t) 'Exposure' [1] means a measure of the ionization produced in air by X or gamma radiation. It is the sum of the electrical charges on all of the ions of one sign produced in air, when all electrons liberated by photons in a volume element of air are completely stopped in air, divided by the mass of the air in the volume element. The special unit of exposure is the roentgen. [4-.04(1)(m)]

(u) 'Fissile material' means plutonium–238, plutonium–239, plutonium–241, uranium–233, uranium–235 or any combination of these radionuclides. Fissile material does not apply to unirradiated natural uranium and depleted uranium, and natural uranium or depleted uranium that has been irradiated in a thermal reactor.

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[1] *1 When not underlined as above the term "exposure" has a more general meaning in these regulations. [4-.04(1)(m)]*

(v) 'Fissile material package.' See 'Package'

(w) 'Former U.S. Atomic Energy Commission (AEC) or U.S. Nuclear Regulatory Commission (NRC) licensed facilities' means nuclear reactors, nuclear fuel processing plants, uranium enrichment plants, or critical mass experimental facilities where AEC or NRC licenses have been terminated. [4-.04(1)(yy)]

(x) 'Generator' means a person whose activities with radioactive material are such that waste is generated that is distinctly separate and/or distinct from materials received. [o5-.17(3)(a)2]

(y) 'Human use' (or medical use) means the intentional internal or external administration of radiation or radioactive materials to individuals under the supervision of an authorized user. [4-.04(1)(o)]

(z) 'Interlock' means a device for precluding access to any area of radiation hazard by automatically eliminating the hazard upon entry by personnel or parts of their body. [4-.04(1)(r)]

(aa) 'Licensing State' means any state with regulations equivalent to the Suggested State Regulations for Control of Radiation relating to, and an effective program for, the regulatory control of NARM. [4-.04(1)(ddd)]

(bb) 'Low specific activity (LSA) material' means radioactive material with limited specific activity that satisfies the following descriptions and limits. Shielding materials surrounding the LSA material may not be considered in determining the estimated average specific activity of the package contents.

1. LSA−I

   (i) Ores containing only naturally occurring radionuclides (e.g., uranium, thorium) and uranium or thorium concentrates of these ores; or

   (ii) Solid unirradiated natural uranium or depleted uranium or natural thorium or their solid or liquid compounds or mixtures; or

   (iii) Radioactive material, other than fissile material, for which the A_2 value is unlimited; or

   (iv) Mill tailings, contaminated earth, concrete, rubble, other debris and activated material in which the radioactive material is essentially uniformly distributed and the average specific activity does not exceed 1 (E−6) A_2/gram.

2. LSA−II

   (i) Water with tritium concentration up to 20 Ci/liter (0.8 terrabequerel/liter); or

   (ii) Material in which the radioactive material is distributed throughout and the average specific activity does not exceed 1 (E−4) A_2/gram for solids and gases or 1 (E−5) A_2/gram for liquids.

3. LSA−III. Solids (e.g., consolidated wastes, activated materials) 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.); and

(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 seven (7) days, would not exceed 0.1 A_2; and

(iii) The average specific activity of the solid does not exceed 2 (E−3) A_2/gram.

(cc) '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 ten (10) days.

(dd) 'Major processors' means persons processing or handling radioactive materials exceeding Type X quantities* as unsealed sources or material. [4-.04(1)(zz)]

(ee) 'Maximum normal operating pressure' means the maximum gauge pressure that would develop in the containment system in a period of one (1) year under the heat condition specified in 10 CFR 71.71(c)(1), in the absence of venting, external cooling by an ancillary system or operational controls during transport.

(ff) 'NARM' means any naturally occurring or accelerator−produced radioactive material. It does not include byproduct, source or special nuclear material. [4-.04(1)(eee)]

(gg) 'Natural radioactivity' means radioactivity of naturally occurring nuclides. [4-.04(1)(ggg)]

(hh) 'Natural thorium' means thorium with the naturally occurring distribution of thorium isotopes (essentially 100 weight percent thorium−232).

(ii) 'Normal form radioactive material' means radioactive material that has not been demonstrated to qualify as special form radioactive material.

(jj) 'Operating procedures' means detailed written instructions including, but not limited to, the normal operation of equipment and movable shielding, closing of interlock circuits, manipulation of controls, radiation monitoring procedures for personnel and areas, testing of interlocks and record keeping requirements. [4-.04(1)(u)]

(kk) 'Ore refineries' means all non−exempt processors of a radioactive material ore. [4-.04(1)(aaa)]

(ll) 'Package' means the packaging together with its radioactive contents as presented for transport.

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* *Type X quantities are defined in Tables RHS 2−1, RHS 2−2 and RHS 2−3 as contained in Chapter 1200−2−5. For purposes of 1200−2−4−.04(1)(dd), where there is involved a combination of radioactive materials licensed, the method of deriving a Type X quantity is as specified in 1200 −2−5−.16(6)(b).[4-.04(1)(zz)]*

1. 'Fissile material package' means a fissile material packaging together with its fissile material contents.

2. '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 lbf/in^2) gauge or a pressure relief device that would allow the release of radioactive material to the environment under the tests specified in 10 CFR 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 determine their distinction for international transportation, see U.S. DOT regulations in 49 CFR 173. A Type B package approved before September 6, 1983, was designated only as Type B. Limitations on its use are specified in 10 CFR 71.13.

(mm) 'Packaging' means the assembly of components necessary to ensure compliance with the packaging requirements of this chapter. 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. [4-.04(1)(x)]

(nn) 'Physician' means an individual licensed by the State to dispense drugs in the practice of medicine.

(oo) 'Qualified individual.' Defined in 1200–2–6–.03.

[4-.04(1)(y)]

(pp) 'Qualified expert' means, for purposes of 1200–2–7–.04(4) and 1200–2–9–.21(2)(g) and (m), a person:

1. Who is certified by the American Board of Radiology in Therapeutic Radiological Physics, Radiological Physics, Roentgen–Ray and Gamma–Ray Physics or X–Ray and Radium Physics; or [4-.04(1)(xx)1]

2. Who has the following [2] minimum training and experience:

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[2] *Licensees or Certified Registrants that utilize persons who do not meet these criteria for minimum training and experience may request a variance excepting them from the requirements of using Qualified Experts. The request should include:*

1. *The name of the proposed individual,*
2. *A description of his training and experience including information similar to that specified in (pp)2,*
3. *Reports of at least one calibration and spot–check program based on measurements personally made by the proposed individual within the last 10 years, and*
4. *Written endorsement of the technical qualifications of the proposed individual from personal knowledge by a physicist certified by the American Board of Radiology in one of the specialties listed in (pp)1.*

The variance request should be addressed to the Division of Radiological Health, at the address given in Rule 1200–2–4–.07. [4-.04(1)(xx)2]

(i) A Master's or Doctor's degree in physics, biophysics, radiological physics or health physics; [4-.04(1)(xx)2(i)]

(ii) One year of full−time training in therapeutic radiological physics; and [4-.04(1)(xx)2(ii)]

(iii) One year of full−time experience in a therapy facility including personal calibration and spot check of at least one teletherapy unit. [4-.04(1)(xx)2(iii)]

(qq) 'Rad.' Defined in 1200−2−5−.33(1)(b). [4-.04(1)(dd)]

(rr) 'Radiation machine' means any device capable of producing radiation except devices that produce radiation through utilization of a radioactive material. [4-.04(1)(bb)]

(ss) 'Radioactive material' means any material, solid, liquid or gas, which emits radiation spontaneously. [4-.04(1)(cc)]

(tt) 'Radiological safety officer' means the qualified individual directly responsible for the safety of all persons at an installation using sources of radiation from hazards associated with such sources. This individual shall have the authority to stop operations whenever he believes that persons are being endangered. (Some other commonly used titles to identify this individual are Radiation Protection Officer and Radiation Safety Officer.) [4-.04(1)(gg)]

(uu) 'Rem.' Defined in 1200−2−5−.33(1)(c). [4-.04(1)(hh)]

(vv) 'Research and development' means theoretical analysis, exploration or experimentation; or extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes. Research and development includes 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 individuals. [4-.04(1)(ii)]

(ww) '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 Chapter 1200−2−5.

(xx) 'Roentgen' (R) means the special unit of exposure. One roentgen equals 2.58×10^{-4} coulomb per kilogram of air. [4-.04(1)(kk)]

(yy) 'Sealed source' means any radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release or dispersal of the radioactive material under the most severe conditions likely to be encountered in normal use and handling. [4-.04(1)(ll)]

(zz) 'Site area emergency' means a classification for events that are in progress, may occur 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. [4-.04(1)(jjj)]

(aaa) 'Source of radiation' means material that emits radiation spontaneously, or apparatus that produces, or may produce when the associated controls are operated, one or more forms of radiation. [4-.04(1)(nn)]

(bbb) 'Special form radioactive material' means radioactive material that satisfies the following conditions:

1. It either is 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 (0.197 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. NRC requirements in effect on June 30, 1983, and constructed before July 1, 1985, may continue to be used. A special form encapsulation designed in accordance with U.S. NRC requirements in effect on March 31, 1996, and constructed before April 1, 1998, may continue to be used. Any other special form encapsulation shall meet the specifications of this definition applicable at the time of its design or construction.

(ccc) 'Special nuclear material in quantities not sufficient to form a critical mass' means:

1. Uranium enriched in the isotope U−235 in quantities not exceeding 350 grams of contained U−235;

2. Uranium−233 in quantities not exceeding 200 grams;

3. Plutonium in quantities not exceeding 200 grams; or

4. 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 kinds of special nuclear material in combination shall not exceed 1 (i.e., unity). For example, the following quantities in combination would not exceed the limitation and are within the formula, as follows:

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

[4-.04(1)(oo)]

(ddd) 'Specific activity' 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.

(eee) 'Surface contaminated object' (SCO) means a solid object that is not itself classed as radioactive material but that has radioactive material distributed on any of its surfaces. Surface activity shall not exceed the following limits:

1. SCO−I: A solid object on which:

(i) The removable (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 1 (E−4) microcurie (4 becquerels) per square centimeter (cm^2) for beta and gamma and low toxicity alpha emitters or 10 microcuries (0.4 becquerel) per cm^2 for all other alpha emitters;

(ii) 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 1 microcurie (4 E+4 becquerels) per square centimeter (cm^2) for beta and gamma and low toxicity alpha emitters or 0.1 microcurie (4 E+3 becquerels) per cm^2 for all other alpha emitters; and

(iii) The removable 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 1 microcurie (4 E+4 becquerels) per square centimeter (cm^2) beta and gamma and low toxicity alpha emitters or 0.1 microcurie (4 E+3 becquerels) per cm^2 for all other alpha emitters.

2. SCO−II: A solid object on which the limits for SCO−I are exceeded and on which:

(i) The removable 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 1 E−2 microcurie (400 becquerels) per square centimeter (cm^2) for beta and gamma and low toxicity alpha emitters or 1 E−3 microcurie (40 becquerels) per cm^2 for all other alpha emitters;

(ii) 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 20 microcuries (8 E+5 becquerels) per square centimeter (cm^2) for beta and gamma and low toxicity alpha emitters or 2 microcuries (8 E+4 becquerels) per cm^2 for all other alpha emitters; and

(iii) The removable 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 20 microcurie (8 E+5 becquerels) per square centimeter (cm^2) for beta and gamma and low toxicity alpha emitters or 2 microcurie (8 E+4 becquerels) per cm^2 for all other alpha emitters.

(fff) 'Therapeutic−type protective tube housing' means:

1. For x−ray therapy apparatus not capable of operating at 500 kVp or above, the following definition applies. An x−ray tube housing so constructed that the leakage radiation at a distance of 1−meter from the target does not exceed 1 roentgen in an hour when the tube is operated at its maximum rated continuous current for the maximum rated tube potential. [4-.04(1)(qq)1]

2. For x−ray therapy apparatus capable of operating at 500 kVp or above, the following definition applies. An x−ray tube housing so constructed that the leakage radiation at a distance of 1−meter from the target does not exceed 0.1 percent of the useful beam exposure rate at 1−meter from the target, for any of its operating conditions. [4-.04(1)(qq)2]

3. In either case, small areas of reduced protection are acceptable providing the average radiation exposure over any area of 100 square centimeters at 1−meter distance from the target does not exceed the values given above. However, no linear dimension of the area used to obtain the average shall exceed 20 centimeters. [4-.04(1)(qq)3]

4. See 1200−2−6−.05(1)(a)15 for leakage requirements for contact therapy apparatus. [4-.04(1)(qq)4]

(ggg) 'These regulations' means "State Regulations for Protection Against Radiation." [4-.04(1)(rr)]

(hhh) '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 the maximum radiation level in millirem per hour at 1−meter (3.3 feet) from the external surface of the package (equivalent to multiplying the maximum radiation level in millisievert(s) per hour at 1−meter (3.3 feet) by 100). The transport index is determined as follows:

1. For non−fissile material packages, 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)); or

2. For fissile material packages, the number determined by multiplying the maximum radiation level in millisievert 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)), or, for criticality control purposes, the number obtained as described in 10 CFR 71.59, whichever is larger.

(iii) '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 Table A−1, Schedule 10−6, Rule 1200−2−10−.37, or may be determined by procedures described in Schedule 10−6, Rule 1200−2−10−.37.

(jjj) 'Type B quantity' means a quantity of radioactive material greater than a Type A quantity.

(kkk) 'Units of radioactivity.' Defined in 1200−2−5−.34. [4-.04(1)(ss)]

(lll) 'Unrefined and unprocessed ore' means ore in its natural form before any processing, such as grinding, roasting, beneficiating or refining. [4-.04(1)(tt)]

(mmm) 'Uranium − natural, depleted, enriched' means:

1. Natural uranium: uranium with the naturally occurring distribution of uranium isotopes (about 0.711 weight percent uranium−235, and the remainder by weight essentially uranium−238).

2. Depleted uranium: uranium containing less uranium−235 than the naturally occurring distribution of uranium isotopes.

3. Enriched uranium: uranium containing more uranium−235 than the naturally occurring distribution of uranium isotopes.

(nnn) 'Useful beam' (or 'primary beam') means that part of the radiation that passes through a window, aperture, cone or other collimating device. [4-.04(1)(vv)]

(ooo) 'Waste' means those low−level radioactive wastes containing radioactive materials that are acceptable for disposal at a land disposal facility. For the purposes of this definition, low−level waste is radioactive waste not classified as high−level radioactive waste, transuranic waste, spent nuclear fuel or byproduct material as defined in Section 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste). [o5-.17(3)(a)3]

(ppp) 'Waste handler' means a person who holds radioactive wastes for disposal and/or who actually disposes of radioactive wastes for other persons. [4-.04(1)(bbb)]

(qqq) 'Waste processor' means a waste handler who performs a physical and/or chemical activity on a material containing or contaminated with radioactive material. [o5-.17(3)(a)4]

(rrr) 'Worker' means an individual engaging in work under a license or registration issued by the Division and controlled by a licensee or registrant, but does not include the licensee or registrant. [4-.04(1)(ww)]

(2) Definitions of certain other words and phrases used in these regulations are set forth in other parts of these regulations where they specifically apply. [4-.04(2)]

Authority: T.C.A. §§68−28−101 et seq.

Rule 1200−2−5−.32 Definitions is amended by adding new paragraphs (79) and (80) and by deleting paragraphs (9), (45), (50) and (53) and substituting the following, so that as amended the paragraphs shall read:

(9) 'Background radiation' means radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material), and 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 radiation from sources of radiation subject to licensing or registering by the Division.

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

(50) 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 registered, unregistered, licensed or unlicensed sources of radiation, whether in the possession of the licensee, registrant or other person. Occupational dose does not include dose received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with subparagraph 1200−2−10−.14(2)(e), from voluntary participation in medical research programs, or as a member of the general public.

(53) Public dose means the dose received by a member of the public from exposure to radiation and radioactive material released by a licensee, or another source of radiation in a licensee's or registrant's unrestricted areas. It 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 subparagraph 1200–2–10–.14(2)(e), or from voluntary participation in medical research programs.

(79) Misadministration means the administration of:

(a) A radiopharmaceutical dosage greater than 30 microcuries of either sodium iodide I–125 or I–131:

1. Involving the wrong individual, or wrong radiopharmaceutical; or

2. When both:

(i) The administered dosage differs from the prescribed dosage by more than 20 percent (20%) of the prescribed dosage and

(ii) The administered dosage differs from the prescribed dosage by more than 30 microcuries.

(b) A therapeutic radiopharmaceutical dosage, other than sodium iodide I–125 or I–131:

1. Involving the wrong individual, wrong radiopharmaceutical, or wrong route of administration; or

2. When the administered dosage differs from the prescribed dosage by more than 20 percent (20%) of the prescribed dosage.

(c) A gamma stereotactic radiosurgery radiation dose:

1. Involving the wrong individual, or wrong treatment site; or

2. When the calculated total administered dose differs from the total prescribed dose by more than 10 percent (10%) of the total prescribed dose.

(d) A teletherapy radiation dose:

1. Involving the wrong individual, wrong mode of treatment or wrong treatment site;

2. When the treatment consists of three (3) or fewer fractions and the calculated total administered dose differs from the total prescribed dose by more than 10 percent (10%) of the total prescribed dose;

3. When the calculated weekly administered dose exceeds the weekly prescribed dose by 30 percent (30%) or more of the weekly prescribed dose; or

4. When the calculated total administered dose differs from the total prescribed dose by more than 20 percent (20%) of the total prescribed dose.

(e) A brachytherapy radiation dose:

1. Involving the wrong individual, wrong radioisotope, or wrong treatment site (excluding, for permanent implants, seeds that were implanted in the correct site but migrated outside the treatment site);

2. Involving a sealed source that is leaking;

3. When, for a temporary implant, one or more sealed sources are not removed upon completion of the procedure; or

4. When the calculated administered dose differs from the prescribed dose by more than 20 percent (20%) of the prescribed dose.

(f) A diagnostic radiopharmaceutical dosage, other than quantities greater than 30 microcuries of either sodium iodide I–125 or I–131:

1. Involving the wrong individual; or

2. When both:

(i) The exposure involves the wrong radiopharmaceutical or wrong route of administration, or when the administered dosage differs from the prescribed dosage; and

(ii) The dose to the individual exceeds 5 rems effective dose equivalent or 50 rems dose equivalent to any individual organ.

(g) A therapeutic radiation machine dose:

1. Involving the wrong individual, wrong mode of treatment or wrong treatment site,

2. When the treatment consists of three (3) or fewer fractions and the calculated total administered dose differs from the total prescribed dose by more than 10 percent (10%) of the total prescribed dose,

3. When the calculated weekly administered dose exceeds the weekly prescribed dose by 30 percent (30%) or more of the weekly prescribed dose, or

4. When the calculated total administered dose differs from the total prescribed dose by more than 20 percent (20%) of the total prescribed dose.

(h) A diagnostic x–ray radiation machine exposure involving the wrong individual.

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

Authority: T.C.A. §§4–5–201 et seq. and 68–202–203 and 206.

Rule 1200–2–5–.40 Radiation Protection Programs is amended by adding paragraph (4). The paragraph shall read:

(4) To implement the ALARA requirements of paragraph 1200–2–5–.40(2) and notwithstanding the requirements in Rule 1200–2–5–.70, licensees shall establish a constraint on air emissions of radioactive material to the environment, excluding radon–222 and its daughters. The constraint shall ensure that the individual member of the public likely to receive the highest dose shall not be expected to receive a total effective dose equivalent in excess of 10 millirems (0.1 millisievert) per year from these emissions. If a licensee exceeds this dose constraint, the licensee shall report the

occurrence as provided in Rule 1200−2−5−.143 and take prompt, appropriate corrective action to ensure against recurrence.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Subparagraph (1)(a) of Rule 1200−2−5−.60 Dose Limits for Individual Members of the Public is amended by adding the words " background radiation, any medical administration the individual has received, voluntary participation in medical research programs, and" after the words "contribution from", so that as amended the subparagraph shall read:

(a) The total effective dose equivalent received by any individual member of the public from the licensed or registered operation does not exceed 0.1 rem (1 mSv) in a year. This limit is exclusive of the dose contribution from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with subparagraph 1200−2−10−.14(2)(e), from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with Rule 1200−2−5−.122; and

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Part (1)(c)5 of Rule 1200−2−5−.92 Use of Individual Respiratory Protection Equipment is amended by deleting the part and substituting the following, so that as amended the part shall read:

5. Determination by a physician before the initial fitting of respirators, and either every 12 months thereafter or periodically at a frequency determined by a physician, that the individual user is medically fit to use the respiratory protection equipment.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Rule 1200−2−5−.111 Posting Requirements is amended by adding paragraph (11):

(11) All radiation machines shall be clearly labeled at the control panel near the switch that energizes the apparatus, and at any remote switched that energize the apparatus, with the words "CAUTION − RADIATION − THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED" or "DANGER − RADIATION − THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED"

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Subparagraphs (1)(a) and (1)(c) and paragraph (2) of Rule 1200−2−5−.125 Transfer for Disposal and Manifests are amended by deleting the subparagraphs and paragraph and substituting the following, so that as amended the subparagraphs and paragraph shall read:

(1) (a) Control transfers of low−level radioactive waste by any waste generator, waste collector or waste processor licensee, as defined in Schedule RHS 8−33 of Rule 1200−2−5−.161, who

ships low−level waste either directly, or indirectly through a waste collector or waste processor, to a licensed low−level waste land disposal facility as defined in Chapter 1200−2−11.

(c) Supplement existing requirements concerning transfers and recordkeeping for those wastes.

(2) Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility shall document the information required on U.S. NRC Uniform Low−Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee as specified in Section I of Schedule RHS 8−33.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Rule 1200−2−5−.130 General Records Provisions is amended by deleting paragraph (2) and substituting paragraphs (2) and (3) as follows, so that as amended the paragraphs shall read:

(2) Notwithstanding the requirements above in paragraph (1), when recording information on shipment manifests, as required in paragraph 1200−2−5−.125(2), information shall be recorded in the International System of Units (SI) or in SI and units as specified in paragraph (1).

(3) The licensee or registrant shall make a clear distinction among the quantities entered on the records required by this Chapter (e.g., total effective dose equivalent, shallow−dose equivalent, eye dose equivalent, deep−dose equivalent, committed effective dose equivalent).

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Paragraph (1) of Rule 1200−2−5−.133 Determination of Prior Occupational Dose is amended by deleting the words "may enter the licensee's or registrant's restricted area and ", so that as amended the paragraph shall read:

(1) For each individual who is likely to receive, in a year, an occupational dose requiring monitoring pursuant to 1200−2−5−.71, the licensee or registrant shall:

Authority: T.C.A. §§4−5−201 et seq. and 68−202−101 et seq.

Rule 1200−2−5−.142 is amended by adding the following and changing the rule name, so that as amended the rule shall read:

1200−2−5−.142 Reports to Individuals of Exposure to Radiation

(1) Licensees and registrants shall report radiation exposure data for an individual, including the results of any measurements, analyses and calculations of radioactive material deposited or retained in the body of an individual, as specified in this rule.

(2) Each licensee or registrant, at the request of any worker, shall advise such worker annually of the worker's exposure to sources of radiation as shown in records maintained by the licensee or registrant pursuant to Rule 1200-2-5-.135.

(3) Each licensee or registrant, at the request of a worker formerly engaged in licensed or registered activities controlled by the licensee or registrant, shall furnish to the worker a report of the individual's exposure to sources of radiation:

(a) 1. As shown in records maintained by the licensee or registrant pursuant to Rule 1200-2-5-.135 for each year the worker was required to be monitored under the provisions of Rule 1200-2-5-.41; and

2. For each year the worker was required to be monitored under the requirements in effect before January 2, 1993.

(b) This report shall:

1. Be furnished within 30 days from the time the request is made or within 30 days after the exposure of the individual has been determined by the licensee, whichever is later;

2. Cover the period that the worker's activities involved exposure to sources of radiation licensed or registered by the Division; and

3. Include the dates and locations of licensed or registered activities in which the worker participated during this period.

(c) The worker's request shall include social security number, dates and location of employment or association and other appropriate identifying data.

(4) When a licensee or registrant is required under Rule 1200-2-5-.143 to report to the Division any exposure of an identified occupationally exposed individual or an identified member of the public to sources of radiation, the licensee or registrant shall also provide a copy of the report submitted to the Division to the individual. Such report shall be transmitted at a time not later than the transmittal to the Division.

(5) At the request of a worker who is terminating employment with the licensee or registrant that involved radiation dose, or of a worker who, while employed by another person, is terminating assignment to work involving radiation dose in the licensee's or registrant's facility during the current year, each licensee or registrant shall provide at termination to each 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 monitoring results are not available at that time, the licensee or registrant shall provide a written estimate of the dose. Estimated doses shall be clearly indicated as such.

(6) Reports submitted under this rule shall:

(a) Be in writing;

(b) Include appropriate identifying data such as the name of the licensee or registrant, the name of the individual and the individual's social security number;

(c) Include the individual's radiation exposure information; and

(c) Include data and results obtained under Division regulations, or conditions, as shown in records maintained by the licensee or registrant under Division regulations

(d) Contain the following statement:

This report is furnished to you under the provisions of the Division of Radiological Health of the Tennessee Department of Environment and Conservation regulations entitled "State Regulations for Protection Against Radiation." You should preserve this report for future reference.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–203 and 206.

Part (1)(b)4 of Rule 1200–2–5–.143 Reports of Exposures, Radiation Levels and Concentrations of Radioactive material Exceeding the Limits is amended by removing the word " or". Part (1)(b)5 is amended by inserting the word " or" at the end. Part (1)(b)6 is added. Part (2)(a)4 and subparagraph (2)(b) are amended by deleting the part and subparagraph and substituting the following. As amended the parts and subparagraph shall read:

(1) (b) 4. The limits for an individual member of the public in 1200–2–5–.60;

5. Any applicable limit in the license or registration; or

6 The ALARA constraints for air emissions established under paragraph 1200–2–5–.40(4); or

(2) (a) 4. 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) (b) Each report filed under paragraph 1200–2–5–.143(1) shall include for each occupationally overexposed individual [16]: the name, Social Security account number and date of birth. The report shall be prepared so that this information is stated in a separate and detachable part.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Rule 1200–2–5–.145 is amended by adding the following and changing the rule name, so that as amended the rule shall read:

1200–2–5–.145 Notifications, Records and Reports of Misadministration.

(1) For a misadministration:

(a) The licensee shall notify by telephone the Division at the number given in Rule 1200–2–4–.07 no later than the next calendar day after discovery of the misadministration.

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[1]*16 With respect to the limit for the embryo/fetus (1200 –2–5–.56), the identifiers should be those of the declared pregnant woman.*

(b) The licensee shall submit a written report to the Division at the address given in Rule 1200–2–4–.07 within 15 days after discovery of the misadministration.

1. The written report shall include:

(i) The licensee's name,

(ii) The prescribing physician's name,

(iii) A brief description of the event,

(iv) Why the event occurred,

(v) The effect on the individual who received the misadministration,

(vi) What improvements are needed to prevent recurrence,

(vii) Actions taken to prevent recurrence,

(viii) Whether the licensee notified the individual (or the individual's responsible relative or guardian) and if not, why not, and if there was notification, what information was provided.

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

3. To meet the requirements of this rule, the notification of the individual receiving the misadministration may be made instead to that individual's responsible relative or guardian, when appropriate.

(c) The licensee shall notify the referring physician and also notify the individual receiving the misadministration of the misadministration no later than 24 hours after its discovery, unless the referring physician personally informs the licensee either that he will inform the individual or that, based on medical judgement, 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 individual receiving the misadministration cannot be reached within 24 hours, the licensee shall notify the individual as soon as possible thereafter. The licensee may not delay any appropriate medical care for the individual, including any necessary remedial care because of the misadministration, because of any delay in notification.

(d) If the individual was notified, the licensee shall also furnish, within 15 days after discovery of the misadministration, a written report to the individual by sending either:

1. A copy of the report that was submitted to the Division; or

2. A brief description of both the event and the consequences as they may affect the individual, provided a statement is included that the report submitted to the Division can be obtained from the licensee.

(2) Each licensee shall retain a record of each misadministration for five (5) years. The record shall contain:

1. The names of all individuals involved (including the prescribing physician, allied health personnel, the individual who received the misadministration and that individual's referring physician, if applicable),

2. The individual's social security number or other identification number if one has been assigned,

3. A brief description of the misadministration, why it occurred, the effect on the individual, improvements needed to prevent recurrence and the actions taken to prevent recurrence.

(3) Aside from the notification requirement, nothing in this section affects any rights or duties of licensees and physicians in relation to each other, to individuals receiving misadministrations, or to that individual's responsible relatives or guardians.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–203 and 206.

Schedule RHS 8–33 of Rule 1200–2–5–.161 Schedules is amended by deleting the schedule and substituting the following, so that as amended the schedule shall read:

SCHEDULE RHS 8–33

REQUIREMENTS FOR TRANSFER OF LOW–LEVEL RADIOACTIVE WASTE
FOR DISPOSAL AT LAND DISPOSAL FACILITIES AND MANIFESTS

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 land disposal facility shall prepare a manifest. The manifest shall contain the information requested on applicable NRC Forms 540 (Uniform Low–Level Radioactive Waste Manifest (Shipping Paper)) and 541 (Uniform Low–Level Radioactive Waste Manifest (Container and Waste Description)) and, if necessary, on an applicable NRC Form 542 (Uniform Low–Level Radioactive Waste Manifest (Manifest Index and Regional Compact Tabulation)). NRC Forms 540 and 540A shall be completed and shall physically accompany the pertinent low–level waste shipment. Upon agreement between shipper and consignee, NRC Forms 541 and 541A and 542 and 542A may be completed, transmitted and stored in electronic media with the capability for producing legible, accurate and complete records of the respective forms. Licensees are not required to comply with the manifesting requirements of this rule when they ship:

1. LLW for processing and expect its return (i.e., for storage under their license) prior to disposal at a licensed land disposal facility;

2. LLW that is being returned to the licensee who is the 'waste generator' or 'generator,' as defined in this rule; or

3. 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.

NRC Forms 540, 540A, 541, 541A, 542 and 542A and the accompanying instructions, in hard copy, may be obtained from the Information and Records Management Branch, Office of Information Resources Management, U.S. Nuclear Regulatory Commission, Washington, DC 20555, telephone (301) 415–7232.

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 Agency 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 shall accompany the Uniform Low–Level Radioactive Waste Manifest required by this chapter.

As used in this appendix, the following definitions apply:

1. 'Chelating agent' has the same meaning as that given in Rule 1200–2–11–.03.

2. 'Chemical description' means a description of the principal chemical characteristics of a low–level radioactive waste.

3. 'Computer–readable medium' means that the regulatory agency's computer can transfer the information from the medium into its memory.

4. 'Consignee' means the designated receiver of the shipment of low–level radioactive waste.

5. 'Decontamination facility' means a facility operating under a license issued by the Division, the U.S. Nuclear Regulatory Commission, or another Agreement State, whose principal purpose is decontamination of equipment or materials to accomplish recycle, reuse or other waste management objectives and, for purposes of this rule, is not considered to be a consignee for LLW shipments.

6. '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.

7. 'EPA identification number' means the number received by a transporter following application to the Administrator of EPA as required by 40 CFR 263.

8. 'Generator' means a licensee operating under a license issued by the Division, the U.S. Nuclear Regulatory Commission, or another Agreement State who:

    a. Is a waste generator as defined in this rule, or

    b. 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).

9. 'High integrity container' (HIC) means a container commonly designed to meet the structural stability requirements of paragraph 1200–2–11–.17(7) and to meet Department of Transportation requirements for a Type A package.

10. 'Land disposal facility' has the same meaning as that given in Rule 1200–2–11–.03.

11. 'NRC Forms 540, 540A, 541, 541A, 542 and 542A' means official NRC Forms referenced in this appendix. Licensees need not use originals of these NRC Forms as long as any substitute forms are equivalent to the original documentation in respect to content, clarity, size and location of information. Upon agreement between the shipper and consignee, NRC Forms 541 (and 541A) and NRC Forms 542 (and 542A) may be completed, transmitted and stored in electronic media. The electronic media shall have the capability for producing legible, accurate and complete records in the format of the uniform manifest.

12. 'Package' means the assembly of components necessary to ensure compliance with the packaging requirements of U.S. DOT regulations, together with its radioactive contents, as presented for transport.

13. 'Physical description' means the items called for on NRC Form 541 to describe a low–level radioactive waste.

14. '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.

15. '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.

16. 'Shipping paper' means NRC Form 540 and, if required, NRC Form 540A which includes the information required by U.S. DOT in 49 CFR 172.

17. 'Source material' has the same meaning as that given in subparagraph 1200–2–4–.04(1)(mm).

18. 'Special nuclear material' has the same meaning as that given in T.C.A. §68–202–202(1).

19. 'Uniform Low–Level Radioactive Waste Manifest' (or 'uniform manifest') means the combination of NRC Forms 540, 541 and, if necessary, 542 and their respective continuation sheets as needed, or equivalent.

20. 'Waste collector' means an entity, operating under a license issued by the Division, the U.S. NRC or another Agreement State, 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 land disposal facility.

21. 'Waste description' means the physical, chemical and radiological description of a low–level radioactive waste as called for on NRC Form 541.

22. 'Waste generator' means an entity, operating under a license issued by the Division, the U.S. NRC or another Agreement State, who:

    a. Possesses any material or component that contains radioactivity or is radioactively contaminated for which the licensee foresees no further use, and:

    b. Transfers this material or component to a licensed land disposal facility or to a licensed waste collector or processor for handling or treatment before 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.'

23. 'Waste processor' means an entity, operating under a license issued by the Division, the U.S. NRC or another Agreement State, whose principal purpose is to process, repackage or otherwise treat low−level radioactive material or waste generated by others before eventual transfer of waste to a licensed low−level radioactive waste land disposal facility.

24. 'Waste type' means a waste within a disposal container having a unique physical description (i.e., 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 radioactive waste shall 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 indicating whether the shipper is acting as a waste generator, collector, processor, or a combination of these identifiers for the purposes of the manifested shipment; and

3. The name, address and telephone number, or the name and U.S. EPA hazardous waste identification number for the carrier transporting the waste to the land disposal facility.

B. Shipment Information

The shipper of the radioactive waste shall 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 shipments;

4. The total radionuclide activity in the shipment;

C. Disposal Container and Waste Information.

The shipper of the radioactive waste shall provide the following information on the uniform manifest regarding the waste and each disposal container of waste in the shipment:

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 one–tenth of one percent (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 special nuclear material, and the masses of uranium and thorium in source material. For discrete waste types (i.e., activated materials, contaminated equipment, mechanical filters, sealed source/devices and wastes in solidification/stabilization media), the identities and activities of individual radionuclides associated with or contained on these waste types within a disposal container shall be reported;

11. The total radioactivity within each container; and

12. For wastes consigned to a disposal facility, the classification of the waste under paragraph 1200–2–11–.17(6). Waste not meeting the structural stability requirements of subparagraph 1200–2–11–.17(7)(b) shall be identified.

D. Uncontainerized Waste Information.

The shipper of the radioactive waste shall provide the following information on the uniform manifest regarding a waste shipment delivered without a disposal container:

1. The approximate volume and weight of the waste;

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 under paragraph 1200–2–11–.17(6). Waste not meeting the structural stability requirements of subparagraph 1200–2–11–.17(7)(b) shall be identified;

5. The identities and activities of individual radionuclides contained in the waste, the masses of U–233, U–235 and plutonium in special nuclear material, and the masses of uranium and thorium in 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 LLW resulting from a processor's activities may be attributable to one or more 'generators' (including 'waste generators') as defined in this rule). 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 (i.e., 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:

    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 one−tenth of one percent (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 subparagraph 1200−2−11−.17(7)(b); and

    e. Radionuclide identities and activities contained in the waste, the masses of U−233, U−235 and plutonium in special nuclear material, and the masses of uranium and thorium in source material if contained in the waste.

II. Certification.

An authorized representative of the waste generator, processor, or collector shall 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 U.S. Department of Transportation, the U.S. Nuclear Regulatory Commission and the Division of Radiological Health. A collector, in signing the certification, is certifying that nothing has been done to the collected waste that would invalidate the waste generator's certification.

III. Control and Tracking.

A. Any licensee who transfers radioactive waste to a land disposal facility or a licensed waste collector shall comply with the requirements in paragraphs A.1 through 9 of this section. Any licensee who transfers waste to a licensed waste processor for waste treatment or repackaging shall comply with the requirements of paragraphs A.4 through 9 of this section. A licensee shall:

1. Prepare all waste so that the waste is classified according to paragraph 1200−2−11−.17(6) and meets the waste characteristics requirements in paragraph 1200−2−11−.17(7);

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 paragraph 1200–2–11–.17(6);

3. Conduct a quality assurance program to assure compliance with paragraph 1200–2–11–.17(6) and paragraph 1200–2–11–.17(7) (the program shall include management evaluation of audits);

4. Prepare the NRC Uniform Low–Level Radioactive Waste Manifest as required by this appendix;

5. Forward a copy or electronically transfer the Uniform Low–Level Radioactive Waste Manifest to the intended consignee so that either:

   a. Receipt of the manifest precedes the LLW shipment, or

   b. The manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee.

   c. Using both a. and b. is also acceptable;

6. Include NRC Form 540 (and NRC Form 540A, if required) with the shipment regardless of the option chosen in part 5 of this subparagraph;

7. Receive acknowledgement of the receipt of the shipment in the form of a signed copy of NRC Form 540;

8. Retain a copy of or electronically store the Uniform Low–Level Radioactive Waste Manifest and documentation of acknowledgement of receipt as the record of transfer of licensed material as required by Chapter 1200–2–10; and

9. For any shipments or any part of a shipment for which acknowledgement 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 shall:

1. Acknowledge receipt of the waste from the shipper within one week of receipt by returning a signed copy of NRC Form 540;

2. Prepare a new manifest to reflect consolidated shipments that meet the requirements of this appendix. The waste collector shall ensure that, for each container of waste in the shipment, the manifest identifies the generator of that container of waste;

3. Forward a copy or electronically transfer the Uniform Low–Level Radioactive Waste Manifest to the intended consignee so that either:

   a. Receipt of the manifest precedes the LLW shipment, or

   b. The manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee.

c. Using both (i) and (ii) is also acceptable;

4. Include NRC Form 540 (and NRC Form 540A, if required) with the shipment regardless of the option chosen in part 3 of this subparagraph;

5. Receive acknowledgement of the receipt of the shipment in the form of a signed copy of NRC Form 540;

6. Retain a copy of or electronically store the Uniform Low−Level Radioactive Waste Manifest and documentation of acknowledgement of receipt as the record of transfer of licensed material as required by Chapter 1200−2−10;

7. For any shipments or any part of a shipment for which acknowledgement 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 Director, Division of Radiological Health, 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 cancelled.

C. Any licensed waste processor who treats or repackages waste shall:

1. Acknowledge receipt of the waste from the shipper within one (1) week of receipt by returning a signed copy of NRC Form 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 shall identify the waste generators, the preprocessed waste volume and the other information required in paragraph I.E. of this appendix;

3. Prepare all waste so that the waste is classified according to paragraph 1200−2−11−.17(6) and meets the waste characteristics requirements in paragraph 1200−2−11−.17(7);

4. Label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with paragraph 1200−2−11−.17(6) and 1200−2−11−.17(8);

5. Conduct a quality assurance program to assure compliance with paragraph 1200−2−11−.17(6) and paragraph 1200−2−11−.17(7) (the program shall include management evaluation of audits);

6. Forward a copy or electronically transfer the Uniform Low−Level Radioactive Waste Manifest to the intended consignee so that either:

a. Receipt of the manifest precedes the LLW shipment, or

b. The manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee.

c. Using both (i) and (ii) is also acceptable;

7. Include NRC Form 540 (and NRC Form 540A, if required) with the shipment regardless of the option chosen in paragraph C.6 of this section;

8. Receive acknowledgement of the receipt of the shipment in the form of a signed copy of NRC Form 540;

9. Retain a copy of or electronically store the Uniform Low–Level Radioactive Waste Manifest and documentation of acknowledgement of receipt as the record of transfer of licensed material as required by Chapter 1200–2–10;

10. For any shipment or any part of a shipment for which acknowledgement 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 Director, Division of Radiological Health, 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 cancelled.

D. The land disposal facility operator shall:

1. Acknowledge receipt of the waste within one (1) week of receipt by returning, as a minimum, a signed copy of NRC Form 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 the discrepancy;

2. Maintain copies of all completed manifests and electronically store the information required by paragraph 1200–2–11–.19(1) until the Division terminates the license; and

3. Notify the shipper and the Director, Division of Radiological Health, 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 cancelled.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Subparagraphs (4)(e) and (4)(i) and paragraph (7) of Rule 1200–2–7–.04 Teletherapy are amended by deleting the term "1200–2–4–.04(1)(xx)" and substituting the term "1200–2–4–.04(1)(pp)", so that as amended the subparagraphs and paragraph shall read:

(4) (e) Full calibration measurements required by (a) of this paragraph and physical decay corrections required by (d) of this paragraph shall be performed by a qualified expert as defined in 1200–2–4–.04(1)(pp).

(i) The licensee shall determine if a person is a qualified expert in accordance with the requirements of 1200–2–4–.04(1)(pp).

(7) The licensee shall determine in accordance with 1200–2–4–.04(1)(pp) if a person is an expert qualified by training and experience to calibrate a teletherapy unit and establish procedures for (and review the results of) spot check measurements.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Rule 1200−2−8−.03 Definitions is amended by deleting the rule and substituting the following, so that as amended the rule shall read:

1200−2−8−.03 Definitions.

(1) 'Annual refresher safety training' means a review conducted or provided by the licensee for its employees on radiation safety aspects of industrial radiography. The review may include, as appropriate, the results of internal inspections, new procedures or equipment, new or revised regulations, accidents or errors that have been observed, and should also provide opportunities for employees to ask safety questions and receive answers to their safety questions.

(2) '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 (e.g., guide tube, control tube, control (drive) cable, removable source stop, 'J' tube and collimator) when it is used as an exposure head.

(3) 'Cabinet radiography' means industrial radiography using radiation machines in an enclosed interlocked cabinet in which:

(a) The radiation machine will not operate unless all openings are closed with interlocks activated.

(b) The cabinet is so shielded that every location on the exterior meets the conditions for an unrestricted area as defined in Chapter 1200−2−5, and

(c) The cabinet is so constructed or arranged as to exclude the entrance of any part of the body of an individual during irradiation.

(d) Baggage entrance and exit openings of airport baggage systems need not be interlocked. All other openings in these systems shall be interlocked. The operator shall be present during operation to ensure no individual enters the device through the baggage entrance or exit opening(s).

(4) 'Certifying entity' means an independent certifying organization meeting the requirements in Appendix A to 10 CFR 34 or an Agreement State meeting the requirements in Appendix A to 10 CFR 34 (see Schedule RHS 8−35, Rule 1200−2−8−.13).

(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.

(6) 'Control (drive) cable' means the cable that is connected to the source assembly and used to drive the source to and from the exposure location.

(7) 'Control drive mechanism' means a device that enables the source assembly to be moved to and from the exposure device.

(8) 'Control tube' means a protective sheath for guiding the control cable. The control tube connects the control drive mechanism to the radiographic exposure device.

(9) 'Exposure head' means a device that locates the gamma radiography sealed source in the selected working position. (An exposure head is also known as a 'source stop.')

(10) 'Field station' means a facility where licensed material may be stored or used and from which equipment is dispatched.

(11) 'Guide tube' (or 'projection sheath') means a flexible or rigid tube (i.e., '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.

(12) 'Hands−on experience' means experience in all of those areas considered to be directly involved in the radiography process.

(13) 'Independent certifying organization' means an independent organization that meets all of the criteria of appendix A to 10 CFR 34 (see Rule 1200−2−8−.18).

(14) 'Permanent radiographic installation' means an enclosed shielded room, cell or vault, not located at a temporary job−site, in which radiography is performed.

(15) 'Personal supervision' means supervision with the radiographer:

(a) Physically present at the site where sources of radiation and associated equipment are being used.

(b) Observing the radiographer's assistant's performance; and

(c) In such proximity that immediate assistance can be given if required.

(16) 'Practical examination' means a demonstration through practical application of the safety rules and principles in industrial radiography including use of all appropriate equipment and procedures.

(17) 'Radiographer' means any individual who performs or who, in attendance at the site where the sealed source or sources are being used, personally supervises industrial radiographic operations and who is responsible to the licensee for assuring compliance with the requirements of the Division's regulations and the conditions of the license.

(18) 'Radiographer certification' means written approval received from a certifying entity stating that an individual has satisfactorily met certain established radiation safety, testing and experience criteria.

(19) 'Radiographer's assistant' means any individual who under the direct supervision of a radiographer, uses radiographic exposure devices, sealed sources or related handling tools, or radiation survey instruments in industrial radiography.

(20) 'Radiographic exposure device' (also called a 'camera' or a '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.

(21) 'Radiographic operations' means all activities associated with the presence of radioactive sources in a radiographic exposure device during use of the device or transport (except when being transported by a common or contract transport), to include surveys to confirm the adequacy of boundaries, setting up equipment and any activity inside restricted area boundaries.

(22) 'S−tube' means a tube through which the radioactive source travels when inside a radiographic exposure device.

(23) 'Shielded position' means the location within the radiographic exposure device or source changer where the sealed source is secured and restricted from movement.

(24) 'Shielded room x−ray radiography' means industrial radiography using radiation machines that is conducted in an enclosed room.

(25) 'Source assembly' means an assembly that consists of the sealed source and a connector that attaches the source to the control cable. The source assembly may also include a stop ball used to secure the source in the shielded position.

(26) 'Source changer' means a device designed and used for replacement of sealed sources in radiographic exposure devices, including those also used for transporting and storage of sealed sources.

(27) 'Storage area' means any location, facility or vehicle which is used to store or to secure a radiographic exposure device, a storage container or a sealed source when it is not in use and which is locked or has a physical barrier to prevent accidental exposure, tampering with or unauthorized removal of the device, container or source.

(28) 'Storage container' means a container in which sealed sources are secured and stored.

(29) 'Temporary job−site' means a location where radiographic operations are conducted and where licensed material may be stored other than the location(s) of use authorized on the license.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−101 et seq.

Rule 1200−2−8−.04 Equipment Control is amended by adding paragraph (11) and subparagraph (5)(f) and by deleting paragraphs (1), (2), (3) and (8), subparagraphs (4)(a) and (9)(c) and parts (4)(b)1 and (4)(b)3 and substituting the following, so that as amended the paragraphs, subparagraphs and parts shall read:

(1) Limits on levels of radiation from storage containers and source changers. The maximum exposure rate limits for storage containers and source changers are 200 millirem (2 millisieverts) per hour at any exterior surface and 10 millirem (0.1 millisieverts) per hour at 1−meter from any exterior surface with the sealed source in the shielded position.

(2) Locking of radiographic exposure devices, storage containers and source changers:

(a) Each radiographic exposure device shall 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 shall 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 paragraph 1200−2−8−.06(1). In addition, during radiographic operations the sealed source assembly shall be secured in the shielded position each time the source is returned to that position.

(b) Each sealed source storage container and source changer shall 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 shall 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.

(3) Storage precautions:

(a) Locked radiographic exposure devices, source changers and storage containers shall be physically secured to prevent tampering with or removal by unauthorized persons.

(b) The licensee shall store licensed material in a manner that will minimize danger from explosion or fire.

(4) (a) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments at each location where radioactive material is present to make physical radiation surveys as required by this chapter and Chapter 1200–2–5 of these regulations. Instrumentation required by this paragraph shall have a range such that 2 millirems (0.02 millisieverts) per hour through 1 rem (0.01 sievert) per hour can be measured.

(b) 1. At energies appropriate for use and at intervals not to exceed six (6) months and after each instrument servicing, except for battery changes.

3. For linear scale instruments, at 2 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 2 points of at least one decade; and for digital instruments, at 3 points between 2 and 1,000 millirems (0.02 and 10 millisieverts) per hour.

(5) (f) Each exposure device using depleted uranium (DU) shielding and an 'S' tube configuration shall be tested for DU contamination at intervals not to exceed 12 months. The analysis shall be capable of detecting the presence of 185 Bq (0.005 microcuries) of radioactive material on the test sample and shall be performed by a person specifically authorized by the Division, the U.S. NRC or an Agreement State to perform the analysis.

1. Should such testing reveal the presence of 185 Bq (0.005 microcuries) or more of removable DU contamination, the exposure device shall be removed from use until an evaluation of the wear on the S–tube has been made. Should the evaluation reveal that the S–tube is worn through, the device may not be used again.

2. DU shielded devices do not have to be tested for DU contamination while in storage and not in use. Before using or transferring such a device however, the device shall be tested for DU contamination if the interval of storage exceeded 12 months.

3. Licensees will have until January 1, 2002, to comply with the DU leak–testing requirements of this subparagraph.

(8) Inspection and maintenance of radiographic exposure devices, source changers, transport and storage containers, associated equipment and survey instruments.

(a) The licensee shall perform visual and operability checks on survey meters, radiographic exposure devices, transport and storage containers, associated equipment and source changers prior to use each day the equipment is used to ensure that the equipment is in good working condition, that the sources are adequately shielded and that required labeling is present. Survey instrument operability shall be performed using check sources or other appropriate means. If equipment problems are found, the equipment shall be removed from service until repaired.

(b) The licensee shall have written procedures for:

1. Inspection and routine maintenance of radiographic exposure devices, source changers, associated equipment, transport and storage containers at intervals not to exceed three (3) months, or before the first use thereafter, to assure proper functioning of components important to safety. If equipment problems are found, the equipment shall be removed from service until repaired.

2. Inspection and maintenance necessary to maintain the Type B packaging used to transport radioactive materials. The inspection and maintenance program shall include procedures to assure that Type B packages are shipped and maintained in accordance with the certificate of compliance or other approval.

(9) (c) The alarm system shall be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test shall include a check of both the visible and audible signals. Entrance control devices that reduce the radiation level upon entry shall be tested monthly. If an entrance control device or an alarm is operating improperly, it shall be immediately labeled as defective and repaired within seven (7) calendar days. The facility may continue to be used during this seven (7) day period, provided the licensee implements the continuous surveillance requirements of paragraph 1200–2–8–.06(1) and uses an alarming ratemeter. The licensee or registrant shall retain records of these tests for three (3) years for inspection by the Division.

(11) Labeling, storage and transportation.

(a) The licensee may not use a source changer or a container to store licensed 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 in conventional colors, i.e., magenta, purple or black on a yellow background, having a minimum diameter of 25 mm, and the wording:

CAUTION (or "DANGER")
RADIOACTIVE MATERIAL
NOTIFY CIVIL AUTHORITIES (or "NAME OF COMPANY")

(b) The licensee shall not transport licensed material unless the material is packaged and the package is labeled, marked and accompanied with appropriate shipping papers in accordance with regulations set out in 10 CFR part 71.

(c) Locked radiographic exposure devices and storage containers shall be physically secured to prevent tampering or removal by unauthorized personnel. The licensee shall store licensed material in a manner that will minimize danger from explosion or fire.

(d) The licensee shall lock and physically secure the transport package containing licensed material in the transporting vehicle to prevent accidental loss, tampering or unauthorized removal of the licensed material from the vehicle.

Paragraph (10) of Rule 1200–2–8–.04 Equipment Control is amended by adding the sentence, "An applicant or licensee may submit engineering analyses to demonstrate the applicability of previously performed testing on similar individual radiography equipment components. Upon review, the Division may find this an acceptable alternative to actual testing of the component pursuant to the above referenced standard." at the end of subparagraph (a) and adding subparagraph (f), so that as amended the subparagraphs shall read:

(10) (a) Each radiographic exposure device and all associated equipment shall meet the requirements specified in American National Standard N432–1980 "Radiological Safety for the Design

and Construction of Apparatus for Gamma Radiography," (published as NBS Handbook 136, issued January 1981) American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018 (ANSI N432). An applicant or licensee may submit engineering analyses to demonstrate the applicability of previously performed testing on similar individual radiography equipment components. Upon review, the Division may find this an acceptable alternative to actual testing of the component under the above referenced standard.

(b) In addition to the requirements specified above in subparagraph (a), the following requirements apply to radiographic exposure devices, source changers, source assemblies and sealed sources.

1. The licensee shall ensure that each radiographic exposure device has attached to it a durable, legible, clearly visible label bearing the:

   (i) Chemical symbol and mass number of the radionuclide in the device;

   (ii) Activity and the date on which this activity was last measured;

   (iii) Model (or product code) and serial number of the sealed source;

   (iv) Manufacturer's identity of the sealed source; and

   (v) Licensee's name, address and telephone number.

2. Radiographic exposure devices intended for use as Type B transport containers shall meet the applicable requirements of 10 CFR part 71.

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.

(c) In addition to the requirements specified above in subparagraphs (a) and (b), 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 shall be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling shall be such that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.

2. The device shall 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 shall be equipped with safety plugs or covers, which shall be installed during storage and transportation to protect the source assembly from water, mud, sand or other foreign matter.

4. (i) Each sealed source or source assembly shall have attached to it or engraved on it, a durable, legible, visible label with the words:

"CAUTION (or "DANGER")--RADIOACTIVE."

(ii) The label may not interfere with the safe operation of the exposure device or associated equipment.

5. The guide tube shall 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 shall be used when moving the source out of the device.

7. An exposure head or similar device designed to prevent the source assembly from passing out of the end of the guide tube shall be attached to the outermost end of the guide tube during industrial radiography operations.

8. The guide tube exposure head connection shall be able to withstand the tensile test for control units specified in ANSI N432-1980.

9. Source changers shall 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.

(d) All newly manufactured radiographic exposure devices and associated equipment acquired by licensees after January 10, 1992, shall comply with the requirements of this paragraph.

(e) All radiographic exposure devices and associated equipment in use after January 10, 1996, shall comply with the requirements of this paragraph.

(f) Notwithstanding subparagraph (1)(a) above, equipment used in industrial radiographic operations need not comply with §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 realistically exert on the lever or crankshaft of the drive mechanism.

Authority: T.C.A. §§4-5-201 et seq. and 68-202-101 et seq.

Subparagraph (1)(c) of Rule 1200-2-8-.05 Personal Radiation Safety Requirements for Radiographers and Radiographer's Assistants is amended by adding paragraphs (4) and (5) and by deleting subparagraph (1)(c) and substituting the following, so that as amended the subparagraph and paragraphs shall read:

(1) (c) Each licensee shall maintain the following records of training and certification for three (3) years after the record is made:

1. Records of training of each radiographer and each radiographer's assistant. The record shall include radiographer certification documents and verification of certification status, copies of written tests, dates of oral and practical examinations,

and names of individuals conducting and receiving 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 shall 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 shall also include a list showing the items checked and any non−compliance(s) observed by the radiological safety officer.

(4) Conducting industrial radiographic operations.

(a) Whenever radiography is performed at a location other than a permanent radiographic installation, at least one other qualified radiographer or an individual who has at a minimum met the requirements of subparagraph 1200−−2−8−.08(5)(b) shall accompany the radiographer. The additional qualified individual shall observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography shall not be performed if only one qualified individual is present.

(b) Reserved.

(c) Licensees will have until January 1, 2002, to meet the requirements for having two qualified individuals present at locations other than a permanent radiographic installation.

(5) Supervision of radiographers' assistants. Whenever a radiographer's assistant uses radiographic exposure devices, associated equipment or sealed sources or conducts radiation surveys required by subparagraph 1200−2−8−.06(3)(b) to determine that the sealed source has returned to the shielded position after an exposure, the assistant shall be under the personal supervision of a radiographer. The personal supervision shall include:

(a) The radiographer's physical presence at the site where the sealed sources are being used;

(b) The availability of the radiographer to give immediate assistance if required; and

(c) The radiographer's direct observation of the assistant's performance of the operations referred to in this section.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−101 et seq.

Paragraph (1) of Rule 1200−2−8−.06 Precautionary Procedures in Radiographic Operations is amended by deleting the words " or radiographer's assistant" and the words "a direct" and substituting the words ", or the other individual present, as required by subparagraph 1200−2−8−.05(4)(a)," and "continuous, direct, visual", so that as amended the paragraph shall read:

(1) Security. During each radiographic operation the radiographer, or the other individual present, as required by subparagraph 1200−2−8−.05(4)(a), shall maintain continuous, direct, visual surveillance of the operation to protect against unauthorized entry into a high radiation area as defined in Chapter 1200−2−5 except at permanent radiographic installations where all entryways are locked and the requirements of paragraph 1200−2−8−.04(9) are met.

Subparagraph (3)(b) of Rule 1200−2−8−.06 Precautionary Procedures in Radiographic Operations is amended by adding the following sentence at the end, so that as amended the subparagraph shall read:

(b) After each exposure, the licensee or registrant shall ensure that a survey with a calibrated and operable radiation survey instrument is made to determine that the sealed source has been returned to its shielded position or that the radiation from the radiation machine has been terminated. The entire circumference of the radiographic exposure device shall be surveyed. If the radiographic exposure device has a source guide tube, the survey shall include the guide tube. The survey shall determine that the sealed source has returned to its shielded position before exchanging films, repositioning the exposure head or dismantling equipment.

The first sentence of subparagraph (3)(c) of Rule 1200−2−8—.06 Precautionary Procedures in Radiographic Operations is amended by inserting the words " the source is exchanged and whenever" after the words "Any time", so that as amended the first sentence of the subparagraph shall read:

(c) Any time the source is exchanged and whenever a radiographic exposure device is placed in a storage area, the licensee shall ensure that a survey with a calibrated and operable radiation survey instrument is made to determine that the sealed source is in its shielded position.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−101 et seq.

Rule 1200−2−8−.07 Minimum Subjects to be Covered in Training Radiographers is amended by deleting the rule and substituting the following, so that as amended Rule 1200−2−8−.07 shall read:

1200−2−8−.07 Minimum Subjects to be Covered in Training Radiographers.

(1) A licensee may not permit any individual to act as a radiographer until the individual:

(a) Has received training in the subjects below in paragraph (7), in addition to a minimum of two (2) months of on−the−job training, and is certified through a radiographer certification program by a certifying entity in accordance with the criteria specified in Appendix A to 10 CFR 34 (see Schedule RHS 8−35, Rule 1200−2−8−.13). (An independent organization that would like to be recognized as a certifying entity shall submit its request to the Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC. 20555−0001.) or

(b) The licensee may, until January 1, 2002, allow an individual who has not met the requirements above in subparagraph (1)(a) to act as a radiographer after the individual has received training in the subjects outlined below in paragraph (7) and demonstrated an understanding of these subjects by successful completion of a written examination that was previously submitted to and approved by the Division.

(2) In addition, the licensee may not permit any individual to act as a radiographer until the individual:

(a) Has received copies of and instruction in the requirements in this chapter; in applicable rules of Chapters 1200−2−5 and 1200−2−10, in applicable U.S. DOT regulations as referenced in 10 CFR part 71, license or registration conditions and the licensee's or registrant's operating and emergency procedures;

(b) Has demonstrated understanding of the licensee's license and operating and emergency procedures by successful completion of a written or oral examination covering this material.

(c) Has received training in the use of 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.

(d) Has demonstrated understanding of the use of radiographic exposure devices, sources, survey instruments and associated equipment described above in subparagraphs (2)(a) and (2)(c) by successful completion of a practical examination covering this material.

(3) The licensee may not permit any individual to act as a radiographer's assistant until the individual:

(a) Has received copies of and instruction in the requirements in this chapter; in applicable rules of Chapters 1200−2−5 and 1200−2−10, in applicable U.S. DOT regulations as referenced in 10 CFR part 71, license or registration conditions and the licensee's or registrant's operating and emergency procedures;

(b) Has developed competence to use, under the personal supervision of the radiographer, the radiographic exposure devices, sealed sources, associated equipment and radiation survey instruments that the assistant will use; and

(c) Has demonstrated understanding of the instructions provided above in subparagraph (3)(a) by successfully completing a written test on the subjects covered and has demonstrated competence in the use of hardware described above in subparagraph (3)(b) by successful completion of a practical examination on the use of such hardware.

(4) The licensee shall provide annual refresher safety training for each radiographer and radiographer's assistant at intervals not to exceed 12 months.

(5) Except as provided below in subparagraph (5)(d), the radiological safety officer or designee shall conduct an inspection program of the job performance of each radiographer and radiographer's assistant to ensure that the Division's regulations, license requirements and the applicant's operating and emergency procedures are followed. The inspection program shall:

(a) Include observation of the performance of each radiographer and radiographer's assistant during an actual industrial radiographic operation, at intervals not to exceed six (6) months; and

(b) Provide that, if a radiographer or a radiographer's assistant has not participated in an industrial radiographic operation for more than six (6) months since the last inspection, the radiographer shall demonstrate knowledge of the training requirements of subparagraph 1200−2−8−.07(2)(c) and the radiographer's assistant shall re−demonstrate knowledge of the training requirements of subparagraph 1200−2−8−.07(3)(b) by a practical examination before these individuals can next participate in a radiographic operation.

(c) The Division may consider alternatives in those situations where the individual serves as both radiographer and radiological safety officer.

(d) In those operations where a single individual serves as both radiographer and radiological safety officer and performs all radiography operations, an inspection program is not required.

(6) The licensee shall maintain records of the above training to include certification documents, written and practical examinations, refresher safety training and inspections of job performance in accordance with paragraph 1200−2−8−.05(1)(c).

(7) The licensee shall include the following subjects required above in paragraph (1):

(a) Fundamentals of radiation safety including:

1. Characteristics of gamma radiation;

2. Units of radiation dose and quantity of radioactivity;

3. Hazards of exposure to radiation;

4. Levels of radiation from licensed material; and

5. Methods of controlling radiation dose (time, distance and shielding);

(b) Radiation detection instruments including:

1. Use, operation, calibration and limitations of radiation survey instruments;

2. Survey techniques; and

3. Use of personnel monitoring equipment;

(c) Equipment to be used including:

1. Operation and control of radiographic exposure equipment, remote handling equipment and storage containers, including pictures or models of source assemblies (pigtails).

2. Storage, control and disposal of licensed material; and

3. Inspection and maintenance of equipment.

(d) The requirements of pertinent Federal regulations; and

(e) Case histories of accidents in radiography.

(8) Licensees will have until January 1, 2002, to comply with the additional training requirements specified above in paragraphs (2) and (3).

(9) Licensees will have until January 1, 2002 to comply with the certification requirements specified above in paragraph (1). Records of radiographer certification maintained in accordance with part 1200−2−8−.05(1)(c)1 provide appropriate affirmation of certification requirements specified above in paragraph (1).

Authority: T.C.A. §§ 4−5−201 et seq. and 68−202−206.

Rule 1200−2−10−.10 is amended by adding paragraph (8). The paragraph shall read:

(8) Capsules containing carbon−14 urea for 'in vivo' diagnostic use for humans.

(a) Except as provided in subparagraphs (8)(b) and (c) below, any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns or

acquires capsules containing 1 microcurie (37 kilobecquerels) carbon−14 urea (allowing for nominal variation that may occur during the manufacturing process) each, for 'in vivo' diagnostic use for humans.

(b) Any person who desires to use the capsules for research involving human subjects shall apply for and receive a specific license under Chapter 1200−2−10.

(c) Any person who desires to manufacture, prepare, process, produce, package, repackage, or transfer for commercial distribution such capsules shall apply for and receive a specific license pursuant to 10 CFR 32.21.

(d) Nothing in this section relieves persons from complying with applicable FDA, other Federal and State requirements governing receipt, administration and use of drugs.

Authority: T.C.A. §§ 4−5−201 et seq. and 68−202−206.

Paragraph (10) of Rule 1200−2−10−.13 Special Requirements for Issuance of Specific Licenses is amended by deleting the paragraph and substituting the following, so that as amended the paragraph shall read:

(10) Manufacture, preparation or transfer for commercial distribution of radiopharmaceuticals containing radioactive material for medical use under group licenses.

(a) In addition to the requirements set forth in 1200−2−10−.12, a specific license to manufacture and distribute radiopharmaceuticals containing radioactive material for use by persons licensed pursuant to 1200−2−10−.14 for uses listed in Group I, Group II, Group IV, or Group V or 1200−2−10−.14(6) will be issued only if:

1. The requested site for manufacture and/or distribution of radiopharmaceuticals is located within Tennessee;

2. The applicant submits evidence that the applicant is at least one of the following:

(i) Registered or licensed with the U. S. Food and Drug Administration (FDA) as a drug manufacturer;

(ii) Registered or licensed with a State agency as a drug manufacturer; or

(iii) Licensed as a pharmacy by the Tennessee Board of Pharmacy.

3. The applicant submits information on the radionuclide; chemical and physical form; packaging including maximum activity per vial, syringe, generator or other container of the radioactive drug; and shielding provided by the packaging of the radioactive material for safe handling and storage of radiopharmaceuticals by group licensees; and

4. The applicant satisfies the following labeling requirements:

(i) 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 shall 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.

(ii) 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 shall 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.

(b) A licensee described above by subpart (a)2(iii):

1. May prepare radioactive drugs for medical use, as defined in subparagraph 1200–2–4–.04(o), provided that the radioactive drug is prepared by either an authorized nuclear pharmacist, as specified below in parts (b)2 and (b)3 this paragraph, or an individual under the supervision of an authorized nuclear pharmacist.

2. May allow a pharmacist to work as an authorized nuclear pharmacist if:

(i) This individual qualifies as an authorized nuclear pharmacist as defined in subparagraph 1200–2–4–.04(1)(lll),

(ii) This individual meets the requirements specified in part 1200–2–10–.35(1)(a)2 and the licensee has received an approved license amendment identifying this individual as an authorized nuclear pharmacist, or

(iii) This individual is designated as an authorized nuclear pharmacist in accordance with part 4 of this subparagraph.

3. The actions authorized above in parts 1 and 2 are permitted in spite of more restrictive language in license conditions.

4. May designate a pharmacist (as defined in subparagraph 1200–2–4–.04(1)(lll)) as an authorized nuclear pharmacist if the individual is identified as of {effective date of amendment}, as an 'authorized user' on a nuclear pharmacy license issued by the Division under this chapter.

5. Shall provide to the Division a copy of each individual's certification by the Board of Pharmaceutical Specialties, the Division, U.S. Nuclear Regulatory Commission or other Agreement State license and a copy of the state pharmacy license or registration, no later than 30 days after the date that the licensee allows, pursuant to subparts 2(i) and 2(iii) of this subparagraph, the individual to work as an authorized nuclear pharmacist.

(c) A licensee shall possess and use instrumentation to measure the radioactivity of radioactive drugs. The licensee shall have procedures for use of the instrumentation. The licensee shall measure by direct amount of radioactivity in

dosages of alpha−, beta−, or photon−emitting radioactive drugs before transfer for commercial distribution. In addition, the licensee shall:

1. 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

2. Check each instrument for constancy and proper operation at the beginning of each day of use.

(d) Nothing in this rule relieves the licensee from complying with applicable FDA, other Federal and State requirements governing radioactive drugs.

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Subpart (2)(c)2(viii) of Rule 1200−2−10−.14 Specific Licenses for Certain Groups of Medical Uses of Radioactive Material is amended by deleting the subpart and substituting the following, so that as amended the subpart shall read:

(2)(c)2 (viii) Release of individuals treated with temporary implants.

(I) Immediately after removing the last temporary implant source from an individual, the licensee shall make a radiation survey of the patient or the human research subject with a radiation detection survey instrument to confirm that all sources have been removed. The licensee shall not release from confinement for medical care an individual treated by temporary implant until all sources have been removed.

(II) A licensee shall retain a record of surveys for three (3) years. Each record shall include the date of the survey, the name of the individual, the dose rate from the individual expressed as millirem per hour and measured at 1−meter from the individual, the survey instrument used, and the initials of the individual who made the survey; and

Authority: T.C.A. §§4−5−201 et seq. and 68−202−203 and 206.

Rule 1200−2−10−.14 Specific Licenses for Certain Groups of Medical Uses of Radioactive Material is amended by adding subparagraph (2)(e):

(2) (e) For Groups IV, V and VI. Release of individuals containing radiopharmaceuticals or permanent implants.

1. The licensee may authorize the release from its control of any individual who has been administered radiopharmaceuticals or permanent 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 millisieverts (0.5 rem).

2. The licensee shall provide the released individual with instructions, including written instructions, on actions recommended to maintain doses to other

individuals ALARA if the total effective dose equivalent to any other individual is likely to exceed 1 millisievert (0.1 rem). If the dose to a breast–feeding infant or child could exceed 1 millisievert (0.1 rem) assuming there were no interruption of breast–feeding, the instructions shall also include:

(i) Guidance on the interruption or discontinuation of breast–feeding and

(ii) Information on the consequences of failure to follow the guidance.

3. The licensee shall maintain a record of the basis for authorizing the release of an individual, for three (3) years after the date of release, if the total effective dose equivalent is calculated by:

(i) Using the retained activity rather than the activity administered,

(ii) Using an occupancy factor less than 0.25 at 1–meter,

(iii) Using the biological or effective half–life, or

(iv) Considering the shielding by tissue.

4. The licensee shall maintain a record, for three (3) years after the date of release, that instructions 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 millisieverts (0.5 rem).

Authority: T.C.A. §§4–5–201 et seq. and 68–202–203 and 206.

Rule 1200–2–10–.16 Specific Terms and Conditions of Licenses is amended by adding paragraph (8). The paragraph shall read:

(8) When temporary job–sites are authorized on a specific license, radioactive material may be used at temporary job–sites, in areas not under exclusive federal jurisdiction, throughout the State of Tennessee.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Part (1)(b)2 of Rule 1200–2–10–.27 is amended by deleting the terms "1200–2–4–.04(1)(ww)" and "1200–2–514(2)" and substituting the terms "1200–2–4–.04(1)(rrr)" and "1200–2–4–.12", so that as amended the part shall read:

(1) (b) 2. Any worker's representative shall be an employee of the licensee or registrant and should be a worker as defined in 1200–2–4–.04(1)(rrr) and shall have received instructions as specified in 1200–2–4–.12.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Rule 1200–2–10–.30 Transportation of Radioactive Materials is amended by adding the following and changing the rule name, so that as amended the rule shall read:

1200–2–10–.30 Packaging and Transportation of Radioactive Material.

(1) Except as authorized in a general license or a specific license issued by the Division, or as exempted in this rule, no licensee may:

(a) Deliver licensed material to a carrier for transport; or

(b) Transport licensed material.

(2) An application by physicians as defined in 1200–2–4–.04(1)(nn) for an amendment to a specific license may be submitted to the Department to request specific conditions to their license to transport radioactive material in the course of their practice of medicine.

(3) A licensee who, under a general or specific license, transports licensed material outside its site of authorized use or on public highways, or who delivers licensed material to a carrier for transport, shall comply with the requirements of this rule and with the applicable requirements of the U.S. DOT regulations in 49 CFR parts 170 through 189 appropriate to the mode of transport.

(a) The licensee shall particularly note U.S. DOT regulations in the following areas:

1. Packaging: 49 CFR part 173, subparts A and B and I;.

2. Marking and labeling: 49 CFR 172, subpart D, 172.400 through 172.407, 172.436 through 172.440 and subpart E;

3. Placarding: 49 CFR part 172, subpart F, especially 172.500 through 172.519, 172.556 and appendices B and C;

4. Accident reporting: 49 CFR part 171, 171.15 and 171.16;

5. Shipping papers and emergency information: 49 CFR part 172, subparts C and G;

6. Hazardous material employee training: 49 CFR part 172, subpart H; and

7. Hazardous material shipper/carrier registration: 49 CFR part 107, subpart G.

(b) The licensee shall also note U.S. DOT regulations pertaining to the following modes of transportation:

1. Rail: 49 CFR part 174, subparts A through D and K;

2. Air: 49 CFR part 175;

3. Vessel: 49 CFR part 176, subparts A through F and M; and

4. Public highway: 49 CFR part 177 and parts 390 through 397.

(4) If U.S. DOT regulations are not applicable to a shipment of licensed material, the licensee shall conform to the standards and requirements of the U.S. DOT specified above in subparagraph (3)(a) to the same extent as if the shipment or transportation were subject to U.S. DOT regulations. A request for modification, waiver or exemption from those requirements, and any notification referred to in those requirements, shall be filed with, or made to, the Director of the Division of Radiological Health at the address given in Rule 1200–2–4–.07.

(5) Exemption for low−level materials.

1. A licensee is exempt from all requirements of this rule with respect to shipment or carriage of a package containing radioactive material having a specific activity not greater than 0.002 μCi/g (70 Bq/g).

2. A licensee is exempt from all requirements of this rule other than paragraphs 1200−2−10−.30(3) and (4) and (10), with respect to shipment or carriage of the following packages, provided the packages contain no fissile material or the fissile material exemption standards of 10 CFR 71.53 are satisfied:

(i) A package containing no more than a Type A quantity of radioactive material;

(ii) A package in which the only radioactive material is low specific activity (LSA) material or surface contaminated objects (SCO), provided the external radiation level at 3−meters from the unshielded material or objects does not exceed 10 mSv/h (1 rem/h); or

(iii) A package transported within locations within the United States that contains only americium or plutonium in special form with an aggregate radioactivity not to exceed 20 curies.

3. A licensee is exempt from all requirements of this rule other than paragraphs 1200−2−10−.30(3) and (4) and (10), with respect to shipment or carriage of low−specific−activity (LSA) material in group LSA−I, or surface contaminated objects (SCO's) in group SCO−I.

(6) General license: U.S. NRC−approved package.

(a) A general license is hereby issued to any licensee of the Division 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 U.S. Nuclear Regulatory Commission.

(b) This general license applies only to a licensee who:

1. Has a copy of the certificate of compliance, 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 10 CFR 71;

3. Submits in writing to the Director, Division of Radiological Health, at the address given in Rule 1200−2−4−.07, before the licensee's first use of the package, the licensee's name and license number and the package identification number specified in the package approval; and

4. Has submitted to the Division and received Division approval for a quality assurance program that satisfies the provisions found in subpart H of 10 CFR 71.

(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 U.S. NRC before April 1, 1996, the general license is subject to the additional restrictions below in paragraph (7).

(7) Previously approved package.

(a) A Type B package previously approved by U.S. NRC but not designated as B(U) or B(M) in the identification number of the U.S. NRC Certificate of Compliance, may be used under the general license above in paragraph (5) with the following additional conditions:

1. Fabrication of the packaging was satisfactorily completed by August 31, 1986, as demonstrated by application of its model number in accordance with Sec. 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 U.S. 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.

(b) 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 U.S. NRC but without the designation '−85' in the identification number of the U.S. NRC Certificate of Compliance, may be used under the general license above in paragraph (5) with the following additional conditions:

1. Fabrication of the package was satisfactorily completed by April 1, 1999 as demonstrated by application of its model number in accordance with 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 U.S. 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.

(8) General license: U.S. DOT specification container.

(a) A general license is issued to any licensee of the Division 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 U.S. DOT regulations at 49 CFR parts 173 and 178.

(b) 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 this rule; and

3. Has submitted to the Division and received Division approval for a quality assurance program that satisfies the provisions found in subpart H of 10 CFR 71.

(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 U.S. DOT regulations at 49 CFR 173.403.

(9) General license: Use of foreign approved package.

(a) A general license is issued to any licensee of the Division 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 U.S. DOT as meeting the applicable requirements of 49 CFR 171.12.

(b) 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;

2. Complies with the terms and conditions of the certificate and revalidation and with the applicable requirements of this rule; and

3. Has submitted to the Division and received Division approval for a quality assurance program that satisfies the provisions found in subpart H of 10 CFR 71.

(c) This general license applies only to shipments made to or from locations outside the United States.

(10) Preliminary determinations.

(a) Before the first use of any packaging for the shipment of licensed material:

1. The licensee shall ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects that could significantly reduce the effectiveness of the packaging or impact compliance with the standards specified in 10 CFR 71.

2. Where the maximum normal operating pressure will exceed 35 kPa (5 lbf/in^2) gauge, the licensee shall test the containment system at an internal pressure at least 50 percent (50%) higher than the maximum normal operating pressure, to verify the capability of that system to maintain its structural integrity at that pressure; and

3. The licensee shall conspicuously and durably mark the packaging with its model number, serial number, gross weight and a package identification number assigned by the U.S. Nuclear Regulatory Commission (U.S. NRC). Before applying the model number, the licensee shall determine that the packaging has been fabricated in accordance with the design approved by the U.S. NRC.

(b) This general license applies only to a licensee who has submitted to the Division and received Division approval for a quality assurance program that satisfies the provisions found in subpart H of 10 CFR 71.

(11) Routine determinations.

(a) Before each shipment of licensed material, the licensee shall ensure that the package with its contents satisfies the applicable requirements of this rule and of the license. The licensee shall determine that:

1. The package is proper for the contents to be shipped in accordance with 49 CFR 173.401–435;

2. The package is in unimpaired physical condition except for superficial defects such as marks or dents;

3. Each closure device of the packaging, including any required gasket, is properly installed, secured and free of defects;

4. Any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid in accordance with 10 CFR 71, Subpart F;

5. Any pressure relief device is operable and set in accordance with written procedures;

6. The package has been loaded and closed in accordance with written procedures;

7. For fissile material, any moderator or neutron absorber, if required, is present and in proper condition;

8. 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 10 CFR 71.45;

9. 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 U.S. DOT regulations in 49 CFR 173.443;

10. External radiation levels around the package and around the vehicle, if applicable, will not exceed the limits specified in 10 CFR 71.47 at any time during transportation; and

11. Accessible package surface temperatures will not exceed the limits specified in 10 CFR 71.43(g) at any time during transportation.

(b) Reserved.

(12) Air transport of plutonium.

(a) Notwithstanding the provisions of any general licenses and notwithstanding any exemptions stated directly in this rule 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 not greater than 0.002 mCi/g (70 Bq/g) of material 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 paragraphs 1200−2−10−.30(3) and (4); 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 U.S. Nuclear Regulatory Commission.

(b) Nothing in subparagraph (a) of this paragraph is to be interpreted as removing or diminishing the requirements of 10 CFR 73.24.

(c) For a shipment of plutonium by air that is subject to part (a)4 above, 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) Opening instructions. 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 subparagraph 1200−2−5−.115(5)(a).

(14) Records.

(a) Each licensee shall maintain, for a period of three (3) years after shipment, a record of each shipment of licensed material not exempt under paragraph 1200−2−10−.30(9), showing where applicable:

1. Identification of the packaging by model number and serial number;

2. Verification that there are no significant defects in the packaging, as shipped;

3. Volume and identification of coolant;

4. Type and quantity of licensed material in each package and the total quantity of each shipment;

5. For each item of irradiated fissile material:

(i) Identification by model number and serial number;

(ii) Irradiation and decay history to the extent appropriate to demonstrate that its nuclear and thermal characteristics comply with license conditions; and

(iii) Any abnormal or unusual condition relevant to radiation safety;

6. Date of the shipment;

7. For fissile packages and for Type B packages, any special controls exercised;

8. Name and address of the transferee;

9. Address to which the shipment was made; and

10. Results of the determinations required by paragraph 1200−2−10−.30(11) and by the conditions of the package approval.

(b) The licensee shall make available to the Division for inspection, upon reasonable notice, all records required by this rule. Records are only valid if stamped, initialed, or signed and dated by authorized personnel or otherwise authenticated.

(15) The licensee shall maintain sufficient written records to furnish evidence of the quality of packaging. The records to be maintained include results of the determinations required by paragraph 1200−2−10−.30(11); design, fabrication and assembly records; results of reviews, inspections, tests and audits; results of monitoring work performance and materials analyses; and results of maintenance, modification and repair activities. Inspection, test and audit records shall identify the inspector or data recorder, the type of observation, the results, the acceptability and the action taken in connection with any deficiencies noted. The records shall be retained for three years after the life of the packaging to which they apply.

(16) Inspection and tests. In addition to the requirements in paragraph 1200−2−10−.27(1) and Rule 1200−2−10−.28, the licensee shall notify the Director, Division of Radiological Health, at the address given in Rule 1200−2−4−.07, at least 45 days before fabrication of a package to be used for the shipment of licensed material having a decay heat load in excess of 5 kW or with a maximum normal operating pressure in excess of 103 kPa (15 lbf/in^2) gauge.

(17) Reports. The licensee shall report to the Director, Division of Radiological Health, within 30 days:

(a) Any instance in which there is significant reduction in the effectiveness of any approved Type B, or fissile, packaging during use;

(b) Details of any defects with safety significance in Type B, or fissile, packaging after first use, with the means employed to repair the defects and prevent their recurrence; or

(c) Instances in which the conditions of approval in the certificate of compliance were not observed in making a shipment.

(18) Advance notification of shipment of irradiated reactor fuel and nuclear waste.

(a) As specified in subparagraphs (b), (c) and (d) below, each licensee shall provide advance notification to the governor of Tennessee, or the governor's designee, and to the Director, Division of Radiological Health, 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 10 CFR 73.37(f). 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 10 CFR 71 to be in Type B packaging for transportation;

2. The licensed material is being transported to or across the 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 A_1 value of the radionuclides as specified in appendix A, Table A–1 for special form radioactive material;

(ii) 3000 times the A_2 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 shall be made in writing to the office of each appropriate governor or governor's designee and to the Director, Division of Radiological Health.

2. A notification delivered by mail shall be postmarked at least seven (7) days before the beginning of the seven (7) day period during which departure of the shipment is estimated to occur.

3. A notification delivered by messenger shall reach the office of the governor, or of the governor's designee, and of the Director, Division of Radiological Health, at least four (4) days before the beginning of the seven (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 30 to reflect any changes in information.

(iii) A list of the names and mailing addresses of the governors' designees is available on request from the Director, Office of State Programs, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001.

(iv) The licensee shall retain a copy of the notification as a record for three (3) years.

(d) Information to be furnished in advance notification of shipment. Each advance notification of shipment of irradiated reactor fuel or nuclear waste shall 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 U.S. DOT in 49 CFR 172.202 and 172.203(d);

3. The point of origin of the shipment and the seven (7) day period during which departure of the shipment is estimated to occur;

4. The seven (7) day period during which arrival of the shipment at the State's boundaries is estimated to occur;

5. The destination of the shipment and the seven (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.

(e) Revision notice. A licensee who finds that schedule information previously furnished to the governor, or governor's designee, and to the Director, Division of Radiological Health, in accordance with this section, will not be met, shall telephone a responsible individual in the office of the governor of the State, or of the governor's designee, and of the Division of Radiological Health and inform those individuals of the extent of the delay beyond the schedule originally reported. The licensee shall maintain a record of the name of the individual contacted for three (3) years.

(f) Cancellation notice.

1. Each licensee who cancels an irradiated reactor fuel or nuclear waste shipment for which advance notification has been sent shall send a cancellation notice to the governor of each State, or to the governor's designee, previously notified, and to the Director, Division of Radiological Health.

2. The licensee shall state in the notice that it is a cancellation and identify the advance notification that is being canceled. The licensee shall retain a copy of the notice as a record for three (3) years.

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Paragraph (12) of Rule 1200–2–12–.03 Definitions is amended by deleting the term "1200–2–4–.04(1)(ll)" and substituting the term "1200–2–4–.04(1)(yy)", so that as amended the paragraph shall read:

(12) Sealed source – See Rule 1200–2–4–.04(1)(yy).

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Paragraph (2) of Rule 1200–2–4–.23 Security is amended by deleting the term "1200–2–4–.04(1)(jj) and substituting the term "1200–2–5–.32(62)", so that as amended the paragraph shall read:

(2) 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 shall maintain direct surveillance of the operation to prevent unauthorized entry into a restricted area, as defined in Rule 1200–2–5–.32(62).

Authority: T.C.A. §§4–5–201 et seq. and 68–202–101 et seq.

Other Information

Oral or written comments are invited at the hearing. In addition, written comments may be submitted to Barbara A. Davis at the Division of Radiological Health, Central Office, address below, prior to or following the public hearing. However, the Division must receive such written comments in its Central Office by 4:30 p.m. (CST), April 30, 2001, in order to assure consideration.

Copies of draft rules are available for review in the Public Access Areas of the following Departmental Environmental Assistance Centers:

Chattanooga Environmental Assistance Center
State Office Building
540 McCallie Avenue, Suite 550
Chattanooga, TN 37402–2013
(423) 634–5745 / 1–888–891–8332

Knoxville Environmental Assistance Center
2700 Middlebrook Pike, Suite 220
Knoxville, TN 37921–5602
(865) 594–6035 / 1–888–891–8332

Memphis Environmental Assistance Center
Perimeter Park
2510 Mt Moriah Road, Suite E–645
Memphis, TN 38115–1520
(901) 368–7939 / 1–888–891–8332

Nashville Environmental Assistance Center
711 R S Gass Boulevard
Nashville, TN 37243
(615) 687–7000 / 1–888–891–8332

Copies are available for review also at the Division of Radiological Health, Central Office:

Division of Radiological Health
L & C Annex, Third Floor
401 Church Street
Nashville, TN 37243–1532
(615)532–0364

The "DRAFT" rules may be accessed for review also at the Department's World Wide Web Site located at **http://www.state.tn.us/environment.htm**

I certify that this is an accurate and complete representation of the intent and scope of rulemaking proposed by the Tennessee Department of Environment and Conservation.

_____

Lawrence E. Nanney, Director
Division of Radiological Health

Subscribed and sworn to before me this the _____ day of _____, 20_____.

_____

Notary Public

My commission expires on the _____ day of _____, 20_____.

The notice of rulemaking set out herein was properly filed in the Department of State on the _____ day of _____, 20_____.

_____

Riley C. Darnell
Secretary of State

By _____