RULES
OF
THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH

CHAPTER 0400-20-10
LICENSING AND REGISTRATION

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0400-20-10-.01 PURPOSE.

This Chapter establishes requirements for the licensing and registration of sources of radiation.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.02 SCOPE.

Except as otherwise specifically provided, no person shall manufacture, produce, receive, possess, use, transfer, own, or acquire radioactive material unless authorized in a specific or general license issued pursuant to this Chapter. All other sources of radiation, registered inspectors, and x-ray installations and services unless exempt from this Chapter under Rule 0400-20-10-.03, 0400-20-10-.04, 0400-20-10-.06, 0400-20-10-.07 or 0400-20-10-.30 shall be registered with the Division in accordance with the requirements of Rule 0400-20-10-.24.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.03 EXEMPTIONS: SOURCE MATERIAL.

(1) Any person is exempt from this Chapter to the extent that such person receives, possesses, uses, or transfers source material in any chemical mixture, compound, solution or alloy in

(Rule 0400-20-10-.03, continued)

which the source material is by weight less than 1/20 of 1 percent (0.05 percent) of the mixture, compound, solution, or alloy.

(2) Any person is exempt from this Chapter to the extent that such person receives, possesses, uses or transfers unrefined and unprocessed ore containing source material; provided that, except as authorized in a specific license, such person shall not refine or process such ore.

(3) Any person is exempt from the requirements for a license set forth in Chapters 0400-20-04, 0400-20-05, and 0400-20-10 to the extent that such person receives, possesses, uses, or transfers:

(a) Any quantities of thorium contained in:

1. Incandescent gas mantles;

2. Vacuum tubes;

3. Welding rods;

4. Electric lamps for illuminating purposes provided that each lamp does not contain more than 50 milligrams of thorium;

5. Germicidal lamps, sunlamps, and lamps for outdoor or industrial lighting provided that each lamp does not contain more than two grams of thorium;

6. Rare earth metals and compounds, mixtures, and products containing not more than 0.25 percent by weight of thorium, uranium, or any combination of these; or

7. Personnel neutron dosimeters provided that each dosimeter does not contain more than 50 milligrams of thorium.

(b) Source material contained in the following products:

1. Glazed ceramic tableware manufactured before August 27, 2013, provided that the glaze contains not more than 20 percent by weight source material;

2. Piezoelectric ceramic containing not more than two percent by weight source material;

3. Glassware containing not more than two percent by weight source material or, for glassware manufactured before August 27, 2013, 10 percent by weight source material; but not including commercially manufactured glass brick, pane glass, ceramic tile, or other glass or ceramic used in construction;

4. Glass enamel or glass enamel frit containing not more than 10 percent by weight source material imported or ordered for importation into the United States, or initially distributed by manufacturers in the United States, before July 25, 1983.

(c) Photographic film, negatives, and prints containing uranium or thorium.

(d) Any finished product or part fabricated of, or containing tungsten or magnesium-thorium alloys, provided that the thorium content of the alloy does not exceed four percent by weight and that the exemption contained in this subparagraph shall not be deemed to authorize the chemical, physical, or metallurgical treatment or processing of any such product or part.

(Rule 0400-20-10-.03, continued)

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

1. Each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM"[1] [Depleting uranium means the source material uranium in which the isotope uranium-235 is less than 0.711 weight percent of the total uranium present];

2. Each counterweight is durably and legibly labeled or marked with the identification of manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED"[1]; and

3. The exemption contained in this subparagraph shall not be deemed authorize the chemical, physical, or metallurgical treatment or processing of any such counterweights other than repair or restoration of any plating or other covering.

(f) Uranium used as shielding constituting part of any shipping container which is conspicuously and legibly impressed with the legend "CAUTION - RADIOACTIVE SHIELDING - URANIUM" and which is encased in mild steel or equally fire resistant metal of minimum wall thickness of 1/8 inch.

(g) Thorium or uranium contained in or on finished optical lenses and mirrors, provided that each lens or mirror does not contain more than 10 percent by weight thorium or uranium or, for lenses manufactured before August 27, 2013, 30 percent by weight of thorium; and that the exemption contained in this subparagraph shall not be deemed to authorize either:

1. The shaping, grinding, or polishing of such lens or mirror or manufacturing processes other than the assembly of such lens or mirror into optical systems and devices without any alteration of the lens or mirror; or

2. The receipt, possession, use or transfer of uranium or thorium contained in contact lenses or in spectacles or in eye pieces in binoculars or other optical instruments.

(h) Reserved.

(i) Thorium contained in any finished aircraft engine part containing nickel-thoria alloy, provided that:

1. The thorium is dispersed in the nickel-thoria alloy in the form of finely divided thoria (thorium dioxide); and

2. The thorium content in the nickel-thoria alloy does not exceed four percent by weight.

(4) The exemptions in paragraph (3) of this rule do not authorize the manufacture of any of the products described.

[1] The requirements specified in parts 1 and 2 of this subparagraph need not be met by counterweights manufactured prior to December 31, 1969; provided that such counterweights were manufactured under a specific license issued by the Atomic Energy Commission and were impressed with the legend required by 10 CFR 40.13(c)(5)(ii) in effect on June 30, 1969.

(Rule 0400-20-10-.03, continued)

(5) No person may initially transfer for sale or distribution a product containing source material to persons exempt under paragraph (3) of Rule 0400-20-10-.03, unless authorized by a license issued under 10 CFR 40.52 to initially transfer such products for sale or distribution.

(a) Persons initially distributing source material in products covered by the exemptions in paragraph (3) of Rule 0400-20-10-.03 before August 27, 2013, without specific authorization may continue such distribution for one year beyond this date (August 27, 2013). Initial distribution may also be continued until the U.S. NRC takes final action on a pending application for license or license amendment to specifically authorize distribution submitted no later than one year beyond this date.

(b) Persons authorized to manufacture, process, or produce these materials or products containing source material by the Division and persons who import finished products or parts, for sale or distribution must be authorized by a license issued under 10 CFR 40.52 for distribution only and are exempt from the requirements of Chapters 0400-20-04 and 0400-20-05.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed September 1, 2021; effective November 30, 2021.*

0400-20-10-.04 EXEMPTIONS: RADIOACTIVE MATERIALS OTHER THAN SOURCE MATERIAL.

(1) Exempt concentrations.

(a) Except as provided in subparagraphs (b) and (d) of this paragraph, any person is exempt from these rules to the extent that such person receives, possesses, uses, transfers, owns, or acquires products containing radioactive material introduced in concentrations not in excess of those listed in Schedule RHS 8-4.

(b) No person may introduce radioactive material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under subparagraph (a) of this paragraph or equivalent regulations of the U.S. Nuclear Regulatory Commission, any Agreement State or Licensing State except in accordance with a license issued pursuant 10 CFR 32.11.

(c) This paragraph shall not be deemed to authorize the import of radioactive material or products containing radioactive material.

(d) A manufacturer, processor, or producer of a product or material is exempt from the requirements for a license set forth in these rules to the extent that this person transfers radioactive material contained in a product or material in concentrations not in excess of those specified in Schedule RHS 8-4 in the Appendix to this Chapter and introduced into the product or material by a licensee holding a specific license issued by the NRC expressly authorizing such introduction. This exemption does not apply to the transfer of radioactive material contained in any food, beverage, cosmetic, drug, or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

(2) Certain items containing radioactive material other than source material.

(a) Except for persons who apply radioactive materials to or persons who incorporate radioactive material into the products listed in this paragraph, any person is exempt

(Rule 0400-20-10-.04, continued)

from these rules to the extent that he receives, possesses, uses, transfers, owns or acquires the following products[2];

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

   (i) 25 millicuries of tritium per timepiece;

   (ii) 5 millicuries of tritium per hand;

   (iii) 15 millicuries of tritium per dial (bezels when used shall be considered as part of the dial);

   (iv) 100 microcuries of promethium-147 per watch or 200 microcuries of promethium-147 per any other timepiece;

   (v) 20 microcuries of promethium-147 per watch hand or 40 microcuries of promethium-147 per other timepiece hand;

   (vi) 60 microcuries of promethium-147 per watch dial or 120 microcuries of promethium-147 per other timepiece dial (bezels when used shall be considered part of the dial);

   (vii) The levels of radiation from hands and dials containing radioactive materials will not exceed when measured through 50 milligrams per square centimeter of absorber:

      (I) For wrist watches, 0.1 millirad per hour at 10 centimeters from any surface;

      (II) For pocket watches, 0.1 millirad per hour at 1 centimeter from any surface;

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

   (viii) One microcurie of radium-226 per timepiece in intact timepieces acquired prior to May 31, 1986.

2. Certain names devices and equipment

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

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

[2] Authority to transfer possession or control by the manufacturer, processor or producer of any equipment, device, commodity, or other product containing radioactive material, whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the U.S. Nuclear Regulatory Commission, Washington, DC 20555.

(iii) Such devices authorized before October 23, 2012 for use under the general license then provided in 10 CFR 31.3 and equivalent regulations of Agreement States and manufactured, tested, and labeled be the manufacturer in accordance with specifications contained in a specific license issued by the Nuclear Regulatory Commission.

3. Balances of precision containing not more than one millicurie of tritium per balance or not more than 0.5 millicurie of tritium per balance part manufactured before December 17, 2007.

4. Reserved.

5. Marine compasses containing not more than 750 millicuries of tritium gas and other marine navigational instruments containing not more than 250 millicuries of tritium gas manufactured before December 17, 2007.

6. Reserved.

7. Electron tubes[3] containing not more than one of the following specified quantities of radioactive material per tube:

(i) 150 millicuries of tritium per microwave receiver protector tube or 10 millicuries of tritium per any other electron tube;

(ii) 1 microcurie of cobalt-60;

(iii) 5 microcuries of nickel-63;

(iv) 30 microcuries of krypton-85;

(v) 5 microcuries of cesium-137;

(vi) 30 microcuries of promethium-147;

provided, the levels of radiation from each electron tube containing radioactive material do not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber.

8. Reserved.

9. Reserved.

10. Reserved.

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

(i) Each source contains no more than one exempt quantity set forth in Schedule RHS 8-3;

[3] "Electron tubes", as used in this subparagraph, include spark gap tubes, power tubes, gas tubes, including glow lamps, receiving tubes, microwave tubes, indicator tubes, pickup tubes, radiation detection tubes and any other completely sealed tube that is designed to conduct or control electrical currents.

(Rule 0400-20-10-.04, continued)

(ii) Each instrument contains no more than 10 exempt quantities. For purposes of this part, an instrument's source(s) may contain either one type or different types of radionuclides and an individual exempt quantity may be composed of fractional parts of one or more of the exempt quantities in Schedule RHS 8-3, provided that the sum of such fractions shall not exceed unity; and

(iii) For purposes of this part, 0.05 microcuries of americium-241 is considered an exempt quantity under Schedule RHS 8-3.

12. Reserved.

13. Ionization chamber smoke detectors containing not more than 1 microcurie (μCi) of americium-241 per detector in the form of a foil and designed to protect life and property from fires.

(b) Any person who desires to apply radioactive material to, or to incorporate radioactive material into, the products exempted in subparagraph (a) of this paragraph or who desires to initially transfer for sale or distribution such products containing radioactive material, should apply for a specific license pursuant to 10 CFR 32.14, which license states that the product may be distributed by the licensee to persons exempt from subparagraph (a) of this paragraph.

(3) Exempt quantities.

(a) Except as provided in subparagraphs (c) through (e) of this paragraph, any person is exempt from these rules to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in individual quantities each of which does not exceed the applicable quantity set forth in Schedule RHS 8-3.

(b) Any person who possesses radioactive material received or acquired before September 25, 1971, under the general license formerly provided in this Chapter is exempt from the requirements for a license set forth in this Chapter to the extent that such person possesses, uses, transfers, or owns such radioactive material.

(c) This paragraph does not authorize the production, packaging or repackaging of radioactive material for purposes of commercial distribution, or the incorporation of radioactive material into products intended for commercial distribution.

(d) No person may, for purposes of commercial distribution, transfer radioactive material in the individual quantities set forth in Schedule RHS 8-3, knowing or having reason to believe that such quantities of radioactive material will be transferred to persons exempt under this paragraph or equivalent regulations of the U.S. Nuclear Regulatory Commission, any Agreement State, or any Licensing State, except in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to Section 32.18 of 10 CFR Part 32 or by the Department pursuant to paragraph (14) of Rule 0400-20-10-.13 which license states that the radioactive material may be transferred by the licensee to persons exempt under this paragraph or the equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State or Licensing State.[4]

[4] Authority to transfer possession or control by the manufacturer, processor or producer of any equipment, device, commodity, or other product containing radioactive material, whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the U.S. Nuclear Regulatory Commission, Washington, DC 20555.

(Rule 0400-20-10-.04, continued)

(e) No person may, for purposes of producing an increased radiation level, combine quantities of radioactive material covered by this exemption so that the aggregate quantity exceeds the limits set forth in Schedule RHS 8-3 in the Appendix to this Chapter, except for radioactive material combined within a device placed in use before May 3, 1999, or as otherwise permitted by the rules in this Chapter.

(4) Capsules containing carbon-14 urea for 'in vivo' diagnostic use for humans.

(a) Except as provided in subparagraphs (b) and (c) of this paragraph, any person is exempt from these rules 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 this Chapter.

(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 paragraph relieves persons from complying with applicable FDA, other federal and state requirements governing receipt, administration and use of drugs.

(5) Gas and aerosol detectors containing radioactive material.

(a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution gas and aerosol detectors containing radioactive material, any person is exempt from the requirements of Chapters 0400-20-04, 0400-20-05, and 0400-20-10, to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in gas and aerosol detectors designed to protect health, safety, or property provided that detectors containing radioactive material shall have been manufactured, processed, produced, or initially transferred[5] in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to section 32.26 of 10 CFR Part 32. This exemption also covers gas and aerosol detectors manufactured or distributed before December 8, 2011, in accordance with a specific license issued by an Agreement State under comparable provisions to 10 CFR 32.36 authorizing distribution to persons exempt from regulatory requirements.

(b) Any person who desires to manufacture, process, or produce gas and aerosol detectors containing radioactive material, or to initially transfer such products for use under subparagraph (a) of this paragraph, should apply for a license under 10 CFR 32.26 and for a certificate of registration in accordance with 10 CFR 32.210.

(6) Self luminous products containing radioactive material.

(a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution self-luminous products containing tritium, krypton-85, or promethium-147, any person is exempt from these rules to the extent that such person receives, possesses, uses, transfers, owns or acquires tritium, krypton-85, promethium-147 in self luminous products manufactured, processed, produced, imported, or transferred in

[5] Authority to transfer possession or control by the manufacturer, processor or producer of any equipment, device, commodity, or other product containing radioactive material, whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the U.S. Nuclear Regulatory Commission, Washington, DC 20555.

(Rule 0400-20-10-.04, continued)

accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to Section 32.22 of 10 CFR Part 32, which license authorizes the transfer of the product to persons who are exempt from regulatory requirements.

(b) Any person who desires to manufacture, process, or produce, or initially transfer for sale or distribution self-luminous products containing tritium, krypton-85, or promethium-147 for use under subparagraph (a) of this paragraph, should apply for license under 10 CFR 32.22 and for a certificate of registration in accordance with 10 CFR 21.210.

(c) The exemption in subparagraph (a) of this paragraph does not apply to tritium, krypton-85, or promethium-147 used in products for frivolous purposes or in toys or adornments.

(d) Any person is exempt from these rules to the extent that such person receives, possesses, uses, transfers, or owns self luminous products containing less than 0.1 microcurie of radium-226 which were acquired prior to September 28, 1991.

(7) Certain industrial devices.

(a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution industrial devices containing radioactive material designed and manufactured for the purpose of detecting measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing an ionized atmosphere, any person is exempt from the requirements for a license set forth in Chapters 0400-20-05, 0400-20-07, 0400-20-08, 0400-20-10, and 0400-20-12 to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material, in these certain detecting, measuring, gauging, or controlling devices and certain devices for producing an ionized atmosphere, and manufactured, processed, produced in accordance with a specific license issued under 10 CFR 32.30, which license authorizes the initial transfer of the device for use under this paragraph. This exemption does not cover sources not incorporated into a device, such as calibration and reference sources.

(b) Any person who desires to manufacture, process, produce, or initially transfer for sale or distribution industrial devices containing radioactive material for use under subparagraph (a) of this paragraph, should apply for a license under 10 CFR 32.30 and for a certificate of registration in accordance with 10 CFR 32.210.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017. Amendments filed September 1, 2021; effective November 30, 2021.*

0400-20-10-.05 RESERVED.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.06 EXEMPTIONS: U.S. DEPARTMENT OF ENERGY AND U.S. NUCLEAR REGULATORY COMMISSION.

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

(Rule 0400-20-10-.06, continued)

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

(2) Prime contractors of DOE performing research in, or development, manufacture, storage, testing or transportation of atomic weapons or components thereof;

(3) Prime contractors of DOE using or operating nuclear reactors or other nuclear devices in the U.S. Government-owned vehicle or vessel; and

(4) Any other prime contractor or subcontractor of DOE or NRC when the State and NRC jointly determine that:

(a) Under the terms of the contract or subcontract, there is assurance that the work thereunder can be accomplished with protection of the public health and safety; and

(b) The exemption of such contractor or subcontractor is authorized by law.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.07 OTHER EXEMPTIONS.

(1) The following machines and equipment are exempt from these regulations:

(a) Domestic television receivers, providing the exposure rate at 5 centimeters from any outer surface is less than 0.5 milliroentgen per hour.

(b) Other electrical equipment that produces radiation incidental to its operation for other purposes, providing the dose rate to the whole body at the point of nearest approach to such equipment when any external shielding is removed does not exceed 0.5 rem per year. The production testing or factory servicing for such equipment shall not be exempt.

(c) Radiation producing machines while in transit or storage incident thereto.

(d) Radiation machines which are totally unusable except for salvage parts.

(2) Equipment described in paragraph (1) of this rule shall not be exempt if it is used or handled in such a manner that any individual might receive a dose of radiation in excess of the limits specified in these regulations.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.08 TYPES OF LICENSES.

(1) Licenses for radioactive materials are of two types:

(a) General licenses provided for in this Chapter are effective without the filing of applications with the Division or the issuance of licensing documents to particular persons; however, the Division will require reporting of devices covered by the particular general license in accordance with part (2)(c)13 of Rule 0400-20-10-.10.

(b) Specific licenses are issued to named persons upon applications filed pursuant to this Chapter.

(Rule 0400-20-10-.08, continued)

(2) Reserved.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.09 GENERAL LICENSES – SOURCE MATERIAL[6].

(1) A general license is hereby issued authorizing commercial and industrial firms; research, educational, and medical institutions; and state, and local government agencies to receive, possess, use, and transfer source materials, in their natural isotopic concentrations and in the form of depleted uranium, for research, development, educational, commercial, or operational purposes in the following forms and quantities:

(a) No more than 1.5 kg (3.3 lb) of source material in dispersible forms (e.g., gaseous, liquid, powder, etc.) at any one time. Any material processed by the general licensee that alters the chemical or physical form of the material containing source material must be accounted for as a dispersible form. A person authorized to possess, use, and transfer source material under this paragraph may not receive more than a total of seven kg (15.4 lb) of source material in any one calendar year; and

(b) No more than a total of seven kg (15.4 lb) of source material at any one time. A person authorized to possess, use, and transfer source material under this paragraph may not receive more than a total of 70 kg (154 lb) of uranium and thorium in any one calendar year. A person may not alter the chemical or physical form of the source material possessed under this paragraph unless it is accounted for under the limits of subparagraph (1)(a) of this rule; or

(c) No more than seven kg (15.4 lb) of uranium, removed during the treatment of drinking water, at any one time. A person may not remove more than 70 kg (154 lb) of uranium from drinking water during a calendar year under this paragraph; or

(d) No more than seven kg (15.4 lb) of source material at laboratories for the purpose of determining the concentration of source material contained within the material being analyzed at any one time. A person authorized to possess, use, and transfer source material under this paragraph may not receive more than a total of 70 kg (154 lb) of source material in any one calendar year.

(2) Any person who receives, possesses, uses, or transfers source material in accordance with the general license in paragraph (1) of this rule:

(a) Is prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as may be authorized by the Division of Radiological Health (Division) in a specific license.

(b) Shall not abandon such source material. Source material may be disposed of as follows:

1. A cumulative total of 0.5 kilograms (1.1 lb) of source material in a solid, non-dispersible form may be transferred each calendar year, by a person authorized to receive, possess, use, and transfer source material under this general license to persons receiving the material for permanent disposal. The recipient of source material transferred under the provisions of this paragraph is exempt from the requirements to obtain a license under this part to the extent the source material

6 The term “source material” is defined in paragraph (88) of Rule 0400-20-05-.32.

(Rule 0400-20-10-.09, continued)

is permanently disposed. This provision does not apply to any person who is in possession of source material under a specific license issued under this Chapter; or

2. In accordance with Chapter 0400-20-05-.120.

(c) Is subject to the provisions in Chapter 0400-20-10.

(d) Shall not export such source material except in accordance with 10 CFR part 110.

(3) Any person who receives, possesses, uses, or transfers source material in accordance with paragraph (1) of this rule shall conduct activities so as to minimize contamination of the facility and the environment. When activities involving such source material are permanently ceased at any site, if evidence of significant contamination is identified, the general licensee shall notify the Division by an appropriate method listed in Rule 0400-20-04-.07 about such contamination and may consult with the Division as to the appropriateness of sampling and restoration activities to ensure that any contamination or residual source material remaining at the site where source material was used under this general license is not likely to result in exposures that exceed the limits in paragraph (2) of Rule 0400-20-10-.36.

(4) Persons who receive, possess, use or transfer source material pursuant to the general license issued in accordance with this paragraph are exempt from the provisions of Chapter 0400-20-04 and Chapter 0400-20-05 to the extent that such receipt, possession, use, or transfer is within the terms of such general license, except that such persons shall comply with the provisions under paragraph (2) of Rule 0400-20-10-.36 and Rule 0400-20-05-.120 to the extent necessary to meet the provisions of subparagraph (2)(b) of this rule and paragraph (3) of this rule. However, this exemption shall not be deemed to apply to any such person who is also in possession of source material under a specific license issued pursuant to this Chapter.

(5) No person may initially transfer or distribute source material to persons generally licensed under subparagraphs (1)(a) and (b) of this rule, unless authorized by a specific license issued in accordance with this Chapter. This prohibition does not apply to analytical laboratories returning processed samples to the client who initially provided the sample. Initial distribution of source material to persons generally licensed by paragraph (1) of this rule before August 27, 2013, without specific authorization may continue for one year beyond this date.

(6) A general license is hereby issued authorizing the receipt of title to source material without regard to quantity. The general license under this paragraph does not authorize any person to receive, possess, use or transfer source material.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed September 1, 2021; effective November 30, 2021.*

0400-20-10-.10 GENERAL LICENSES[7] - RADIOACTIVE MATERIAL OTHER THAN SOURCE MATERIAL.

(1) Reserved.

(2) Certain detecting, measuring, gauging or controlling devices and certain devices for producing light or an ionized atmosphere.[8]

[7] Different general licenses are issued in this rule, each of which has its own specific conditions and requirements.

[8] Persons possessing radioactive material in devices under the general license in this paragraph before October 2, 1978, may continue to possess, use or transfer that material in accordance with the requirements in the 1972 edition of the regulations.

(Rule 0400-20-10-.10, continued)

(a) A general license is hereby issued to commercial and industrial firms and research, educational and medical institutions, individuals in the conduct of their business and State or local government agencies to own, acquire, receive, possess, use or transfer, in accordance with the provisions of subparagraphs (b), (c) and (d) of this paragraph, radioactive material contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

(b) 1. The general license in subparagraph (a) of this paragraph applies only to radioactive material contained in devices that have been manufactured or initially transferred and labeled in accordance with the specifications contained in:

(i) A specific license issued by the Division pursuant to paragraph (5) of Rule 0400-20-10-.13, or

(ii) A specific license issued by the U.S. Nuclear Regulatory Commission pursuant to 10 CFR 32.51 or an Agreement State with provisions comparable to paragraph (5) of Rule 0400-20-10-.13.

2. The devices shall have been received from one of the licensees in part 1 of this subparagraph or through a transfer made under part (c)9 of this paragraph.

(c) Persons who own, acquire, receive, possess, use or transfer radioactive material in a device pursuant to the general license contained in subparagraph (a) of this paragraph:

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

2. Shall assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than 6 month intervals or at such other intervals as are specified in the label; however,

(i) Devices containing only krypton need not be tested for leakage of radioactive material; and

(ii) Devices containing only tritium or not more than 100 microcuries of other beta and/or gamma emitting material or 10 microcuries of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose.

3. Shall assure that the tests required by part 2 of this subparagraph and other testing, installation, servicing and removal from installation involving the radioactive material, its shielding or containment, are performed:

(i) In accordance with the instructions provided by the labels, or

(ii) By a person holding an applicable specific license issued by the Division, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State to perform such activities.

4. Shall maintain records showing compliance with the requirements of parts 2 and 3 of this subparagraph. The records shall show the results of tests. The records also shall show the dates of performance of and the names of persons

(Rule 0400-20-10-.10, continued)

performing testing, installation, servicing and removal from installation of the radioactive material, its shielding or containment. The licensee shall retain these records as follows:

(i) Each record of a test for leakage or radioactive material required by part 2 of this subparagraph shall be retained for 3 years after the next required leak test is performed or until the sealed source is transferred or disposed of;

(ii) Each record of a test of the on-off mechanism and indicator required by part 2 of this subparagraph shall be retained for 3 years after the next required test of the on-off mechanism and indicator is performed or until the sealed source is transferred or disposed of; and

(iii) Each record that is required by part 3 of this subparagraph shall be retained for 3 years from the date of the recorded event or until the sealed source is transferred or disposed of.

5. Shall immediately suspend operation of the device if there is a failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on-off mechanism or indicator, or upon the detection of 0.005 microcurie (185 becquerel) or more removable radioactive material. The device may not be operated until it has been repaired by the manufacturer or other person holding an applicable specific license issued by the Division, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State to repair such devices. The device and any radioactive material from the device may only be disposed of by transfer to a person holding an applicable specific license to receive the radioactive material contained in the device or as otherwise approved by the Division. The licensee shall within 30 days furnish to the Division at the address in Rule 0400-20-04-.07 a report containing a brief description of the event and the remedial action taken. In the case of detection of 0.005 microcurie or more removable radioactive material or failure of or damage to a source likely to result in contamination of the premises or the environs, the licensee shall within 30 days submit to the Division at the address in Rule 0400-20-04-.07 a plan for ensuring that the premises and environs are acceptable for unrestricted use. Under these circumstances, the criteria set out in paragraph (2) of Rule 0400-20-10-.36, “Radiological criteria for unrestricted use,” may be applicable, as determined by the Division on a case-by-case basis;

6. Shall not abandon the device containing radioactive material;

7. Shall not export the device containing radioactive material except in accordance with 10 CFR 110;

8. Shall:

(i) Transfer or dispose of the device containing radioactive material only by export as provided by part 7 of this subparagraph, by transfer to another general licensee as authorized in part 9 of this subparagraph, or to a person authorized to receive the device by a specific license issued by the Division under this Chapter or an equivalent license issued by the U.S. Nuclear Regulatory Commission or an Agreement State, or as otherwise approved under subpart (iii) of this part.

(Rule 0400-20-10-.10, continued)

(ii) Shall within 30 days after the transfer of a device to a specific licensee or export furnish a report to the Division. The report shall contain:

(I) The identification of the device by manufacturer's (or initial transferor's) name, model number and serial number;

(II) The name, address and license number of the person receiving the device (license number not applicable if exported); and

(III) The date of the transfer.

(iii) Shall obtain written Division approval before transferring the device to any other specific licensee not specifically identified in subpart (i) of this part. However a holder of a specific license may transfer a device for possession and use under its own specific license without prior approval, if, the holder:

(I) Verifies that the specific license authorizes the possession and use, or applies for and obtains an amendment to the license authorizing the possession and use;

(II) Removes, alters, covers, or clearly and unambiguously augments the existing label (otherwise required by part 1 of this subparagraph) so that the device is labeled in compliance with Rule 0400-20-05-.113; however the manufacturer, model number, and serial number must be retained;

(III) Obtains manufacturer's or initial transferor's information concerning maintenance that would be applicable under the specific license (such as leak testing procedures); and

(IV) Reports the transfer under subpart (ii) of this part.

9. Shall transfer the device to another general licensee only if:

(i) The device remains in use at a particular location. In this case, the transferor shall give the transferee a copy of this paragraph and any safety documents identified in the label of the device. Within 30 days of the transfer, the transferor shall report to the Division:

(I) The manufacturer's (or initial transferor's) name;

(II) The model number and the serial number of the device transferred;

(III) The transferee's name and mailing address for the location of use; and

(IV) The name, title and phone number of the responsible individual identified by the transferee in accordance with part 12 of this subparagraph to have knowledge of and authority to take actions to ensure compliance with the appropriate regulations and requirements; or

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

(Rule 0400-20-10-.10, continued)

10. Shall comply with the provisions of Rules 0400-20-05-.140 and 0400-20-05-.141 for reporting radiation incidents, theft or loss of radioactive material;

11. Shall respond to written requests from the Division to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the information by submitting a letter to the Division at the address in Rule 0400-20-04-.07 providing written justification as to why it cannot comply;

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

13. Shall:

    (i) Report these devices to the Division annually. Reporting shall be done by verifying, correcting and/or adding to the information provided in a request for a report received from the Division. The report information shall be submitted to the Division within 30 days of the date of the request or as otherwise indicated in the request.

    (ii) In reporting devices, furnish the following information and any other information specifically requested by the Division:

        (I) Name and mailing address of the general licensee;

        (II) Information about each device: the manufacturer (or initial transferor), model number, serial number, the radioisotope and activity (as indicated on the label);

        (III) Name, title and telephone number of the responsible person designated as a representative of the general licensee under part 12 of this subparagraph;

        (IV) Address or location at which the device(s) are used and/or stored. For portable devices, the address of the primary place of storage. Each address for a location of use represents a separate general license;

        (V) Certification by the responsible representative of the general licensee that the information concerning the device(s) has been verified through a physical inventory and checking of label information; and

        (VI) Certification by the responsible representative of the general licensee that they are aware of the requirements of the general license.

(Rule 0400-20-10-.10, continued)

14. Shall be subject to the bankruptcy notification requirement in paragraph (7) of Rule 0400-20-10-.16 if holding devices containing radioactive material that meet the following criteria, based on the activity indicated on the label:

    (i) At least 10 mCi (370MBq) of cesium-137;

    (ii) At least 0.1 mCi (3.7 MBq) of strontium-90;

    (iii) At least 1 mCi (37 MBq) of cobalt-60;

    (iv) At least 1 mCi (37 MBq) of americium-241 or any other transuranic (i.e., element with atomic number greater than uranium (92)); or

    (v) At least 0.1 mCi (37 MBq) of radium-226.

15. Persons generally licensed by the U.S. Nuclear Regulatory Commission or an Agreement State with respect to devices meeting the criteria in parts 13 and 14 of this subparagraph are not subject to reporting requirements if the devices are used in areas subject to the Division's jurisdiction for a period less than 180 days in any calendar year. The Division will not request reporting information from such licensees.

16. Shall report changes to the mailing address for the location of use (including change in name of general licensee) to the Division, at the address in Rule 0400-20-04-.07, within 30 days of the effective date of the change. For a portable device, a report of address change is only required for a change in the device's primary place of storage;

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

(d) The general license provided in this paragraph is subject to the provisions of paragraphs (1), (2) and (3) of Rule 0400-20-10.16, paragraphs (1), (2) and (3) of Rule 0400-20-10-.23, Rules 0400-20-10-.26 through 0400-20-10-.28 and Rule 0400-20-10-.30.

(e) The general license in subparagraph (a) of this paragraph does not authorize the manufacture or import of devices containing radioactive material.

(3) Luminous safety devices for aircraft.

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

1. Each device contains not more than 10 curies of tritium or 300 millicuries of promethium-147; and

2. Each device has been manufactured, assembled or imported in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, or each

(Rule 0400-20-10-.10, continued)

device has been manufactured or assembled in accordance with the specifications contained in a specific license or equivalent licensing document issued by the Division or an Agreement State to the manufacturer or assembler of such device pursuant to licensing requirements equivalent to those in Section 32.53 of 10 CFR Part 32.

(b) Persons who own, receive, acquire, possess or use luminous safety devices pursuant to the general license in subparagraph (a) of this paragraph are exempt from the requirements of Chapter 0400-20-05, except that they shall comply with the provisions of Rules 0400-20-05-.140 and 0400-20-05-.141.

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

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

(e) The general license provided in this paragraph is subject to the provisions of Rules 0400-20-10-.16 through 0400-20-10-.30, as applicable.

(4) Calibration and reference sources.

(a) A general license is hereby issued to those persons listed below to own, receive, acquire, possess, use and transfer, in accordance with the provisions of subparagraphs (d) and (e) of this paragraph, americium-241 in the form of calibration or reference sources:

1. Any person who holds a specific license issued by the Division that authorizes the receipt, possession, use and transfer of radioactive materials; and

2. Any person who holds a specific license issued by the U.S. Nuclear Regulatory Commission which authorizes the receipt, possessions, use and transfer of special nuclear material.

(b) A general license is hereby issued to receive, possess, use and transfer plutonium in the form of calibration or reference sources in accordance with the provisions of subparagraph (d) and (e) of this paragraph to any person who holds a specific license issued by the Division which authorizes him to receive, possess, use and transfer radioactive material.

(c) A general license is hereby issued to own, receive, possess, use and transfer radium-226 in the form of calibration or reference sources in accordance with the provisions of subparagraph (d) and (e) of this paragraph to any person who holds a specific license issued by the Division which authorizes him to receive, possess, use, and transfer radioactive material.

(d) The general licenses in subparagraphs (a), (b) and (c) of this paragraph apply only to calibration or reference sources which have been manufactured in accordance with the specifications contained n a specific license issued to the manufacturer or importer of the sources by the U.S. Nuclear Regulatory Commission pursuant to Section 32.57 of 10 CFR, Part 32 or Section 70.39 of 10 CFR, Part 70 or which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer by the Division or any Agreement State or Licensing State pursuant to licensing requirements equivalent to those contained in Section 32.57 of 10 CFR, Part 32 or Section 70.39 of 10 CFR, Part 70.

(Rule 0400-20-10-.10, continued)

(e) The general licenses provided in subparagraphs (a), (b) and (c) of this paragraph are subject to the provisions of Rules 0400-20-10-.16, 0400-20-10-.22, 0400-20-10-.23, 0400-20-10-.26, 0400-20-10-.27, 0400-20-10-.28, and 0400-20-10-.30, and Chapters 0400-20-04 and 0400-20-05. In addition, persons who own, receive, acquire, possess, use and transfer one or more calibration or reference sources pursuant to these general licenses:

1. Shall not possess at any one time, at any one location of storage or use, more than 5 microcuries of americium-241, 5 microcuries of plutonium or 5 microcuries of radium-226 in such sources;

2. Shall not receive, possess, use or transfer such source unless the source, or the storage container, bears a label which includes one of the following statements, as appropriate, or a similar statement which contains the information called for in one of the following statements, as appropriate:

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

CAUTION - RADIOACTIVE MATERIAL - THIS
SOURCE CONTAINS (AMERICIUM-241) (PLUTONIUM)[9].
DO NOT TOUCH RADIOACTIVE
PORTION OF THIS SOURCE

_____
(name of manufacturer or importer)

(ii) The receipt, possession, use and transfer of this source, Model_____, Serial No._____, are subject to a general license and the regulations of a Licensing State. Do not remove this label.

CAUTION - RADIOACTIVE MATERIAL - THIS
SOURCE CONTAINS RADIUM-226.
DO NOT TOUCH RADIOACTIVE
PORTION OF THIS SOURCE

_____
(name of manufacturer or importer)

3. Shall not transfer, abandon or dispose of such source except by transfer to a person authorized by a license from the Division, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State to receive the source;

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

5. Shall not use such source for any purpose other than the calibration of radiation detectors or the standardization of other sources.

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

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

(Rule 0400-20-10-.10, continued)

(5) Ownership of radioactive material.

A general license is hereby issued to own radioactive material without regard to quantity. Notwithstanding any other provisions of this Chapter, this general license does not authorize the manufacture, production, transfer, receipt, possession or use of radioactive material.

(6) Ice detection devices.

(a) A general license is hereby issued to own, receive, acquire, possess, use and transfer strontium-90 contained in ice detection devices, provided each device contains not more than 50 microcuries of strontium-90 and each device has been manufactured or imported in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission or each device has been manufactured in accordance with the specifications contained in a specific license or equivalent licensing document issued by the Division or any Agreement State to the manufacturer of such device pursuant to licensing requirements equivalent to those in Section 32.61 of 10 CFR, Part 32 of the regulations of the U.S. Nuclear Regulatory Commission.

(b) Persons who own, receive, acquire, possess, use or transfer strontium-90 contained in ice detection devices pursuant to the general license in subparagraph (a) of this paragraph:

1. Shall, upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating to the device, discontinue use of the device until it has been inspected, tested for leakage and repaired by a person holding a specific license or equivalent licensing document from the U.S. Nuclear Regulatory Commission or an Agreement State to manufacture or service such devices; or shall dispose of the device pursuant to the provisions of these regulations;

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

3. Are exempt from the requirements of Chapter 0400-20-05 except that such persons shall comply with the provisions of paragraph (1) of Rule 0400-20-05-.120, Rule 0400-20-05-.140 and Rule 0400-20-05-.141.

(c) This general license does not authorize the manufacture, assembly, disassembly or repair of strontium-90 sources in ice detection devices.

(d) The general license provided in this paragraph is subject to the provisions of Rules 0400-20-10-.16, 0400-20-10-.22, 0400-20-10-.23, 0400-20-10-.26, 0400-20-10-.27, 0400-20-10-.28, and 0400-20-10-.30.

(7) Radioactive material for certain in vitro clinical or laboratory testing.

(a) A general license is hereby issued to any physician, veterinarian in the practice of veterinary medicine, clinical laboratory or hospital to receive, acquire, possess, transfer or use, for any of the following stated tests, in accordance with the provisions of subparagraphs (b), (c), (d), (e) and (f) of this paragraph, the following radioactive materials in prepackaged units for use in “in vitro” clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals:

1. Iodine-125, in units not exceeding 10 microcuries each.

(Rule 0400-20-10-.10, continued)

2. Iodine-131, in units not exceeding 10 microcuries each.

3. Carbon-14, in units not exceeding 10 microcuries each.

4. Hydrogen-3 (tritium), in units not exceeding 50 microcuries each.

5. Iron-59, in units not exceeding 20 microcuries each.

6. Cobalt-57, in units not exceeding 10 microcuries each.

7. Selenium-75, in units not exceeding 10 microcuries each.

8. Mock iodine-125 reference or calibration sources, in units not exceeding 0.05 microcurie of iodine-129 and 0.005 microcurie of americium-241 each.

(b) No person shall receive, acquire, possess, use or transfer radioactive material pursuant to the general license established by subparagraph (a) of this paragraph until he has filed an application for and received from the Division a copy of Form RHS 8-5I with number assigned. The general licensee shall furnish on the application the following information and such other information as may be required by that form:

1. Name and address of the licensee;

2. The location of use; and

3. A statement that the licensee has appropriate radiation measuring instruments to carry out “in vitro” clinical or laboratory tests with radioactive materials as authorized under this general license and that such tests will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive materials.

(c) A person who receives, acquires, possesses or uses radioactive material pursuant to this general license shall comply with the following:

1. The general licensee shall not possess at any one time, pursuant to this general license, at any one location of storage or use, a total amount of iodine-125, iodine-131, cobalt-57, selenium-75 and/or iron-59 in excess of 200 microcuries.

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

3. The general licensee shall use the radioactive material only for the uses authorized by subparagraph (a) of this paragraph.

4. The general licensee shall not transfer the radioactive material except by transfer to a person authorized to receive it by a license pursuant to this Chapter, from the U.S. Nuclear Regulatory Commission, or an Agreement State or Licensing State nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the supplier.

5. The general licensee shall dispose of the Mock Iodine-125 reference or calibration sources described in subparagraph (a) of this paragraph as required by Rule 0400-20-05-.120.

(Rule 0400-20-10-.10, continued)

(d) The general licensee shall not receive, acquire, possess or use radioactive material pursuant to subparagraph (a) of this paragraph:

1. Except as prepackaged units which are labeled in accordance with the provisions of a specific license issued by the Division, the U.S. Nuclear Regulatory Commission, an Agreement State or Licensing State that authorizes manufacture and distribution of iodine-125, iodine-131, carbon-14, hydrogen-3 (tritium), selenium-75, cobalt-57, iron-59, or Mock Iodine-125 to persons generally licensed; and

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

(i) This radioactive material may be received, acquired, possessed and used only by physicians, veterinarians in the practice of veterinary medicine, clinical laboratories or hospitals and only for “in vitro” clinical or laboratory tests not involving internal or external administration of the material, or the radiation there from, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of the U.S. Nuclear Regulatory Commission or of a State with which the Commission has entered into an agreement for the exercise of regulatory authority.

_____
(name of manufacturer)

(ii) This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians in the practice of veterinary medicine, clinical laboratories or hospitals and only for “in vitro” clinical or laboratory tests not involving internal or external administration of the material, or the radiation there from, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of a Licensing State.

_____
(name of manufacturer)

(e) Licensees possessing or using radioactive materials under this general license shall report in writing to the Director, Division of Radiological Health, at the address in Rule 0400-20-04-.07, any changes in information furnished in the application submitted under subparagraph (b) of this paragraph. The report shall be furnished within 30 days after the effective date of such change.

(f) Any person using radioactive material pursuant to this general license is exempt from the requirements of Chapter 0400-20-05 with respect to radioactive materials covered by this general license, except that such person using the Mock Iodine-125 described in part (a)8 of this paragraph shall comply with the provisions of Rules 0400-20-05-.120, 0400-20-05-.140, and 0400-20-05-.141.

(8) Self luminous products containing radium-226

(a) A general license is hereby issued to any person to acquire, receive, possess, use, or transfer, in accordance with the provisions of subparagraphs (b) through (d) of this

(Rule 0400-20-10-.10, continued)

paragraph, radium-226 contained in the following products manufactured prior to December 8, 2011.

1. Antiquities originally intended for use by the general public.

   For the purposes of this paragraph, antiquities mean products originally intended for use by the general public and distributed in the late 19th and early 20th centuries, such as radium emanator jars, revigators, radium water jars, radon generators, refrigerator cards, radium bath salts, and healing pads.

2. Intact timepieces containing greater than 0.037 MBq (1 μCi), nonintact timepieces, and timepiece hands and dials no longer installed in timepieces.

3. Luminous items installed in air, marine, or land vehicles.

4. All other luminous products provided that no more than 100 items are used or stored at the same location at any one time.

5. Small radium sources containing no more than 0.037 MBq (1 μCi) of radium-226.

   For the purposes of this paragraph, “small radium sources” means discrete survey instrument check sources, sources contained in radiation measuring instruments, sources used in educational demonstrations (such as cloud chambers and spinthariscopes), electron tubes, lightning rods, ionization sources, static eliminators, or as designated by the NRC.

(b) Persons who acquire, receive, possess, use, or transfer byproduct material under the general license issued in subparagraph (a) of this paragraph are exempt from the provisions of Chapters 0400-20-04 and 0400-20-05, and Rule 0400-20-10-.26, to the extent that the receipt, possession, use, or transfer of byproduct material is within the terms of the general license; provided, however, that this exemption shall not be deemed to apply to any such person specifically licensed under this Chapter.

(c) Any person who acquires, receives, possesses, uses, or transfers byproduct material in accordance with the general license in subparagraph (a) of this paragraph shall:

1. Notify the Division should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive material (a report containing a brief description of the event, and the remedial action taken, must be furnished to the Division at the address listed in Rule 0400-20-04-.07 within 30 days);

2. Not abandon products containing radium-226 (the product, and any radioactive material from the product, may only be disposed of according to Rule 0400-20-05-.127 or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC or an Agreement State;

3. Not export products containing radium-226 except in accordance with 10 CFR Part 110;

4. Dispose of products containing radium-226 at a disposal facility authorized to dispose of radioactive material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under this Chapter, or equivalent

(Rule 0400-20-10-.10, continued)

regulations of the NRC or an Agreement State, or as otherwise approved by the NRC or an Agreement State; and

5. Respond to written requests from the Division to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the information by providing the Division, by an appropriate method listed in 10 CFR 30.6(a), a written justification for the request.

(d) The general license in subparagraph (a) of this paragraph does not authorize the manufacture, assembly, disassembly, repair, or import of products containing radium-226, except that timepieces may be disassembled and repaired.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017.*

0400-20-10-.11 FILING OF APPLICATION FOR SPECIFIC LICENSES.

(1) Application for specific licenses shall be filed in duplicate on a form prescribed by the Division.

(2) The Division may at any time after the filing of the original application, and before the expiration of the license, require further statements in order to enable the Division to determine whether the application should be granted or denied or whether a license should be modified or revoked.

(3) Each application shall be signed by the applicant or licensee or a person duly authorized to act for and on his behalf.

(4) An application for a license may include a request for a license authorizing one or more activities.

(5) In his application, the applicant may incorporate by reference information contained in previous applications, statements or reports filed with the Division provided such references are specific.

(6) Applications and documents submitted to the Division may be made available for public inspection except that the Division may withhold any document or part thereof from public inspection if disclosure of its contents involves proprietary information.

(7) (a) An application for a specific license to use radioactive material in the form of a sealed source or in a device that contains the sealed source shall either:

1. Identify the source or device by manufacturer and model number as registered with the NRC under 10 CFR 32.210 or with an Agreement State or for a source or a device containing radium-226 or accelerator-produced radioactive material with an Agreement State under provisions comparable to 10 CFR 32.210; or

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

(b) For sources or devices manufactured prior to September 12, 2017, that are not registered with the NRC under 10 CFR 32.210 or with an Agreement State, and for

(Rule 0400-20-10-.11, continued)

which the applicant is unable to provide all categories of information specified in 10 CFR 32.210(c), the applicant must provide:

1. All available information identified in 10 CFR 32.210(c) concerning the source, and, if applicable, the device; and

2. Sufficient additional information to demonstrate that there is reasonable assurance that the radiation safety properties of the source or device are adequate to protect health and minimize danger to life and property. Such information must include a description of the source or device, a description of radiation safety features, the intended use and associated operating experience, and the results of a recent leak test.

(c) For sealed sources and devices allowed to be distributed without registration of safety information in accordance with part (18)(g)1 of Rule 0400-20-10-.13, the applicant may supply only the manufacturer, model number, and radionuclide and quantity.

(d) If it is not feasible to identify each sealed source and device individually, the applicant may propose constraints on the number and type of sealed sources and devices to be used and the conditions under which they will be used, in lieu of identifying each sealed source and device.

(8) An application from a medical facility, educational institution, or Federal facility to produce Positron Emission Tomography (PET) radioactive drugs for noncommercial transfer to licensees in its consortium authorized for medical use under Chapter 0400-20-07 or equivalent Agreement State requirements shall include:

(a) A request for authorization for the production of PET radionuclides or evidence of an existing license issued under this Chapter or Agreement State requirements for a PET radionuclide production facility within its consortium from which it receives PET radionuclides;

(b) Evidence that the applicant is qualified to produce radioactive drugs for medical use by meeting one of the criteria in part (10)(a)2 of Rule 0400-20-10-.13;

(c) Identification of individual(s) authorized to prepare the PET radioactive drugs if the applicant is a pharmacy, and documentation that each individual meets the requirements of an authorized nuclear pharmacist as specified in part (10)(b)2 of Rule 0400-20-10-.13; and

(d) Information identified in part (10)(a)3 of Rule 0400-20-10-.13 on the PET drugs to be noncommercially transferred to members of its consortium.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017. Amendments filed September 1, 2021; effective November 30, 2021.*

0400-20-10-.12 GENERAL REQUIREMENTS FOR THE ISSUANCE OF SPECIFIC LICENSES.

A license application will be approved if the Division determines that:

(1) The applicant has properly trained a sufficient number of personnel to use the material in question for the purpose required in accordance with these regulations in such a manner as to protect the public health and safety or property;

(Rule 0400-20-10-.12, continued)

(2) The applicant's proposed equipment, facilities and procedures are in good repair and working order and designed to protect the public health and safety or property;

(3) The applicant satisfies all applicable requirements of these regulations;

(4) The applicant or an existing licensee in any of the classes specified in subparagraph (a) of this paragraph and not otherwise specifically exempted by subparagraph (m) of this paragraph has provided financial assurance and a decommissioning funding plan as herein specified. (See paragraph (6) of this Rule for definitions of terms used in this paragraph.)

(a) Classes for financial assurance:

1. Major processors

2. Waste handlers

3. Ore refineries

4. Former AEC or NRC licensed facilities

5. Other persons with or applicants for a specific license as determined by the Commissioner.

(b) The financial assurance shall be filed with and maintained by the Director, in a dollar amount determined by the Commissioner as necessary to provide for the protection of public health and safety in the event of abandonment, insolvency, or other inability of the licensee to perform to the satisfaction of the Commissioner. In no instance shall the amount determined by the Commissioner be less than the decommissioning cost estimate.

(c) Each decommissioning funding plan must be submitted for review and approval and must contain the following:

1. A detailed decommissioning cost estimate, in an amount reflecting:

(i) The cost of an independent contractor to perform all decommissioning activities taking into account the probable extent of contamination, the amount of possible property damage, the costs of removal and disposal of sources of radiation used by the specific licensee, the costs of reclamation of the property, and any other relevant considerations;

(ii) The cost of meeting the 0400-20-10-.36 criteria for unrestricted use, provided that, if the applicant or licensee can demonstrate its ability to meet the provisions of paragraph (3) of Rule 0400-20-10-.36, the cost estimate may be based on meeting the paragraph (3) of Rule 0400-20-10-.36 criteria;

(iii) The volume of onsite subsurface material containing residual radioactivity that will require remediation to meet the criteria for license termination; and

(iv) An adequate contingency factor;

2. Identification of and justification for using the key assumptions contained in the decommissioning cost estimate;

(Rule 0400-20-10-.12, continued)

3. A description of the method of assuring funds for decommissioning from subparagraph (f) of this paragraph, including means for adjusting cost estimates and associated funding levels periodically over the life of the facility;

4. A certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning; and

5. A signed original of the financial instrument obtained to satisfy the requirements of subparagraph (f) of this paragraph (unless a previously submitted and accepted financial instrument continues to cover the cost estimate for decommissioning).

(d) At the time of license renewal and at intervals not to exceed three years, the decommissioning funding plan must be resubmitted with adjustments as necessary to account for changes in costs and the extent of contamination. If the amount of financial assurance will be adjusted downward, this cannot be done until the updated decommissioning funding plan is approved. The decommissioning funding plan must update the information submitted with the original or prior approved plan, and must specifically consider the effect of the following events on decommissioning costs:

1. Spills of radioactive material producing additional residual radioactivity in onsite subsurface material;

2. Waste inventory increasing above the amount previously estimated;

3. Waste disposal costs increasing above the amount previously estimated;

4. Facility modifications;

5. Changes in authorized possession limits;

6. Actual remediation costs that exceed the previous cost estimate;

7. Onsite disposal; and

8. Use of a settling pond.

(e) Each applicant or licensee of each facility to which it is applicable must file and maintain with the Director financial assurance in accordance with the requirements of this subparagraph.

1. The applicant or licensee must choose from the financial assurance mechanisms as specified in subparagraph (f) of this paragraph. (NOTE: See also subparagraphs (g), (h), and (i) of this paragraph.)

2. The applicant or licensee must file and maintain financial assurance in an amount at least equal to the current decommissioning cost estimate, unless the Commissioner determines that a greater amount must be filed and maintained in accordance with subparagraph (b) of this paragraph.

(i) Whenever the decommissioning cost estimate increases to an amount greater than the amount of financial assurance currently filed with the Director, the licensee must, within 60 days after the increase, file additional financial assurance at least equal to this increase.

(Rule 0400-20-10-.12, continued)

(ii) Whenever the current decommissioning cost estimate decreases, and upon the written request of the licensee, the Commissioner shall, provided the decrease is validated, reduce the amount of financial assurance required for the facility to the amount of the current decommissioning cost estimate. Upon such occurrence, the Director shall, as appropriate considering the financial assurance mechanism(s) on file, either cause to be released to the licensee cash or collateral equal to this reduction or allow the licensee to substitute for the mechanism(s) on file a new mechanism(s) in the reduced amount.

3. An applicant for a license must file the financial assurance instruments(s) before the license can be issued.

4. The financial assurance must be maintained by the applicant or licensee until the Commissioner releases the licensee from the requirements of this subparagraph, as specified in this part, or until the Commissioner orders forfeiture of the financial assurance as provided in part 5 of this subparagraph.

5. The Commissioner may order that any financial assurance filed by a licensee pursuant to this subparagraph be forfeited to the State if the Commissioner determines that the licensee has failed to perform decommissioning in a manner deemed acceptable by the Commissioner to assure health and safety from radiation hazards and other license requirements when required to do so. Any such forfeiture action shall follow the procedures provided in subparagraph (j) of this paragraph.

(f) Mechanisms of financial assurance.

1. Surety Bond

An applicant or licensee may satisfy the requirements of subparagraph (e) of this paragraph by obtaining and filing a surety bond which conforms to the requirements of this part.

(i) The surety company issuing the bond must be licensed to do business as a surety in Tennessee.

(ii) The wording of the surety bond must be identical to the wording specified in part (I)1 of this paragraph.

(iii) The bond must guarantee that:

(I) Funds will be available to perform decommissioning in a manner deemed acceptable by the Commissioner to assure health and safety from radiation hazards and other requirements of the license for the facility whenever required to do so.

(II) The licensee will provide alternate financial assurance as specified in this paragraph and obtain the Director’s written approval of the assurance provided within 90 days of receipt by both the licensee and the Director of a notice of cancellation of the bond from the surety.

(iv) Under the terms of the bond, the surety will become liable on the bond obligation when the licensee fails to perform as guaranteed by the bond. Following a determination by the Commissioner that the licensee has failed

to so perform, under the terms of the bond the surety will perform decommissioning to the satisfaction of the State as guaranteed by the bond or will forfeit the amount of the penal sum, as provided in part (e)5 of this paragraph.

(v) The penal sum of the bond must be in an amount at least adequate to provide the necessary financial assurance.

(vi) Under the terms of the bond, the surety may cancel the bond by sending notice of cancellation by certified mail to the licensee and to the Director. Cancellation may not occur, however, during the 180 days beginning on the date of receipt of the notice of cancellation by both the licensee and the Director, as evidenced by the return receipts.

(vii) The surety will not be liable for deficiencies in the performance of decommissioning after the Commissioner releases the licensee from the financial assurance requirements as provided in part (e)4 of this paragraph.

2. Personal Bond Supported by a Letter of Credit

An applicant or licensee may satisfy the requirements of subparagraph (e) of this paragraph by filing his personal performance guarantee accompanied by collateral in the form of an irrevocable standby letter of credit. He must guarantee funds to perform decommissioning in accordance with acceptable practice for protection of health and safety and other requirements of the license for the facility. The irrevocable standby letter of credit supporting this guarantee must conform to the following requirements:

(i) The institution issuing the letter of credit must be an entity which has the authority to issue letter of credit and whose letter-of-credit operations are regulated and examined by a Federal or State agency.

(ii) The wording of the letter of credit must be identical to the wording specified in part (I)2 of this paragraph.

(iii) The letter of credit must be accompanied by a letter from the licensee referring to the letter of credit by number, issuing institution and date and providing the following information: The radioactive material license number, name and address of the facility and the amount of funds assured for decommissioning of the facility by the letter of credit. (NOTE: This letter from the licensee may also contain his personal performance guarantee.)

(iv) The letter of credit must be irrevocable and issued for a period of at least one year. The letter of credit must provide that the expiration date will be automatically extended for a period of at least one year unless, at least 180 days before the current expiration date, the issuing institution notifies both the licensee and the Director by certified mail of a decision not to extend the expiration date. Under the terms of the letter of credit, the 180 days will begin on the date when both the licensee and the Director have received the notice, as evidenced by the return receipts.

(v) The letter of credit must be issued in an amount at least adequate to provide the necessary financial assurance.

(Rule 0400-20-10-.12, continued)

(vi) The Commissioner may draw on the letter of credit upon forfeiture as provided in part (e)5 of this paragraph. The Commissioner will also draw on the letter of credit if the licensee does not establish alternate financial assurance as specified in this paragraph and obtain written approval of such alternate assurance from the Director within 90 days after receipt by both the licensee and the Director of a notice from the issuing institution that it has decided not to extend the letter of credit beyond the current expiration date. The Director may delay the drawing if the issuing institution grants an extension of the term of the credit. During the last 30 days of any such extension the Commissioner will draw on the letter of credit if the licensee has failed to provide alternate financial assurance as specified in this paragraph and obtain written approval of such assurance from the Director.

3. Personal Bond Supported by Insurance

An applicant or licensee may satisfy the requirements of subparagraph (e) of this paragraph by filing his personal performance guarantee accompanied by collateral in the form of an insurance policy. He must guarantee funds sufficient to perform decommissioning in a manner deemed acceptable by the Commissioner for protection of health and safety and other requirements of the license for the facility. The insurance policy supporting this guarantee must conform to the following requirements:

(i) The insurer must be licensed to transact the business of insurance or eligible to provide insurance as an excess or surplus lines insurer in the State of Tennessee.

(ii) The insurance policy must be accompanied by a certificate of insurance whose wording is identical to the wording specified in part (I)3 of this paragraph.

(iii) The insurance policy must be for a face amount at least adequate to provide the necessary financial assurance. The term “face amount” means the total amount the insurer is obligated to pay under the policy. Actual payments by the insurer will not change the face amount, although the insurer’s future liability will be lowered by the amount of the payments.

(iv) The insurance policy must guarantee that funds will be available for decommissioning whenever decommissioning is necessary.

(v) Upon forfeiture of financial assurance as provided in part (e)5 of this paragraph, the Commissioner will direct the insurer to pay the full face amount to the State.

(vi) The licensee must maintain the policy in full force and effect until the Commissioner releases the financial assurance mechanism as provided in this paragraph. Failure to pay the premium, without substitution of alternate financial assurance as specified in this paragraph, will constitute a significant violation of these rules, warranting such remedy as the Commissioner deems necessary. Such violation will be deemed to begin upon receipt by the Director of a notice of future cancellation, termination, or failure to renew due to nonpayment of the premium, rather than upon the date of expiration.

(Rule 0400-20-10-.12, continued)

(vii) The policy must provide that the insurer may not cancel, terminate, or fail to renew the policy except for failure to pay the premium. The automatic renewal of the policy must, at a minimum, provide the insured with the option of renewal at the face amount of the expiring policy. If there is a failure to pay the premium, the insurer may elect to cancel, terminate, or fail to renew the policy by sending notice by certified mail to the licensee and the Director. Cancellation, termination, or failure to renew may not occur, however, during the 180 days beginning with the date of receipt of the notice by both the Director and the licensee, as evidenced by the return receipts. Cancellation, termination, or failure to renew may not occur and the policy will remain in full force and effect in the event that on or before the date of expiration:

(I) The Commissioner deems the facility abandoned;

(II) The license is terminated or revoked or renewal is denied;

(III) Closure is ordered by the Commissioner or a court of competent jurisdiction;

(IV) The licensee is named as debtor in a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code; or

(V) The premium due is paid.

(viii) Commencing on the date that liability to make payments pursuant to the policy accrues, the insurer will thereafter annually increase the face amount of the policy. Such increase must be equivalent to the face amount of the policy, less any payments made, multiplied by an amount equivalent to 85 percent of the most recent investment rate or of the equivalent coupon-issue yield announced by the U.S. Treasury for 26-week Treasury securities.

4. Personal Bond Supported by Securities

An applicant or licensee may satisfy the requirements of subparagraph (e) of this paragraph by filing his personal performance guarantee accompanied by collateral in the form of securities. He must guarantee sufficient funds to perform decommissioning in accordance with acceptable practices for protection of health and safety and other requirements of the license for the facility. The securities supporting this guarantee must be fully registered as to principal and interest in such manner as to identify the State and the Division as holder of such collateral and to also identify that person filing such collateral. These securities must have a current market value at least adequate to provide the necessary financial assurance and must be included among the following types:

(i) Negotiable certificates of deposit assigned irrevocably to the State.

(I) Such certificates of deposit must be automatically renewable and must be assigned to the State in writing and recorded as such in the records of the financial institution issuing such certificate.

(II) Such certificates of deposit must also include a statement signed by an officer of the issuing financial institution which waives all rights of lien which the institution has or might have against the certificate.

(Rule 0400-20-10-.12, continued)

(ii) Negotiable United States Treasury securities assigned irrevocably to the State.

(iii) Negotiable general obligation municipal or corporate bonds which have at least an "A" rating by Moody's and/or Standard & Poor's rating services and which are assigned irrevocably to the State.

5. Personal Bond Supported by Cash

An applicant or licensee may satisfy the requirements of subparagraph (e) of this paragraph by filing his personal performance guarantee accompanied by cash in an amount at least adequate to provide the necessary financial assurance.

6. Financial Test and Corporate Guarantee

(i) An applicant or licensee may satisfy the requirements of subparagraph (e) of this paragraph by demonstrating that he passes a financial test as specified in this part. To pass this test the licensee must meet the criteria of either item (I) or (II) of this subpart as follows:

(I) The applicant or licensee must have:

I. Two of the following three ratios: a ratio of total liabilities to net worth less than 2.0, a ratio of the sum of net income plus depreciation, depletion and amortization to total liabilities greater than 0.1, and a ratio of current assets to current liabilities greater than 1.5;

II. Net working capital and tangible net worth each at least six times the current decommissioning cost estimate;

III. Tangible net worth of at least $10 million; and

IV. Assets in the United States amounting to at least 90 percent of this total assets or at least six times the current decommissioning cost estimate.

(II) The applicant or licensee must have:

I. A current rating for his most recent bond issuance of AAA, AA, A or BBB as issued by Standard & Poor's, or Aaa, Aa, A or Baa as issued by Moody's;

II. Tangible net worth at least six times the current decommissioning cost estimate;

III. Tangible net worth of at least $10 million; and

IV. Assets located in the United States amounting to at least 90 percent of his total assets or at least six times the current decommissioning cost estimate.

(ii) The phrase "current decommissioning cost estimates" as used in subpart (i) of this part refers to the cost estimates required to be shown in paragraphs 1 through 4 of the letter from the applicant's or licensee's chief financial officer.

(Rule 0400-20-10-.12, continued)

(iii) To demonstrate that he meets this test, the applicant or licensee must submit the following items to the Director:

(I) A letter signed by the applicant's or licensee's chief financial officer and worded as specified in part (I)4 of this paragraph;

(II) A copy of the independent certified public accountant's report on examination of the applicant's or licensee's financial statements for the latest completed fiscal year; and

(III) A special report from the applicant's or licensee's independent certified public accountant to the applicant or licensee stating that:

I. He has compared the data which the letter from the chief financial officer specifies as having been derived from the independently audited, year-end financial statements for the latest fiscal year with the amounts in such financial statements; and

II. In connection with that procedure, no matters came to his attention which caused him to believe that the specified data should be adjusted.

(iv) After the initial submission of items specified in subpart (iii) of this part, the licensee must send updated information to the Director within 90 days after the close of each succeeding fiscal year. This information must consist of all three items specified in subpart (iii) of this part.

(v) If the licensee no longer meets the requirements of subpart (i) of this part, he must send notice to the Director of intent to establish alternate financial assurance as specified in this paragraph. The notice must be sent by certified mail within 90 days after the end of the fiscal year for which the year-end financial data show that the licensee no longer meets the requirements. The licensee must provide the alternate financial assurance within 120 days after the end of such fiscal year.

(vi) The Director may, based on a reasonable belief that the licensee may no longer meet the requirements of subpart (i) of this part, require reports of financial condition at any time from the licensee in addition to those specified in subpart (iii) of this part. If the Director finds, on the basis of such reports or other information, that the licensee no longer meets the requirements of subpart (i) of this part, the licensee must provide alternate financial assurance as specified in this paragraph within 30 days after notification of such a finding.

(vii) The Director may disallow use of this test on the basis of qualifications in the opinion expressed by the independent certified public accountant in his report on examination of the applicant's or licensee's financial statements. An adverse opinion or a disclaimer of opinion will be cause for disallowance. The Director will evaluate other qualifications on an individual basis. The applicant or licensee must provide alternate financial assurance as specified in this paragraph within 30 days after notification of the disallowance.

(Rule 0400-20-10-.12, continued)

(viii) An applicant or licensee may meet the requirements of subparagraph (e) of this paragraph by obtaining a written guarantee, hereafter referred to as "corporate guarantee." The guarantor must be the parent corporation of the licensee. The guarantor must meet the requirements for applicants or licensees in subparts (i) through (vii) of this part and must comply with the terms of the corporate guarantee. The wording of the corporate guarantee must be identical to the wording specified in part (I)5 of this paragraph. The corporate guarantee must accompany the items sent to the Director as specified in subpart (iii) of this part. The terms of the corporate guarantee must provide that:

(I) If the licensee fails to perform decommissioning of a facility covered by a corporate guarantee for decommissioning in accordance with acceptable practices to protect health and safety and other license requirements whenever required to do so, the guarantor will do so or forfeit to the State monies in an amount equal to the current decommissioning cost estimate for the facility, as provided in part (e)5 of this paragraph.

(II) The corporate guarantee will remain in force unless the guarantor sends notice of cancellation by certified mail to the licensee and to the Director. Cancellation may not occur, however, during the 180 days beginning on the date of receipt of the notice of cancellation by both the licensee and the Director as evidenced by the return receipts.

(III) If the licensee fails to provide alternate financial assurance as specified in this paragraph and obtain the written approval of such alternate assurance from the Director within 90 days after receipt by both the licensee and the Director of a notice of cancellation of the corporate guarantee from the guarantor, the guarantor will provide such alternative financial assurance in the name of the licensee.

(g) Use of Multiple Financial Mechanisms

In meeting the requirements of subparagraph (e) of this paragraph, an applicant or licensee may utilize more than one financial assurance mechanism per facility. These mechanisms are limited to personal bonds supported by letters of credit, insurance, securities or cash. The mechanisms must be as specified in subparagraph (f) of this paragraph, except that it is the combination of mechanisms, rather than the single mechanism, which must provide financial assurance for the necessary amount.

(h) Use of a Financial Mechanism for Multiple Facilities

An applicant or licensee may use a financial assurance mechanism specified in subparagraph (f) of this paragraph to meet the requirements of subparagraph (e) of this paragraph for more than one facility he owns or operates in Tennessee. If so, the mechanism submitted to the Director must include a list showing, for each facility, the license number, name, address, and amount of funds for decommissioning care assured by the mechanism. The amount of funds available through the mechanism must be no less than the sum of funds that would be available if a separate mechanism had been filed and maintained for each facility.

(i) Substituting Alternate Financial Assurance

(Rule 0400-20-10-.12, continued)

In meeting the requirements of subparagraph (e) of this paragraph, a licensee may substitute alternate financial assurance meeting the requirements of this paragraph for the financial assurance already filed with the Director for the facility. However, the existing financial assurance shall not be released by the Commissioner until the substitute financial assurance has been received and approved by him.

(j) Procedures for Forfeiture of Financial Assurance

1. Upon the determination of abandonment, insolvency, or other inability of the licensee to perform to the satisfaction of the Commissioner, a notice of non-compliance shall be served upon the licensee. Such notice shall be hand-delivered or forwarded by certified mail. The notice of non-compliance shall specify in what respects the licensee has failed to perform as required.

2. If the Commissioner determines that the licensee has failed to perform as specified in the notice of non-compliance, or as specified in any subsequent compliance agreement which may have been reached by the licensee and the Commissioner, the Director shall cause a notice of show cause meeting to be served upon the licensee. Such notice shall be signed by the Director and either hand-delivered or forwarded by certified mail to the licensee. The notice of show cause meeting shall establish the date, time, and location of a meeting scheduled to provide the licensee with the opportunity to show cause why the Director should not pursue forfeiture of the financial assurance filed to guarantee such performance.

3. If no mutual compliance agreement is reached at the show cause meeting, or, upon the Commissioner's determination that the licensee has failed to perform as specified in such agreement that was reached, the Director shall request the Commissioner to order forfeiture of the financial assurance filed to guarantee such performance.

4. The Commissioner shall order forfeiture of the financial assurance upon his validation of the Director's determinations and upon his determination that the procedures of this subparagraph have been followed. The Commissioner may, however, at his discretion, provide opportunity for the licensee to be heard before himself before issuing such order. Upon issuance a copy of the order shall be hand-delivered or forwarded by certified mail to the licensee. Any such order issued by the Commissioner shall become effective 30 days after the receipt by the licensee.

5. If necessary, upon the effective date of the order of forfeiture, the Commissioner shall give notice to the State Attorney General who shall collect the forfeiture.

6. All funds from forfeited financial assurances shall be deposited in the State's radiation reclamation trust fund account for use by the Commissioner as set forth in T.C.A. § 68-202-405.

(k) Incapacity of Applicants or Licensees, Guarantors, or Financial Institutions

1. An applicant or licensee must notify the Director by certified mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the applicant or licensee as debtor, within 10 days after commencement of the proceeding. A guarantor of a corporate guarantee as specified in part (f)6 of this paragraph must make such a notification if he is named as debtor, as required under the terms of the corporate guarantee.

2. An applicant or licensee who fulfills the requirements of this paragraph by obtaining a surety bond, letter of credit or insurance policy will be deemed to be without the required financial assurance in the event of bankruptcy of the issuing institution or a suspension or revocation of the authority of the institution issuing the surety bond, letter of credit or insurance policy to issue such instruments. The applicant or licensee must establish other financial assurance within 30 days after such an event.

(l) Wording of the Instruments

1. A surety bond guaranteeing funds for decommissioning as specified in part (f)1 of this paragraph, must be worded as follows except that the instructions in parentheses are to be replaced with the relevant information and the parentheses deleted:

SURETY BOND

Date bond executed: _____
Effective date: _____
Principal: (legal name and business address of applicant or licensee)
Type of organization: (insert “individual,” “joint venture,” “partnership” or “corporation”)
State of incorporation: _____
Surety(ies): (Name(s) and business address(es))
License number, name, address and decommissioning cost for each facility guaranteed by this bond (list amounts separately):
$_____
Total penal sum of bond: $_____
Surety’s bond number: _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, the Principal and Surety(ies) hereto are firmly bound to the State of Tennessee, Department of Environment and Conservation (hereinafter called “Department”), in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns jointly and severally; provided that, where the Surety(ies) are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum “jointly and severally” only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

WHEREAS said Principal is required, under the Tennessee Radiological Health Service Act, as amended, to have a license in order to receive, possess, store and use radioactive material at the facility identified above, and

WHEREAS said Principal is required to provide financial assurance for decommissioning as a condition of the license;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall faithfully perform decommissioning, whenever required to do so, of each facility for which this bond guarantees funds for decommissioning, to the satisfaction of the Commissioner, State of Tennessee, Department of Environment and Conservation in accordance with acceptable practices for protection of health and safety pursuant to all applicable laws, statutes, rules and

(Rule 0400-20-10-.12, continued)

regulations, as such laws, statutes, rules and regulations may be amended,

OR, if the Principal shall provide alternate financial assurance as specified in paragraph (4) of Rule 0400-20-10-.12, and obtain the written approval of such assurance from the Director, Division of Radiological Health (hereinafter called "Director"), within 90 days after the date notice of cancellation is received by both the Principal and the Director from the Surety(ies), then this obligation shall be null and void, otherwise it is to remain in full force and effect.

The Surety(ies) shall become liable on this bond obligation only when the Principal has failed to fulfill the conditions described above.

Upon notification by the Director that the Principal has been found in violation of the decommissioning requirements of the Division, for a facility for which this bond guarantees funds for performance of decommissioning, the Surety(ies) shall forfeit the decommissioning cost amount guaranteed for the facility to the Department as directed by the Director.

Upon notification by the Director that the Principal has filed to provide alternate financial assurance as specified in paragraph (4) of Rule 0400-20-10-.12, and obtain written approval of such assurance from the Director during the 30 days following receipt by both the Principal and the Director of a notice of cancellation of the bond, the Surety(ies) shall forfeit funds in the amount guaranteed for the facility(ies) to the Department as directed by the Director.

The Surety(ies) hereby waive(s) notification of amendments to licenses, applicable laws, statutes, rules and regulations and agree(s) that no such amendment shall in any way alleviate its (their) obligation on this bond.

The liability of the Surety(ies) shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the Surety(ies) hereunder exceed the amount of said penal sum.

The Surety(ies) may cancel the bond by sending notice of cancellation by certified mail to the Principal and to the Director, provided, however, that cancellation shall not occur during the 180 days beginning on the date of receipt of the notice of cancellation by both the Principal and the Director, as evidenced by the return receipts.

The Principal may terminate this bond by sending written notice to the Surety(ies), provided, however, that no such notice shall become effective until the Surety(ies) receive(s) written authorization for termination of the bond by the Director.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this SURETY BOND and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the Principal and Surety(ies) and that the wording of this surety bond is identical to the wording specified in part (4)(l)1 of Rule 0400-20-10-.12 as such regulation was constituted on the date this bond was executed.

PRINCIPAL

(Signature(s))

(Rule 0400-20-10-.12, continued)

(Name(s))
(Title(s))
(Corporate seal)
CORPORATE SURETY(IES)
(Name and address)
State of incorporation: _____
Liability limit: $_____
(Signature(s))
(Name(s) and title(s))
Corporate seal:
(For every co-surety, provide signature(s), corporate seal and other information in the same manner as for Surety above.)
Bond premium: $_____

2. A letter of credit, as specified in part (f)2 of this paragraph, must be worded as follows except that instructions in parentheses are to be replaced with the relevant information and the parentheses deleted:

IRREVOCABLE STANDBY LETTER OF CREDIT

Director
Division of Radiological Health
State of Tennessee, Department of Environment and Conservation

Dear Sir or Madam:

We hereby establish our Irrevocable Standby Letter of Credit No. _____ in your favor, at the request and for the account of (applicant's or licensee's name and address) up to the aggregate amount of (in words) U.S. dollars $ _____, available upon presentation of:

1) your sight draft, bearing reference to this letter of credit No. _____, and

2) your signed statement reading as follows: "I certify that the amount of the draft is payable pursuant to rules issued under authority of the Tennessee Radiological Health Service Act, as amended."

This letter of credit is effective as of (date) and shall expire on (date at least one year later), but such expiration date shall be automatically extended for a period of (at least one year) on (date) and on each successive expiration date, unless, at least 180 days before the current expiration date, we notify both you and (applicant's or licensee's name) by certified mail that we have decided not to extend this letter of credit beyond the current expiration date. In the event you are so notified, any unused portion of the credit shall be available upon presentation of your sight draft for 180 days after the date of receipt by both you and (licensee's name), as shown on the signed return receipts.

Whenever this letter of credit is drawn on under and in compliance with the terms of this credit, we shall duly honor such draft upon presentation to us, and we shall forfeit the amount of the draft to the State of Tennessee in accordance with your instructions.

We certify that the wording of this letter of credit is identical to the wording specified in part (4)(l)2 of Rule 0400-20-10-.12 as such regulation was constituted on the date shown immediately below.

(Signature(s) and title(s) of official(s) of issuing institution) (Date)

This credit is subject to (insert "the most recent edition of the Uniform Customs and Practice for Documentary Credits, published by the International Chamber of Commerce," or "the Uniform Commercial Code").

3. A certificate of insurance, as specified in part (f)3 of this paragraph must be worded as follows except that instructions in parentheses are to be replaced with the relevant information and the parentheses deleted:

CERTIFICATE OF INSURANCE FOR DECOMMISSIONING

Name and Address of Insurer
(herein called the "Insurer"): _____

Name and Address of Insured
(herein called the "Insured"): _____

Facilities Covered: (List for each facility: The license number, name, address, and the amount of insurance for decommissioning (these amounts for all facilities covered must total the face amount shown below))

Face Amount: $ _____

Policy Number: _____

Effective Date: _____

The Insurer hereby certifies that it has issued to the Insured the policy of insurance identified above to provide financial assurance for decommissioning the facilities identified above. The Insurer further warrants that such policy conforms in all respects with the requirements of part (4)(l)3 of Rule 0400-20-10-.12, as applicable and as such rules were constituted on the date shown immediately below. It is agreed that any provision of the policy inconsistent with such regulation is hereby amended to eliminate such inconsistency.

Whenever requested by the Director, Division of Radiological Health, State of Tennessee, Department of Environment and Conservation, the Insurer agrees to furnish to the Director, Division of Radiological Health a duplicate original of the policy listed above, including all endorsements thereon.

I hereby certify that the wording of this certificate is identical to the wording specified in part (4)(l)3 of Rule 0400-20-10-.12 as such regulation was constituted on the date shown immediately below.

(Authorized signature for Insurer)

(Name of person signing)

(Title of person signing)

Signature of witness or notary: _____

(Date)

(Rule 0400-20-10-.12, continued)

4. A letter from the chief financial officer, as specified in part (f)6 of this paragraph must be worded as follows except that instructions in parentheses are to be replaced with the relevant information and the parentheses deleted:

LETTER FROM CHIEF FINANCIAL OFFICER

(Address to Director, Division of Radiological Health)

I am the chief financial officer of (name and address of firm). This letter is in support of this firm's use of the financial test to demonstrate financial assurance, as specified in paragraph (4) of Rule 0400-20-10-.12.

(Fill out the following four paragraphs regarding facilities and associated cost estimates. If your firm has no facilities that belong in a particular paragraph, write "None" in the space indicated. For each facility, include its license number, name, address, and current decommissioning cost estimates.)

1. This firm is the licensee at the following facility for which financial assurance for decommissioning is demonstrated through the financial test specified in paragraph (4) of Rule 0400-20-10-.12. The current decommissioning cost estimate covered by the test is: $ _____.

2. This firm guarantees, through the corporate guarantee specified in paragraph (4) of Rule 0400-20-10-.12, the decommissioning of the following facility owned or operated by a subsidiary of this firm. The current cost estimates for decommissioning so guaranteed is: $ _____.

3. In other states, this firm, as licensee or guarantor, is demonstrating financial assurance for decommissioning of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in paragraph (4) of Rule 0400-20-10-.12. The current decommissioning cost estimates covered by such a test are shown for each facility: $ _____.

4. This firm is the licensee of the following facilities receiving, possessing, using or storing radioactive material for which financial assurance for decommissioning is not demonstrated either to the Division, another State, or the U.S. Nuclear Regulatory Commission through the financial test or any other financial assurance mechanisms specified in paragraph (4) of Rule 0400-20-10-.12 or equivalent or substantially equivalent mechanisms. The current decommissioning cost estimates not covered by such financial assurance are shown for each facility: $ _____.

This firm (insert "is required" or "is not required") to file a Form 10K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this firm ends on (month, day). The figures for the following items marked with an asterisk are derived from this firm's independently audited, year-end financial statement for the latest completed fiscal year, ending (date).

(Fill in Alternative I if the criteria of item (f)6(i)(I) of this paragraph are used. Fill in Alternative II if the criteria of item (f)6(i)(II) of this paragraph

(Rule 0400-20-10-.12, continued)

are used).

ALTERNATIVE I

1. Sum of current decommissioning cost estimates (total of all cost estimates shown in the four paragraphs above) $ _____

*2. Total liabilities (if any portion of the decommissioning cost estimate is included in total liabilities, you may deduct the amount of that portion from this line and add that amount to lines 3 and 4) $ _____

*3. Tangible net worth $ _____

*4. Net worth $ _____

*5. Current assets $ _____

*6. Current liabilities $ _____

*7. Net working capital (line 5 minus line 6) $ _____

*8. The sum of net income plus depreciation, depletion, and amortization $ _____

*9. Total assets in U.S. (required only if less than 90% of firm's assets are located in the U.S.) $ _____

		YES	NO
10.	Is line 3 at least $10 million?	_____	_____
11.	Is line 3 at least 6 times line 1?	_____	_____
12.	Is line 7 at least 6 times line 1?	_____	_____
*13.	Are at least 90% of firm's assets located in the U.S.? If not, complete line 14	_____	_____
14.	Is line 9 at least 6 times line 1?	_____	_____
15.	Is line 2 divided by line 4 less than 2.0?	_____	_____
16.	Is line 8 divided by line 2 greater than 0.1?	_____	_____
17.	Is line 5 divided by line 6 greater than 1.5?	_____	_____

ALTERNATIVE II

1. Sum of current decommissioning cost estimates (total of all cost estimates shown in the

(Rule 0400-20-10-.12, continued)

four paragraphs above) $ _____

2. Current bond rating of most recent issuance of this firm and name of rating service _____

3. Date of issuance of bond _____

4. Date of maturity of bond _____

*5. Tangible net worth $ _____

*6. Total assets in U.S. (required only if less than 90% of firm's assets are located in the U.S.) $ _____

		YES	NO
7.	Is line 5 at least $10 million?	_____	_____
8.	Is line 5 at least 6 times line 1?	_____	_____
9.	Are at least 90% of firm's assets located in the U.S.? If not, complete line 10.	_____	_____
10.	Is line 6 at least 6 times line 1?	_____	_____

I hereby certify that the wording of this letter is identical to the wording specified in part (4)(l)4 of Rule 0400-20-10-.12 as such rules were in effect on the date shown immediately below.

(Signature)
(Name)
(Title)(Date)

5. A corporate guarantee, as specified in part (f)6 of this paragraph, must be worded as follows except that instructions in parentheses are to be replaced with the relevant information and the parentheses deleted:

CORPORATE GUARANTEE FOR DECOMMISSIONING

Guarantee made this (date) by (name of guaranteeing entity), a business corporation organized under the laws of the State of (insert name of State), herein referred to as guarantor, to the State of Tennessee, Department of Environment and Conservation ("Department"), obligee, on behalf of our subsidiary (applicant or licensee) of (business address).

Recitals

1. Guarantor meets or exceeds the financial test criteria and agrees to comply with the reporting requirements for guarantors as specified in part (4)(f)6 of Rule 0400-20-10-.12.

2. (Applicant or licensee) owns or operates and is licensed by the Department to receive, possess, store and use radioactive material at

(Rule 0400-20-10-.12, continued)

the facility covered by this guarantee: (List for the facility: license number, name and address).

3. For value received from (licensee), guarantor guarantees to the Department that in the event that (licensee) fails to perform decommissioning of the above facility in a manner deemed acceptable by the Commissioner to assure health and safety from radiation hazards and other license requirements, the guarantor shall do so or forfeit to the State of Tennessee, as specified in paragraph (4) of Rule 0400-20-10-.12 monies in an amount equal to the current decommissioning cost estimates as specified in paragraph (4) of Rule 0400-20-10-.12.

4. Guarantor agrees that if, at the end of any fiscal year before termination of this guarantee, the guarantor fails to meet the financial test criteria, guarantor shall send within 30 days, by certified mail, notice to the Director of the Department's Division of Radiological Health ("Division Director") and to (licensee) that he intends to provide alternate financial assurance as specified in paragraph (4) of Rule 0400-20-10-.12, in the name of (licensee). Within 90 days after the end of such fiscal year, the guarantor shall establish such financial assurance unless (licensee) has done so.

5. The guarantor agrees to notify the Division Director, by certified mail, of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming guarantor as debtor, within 10 days after commencement of this proceeding.

6. Guarantor agrees that within 30 days after being notified by the Division Director of a determination that guarantor no longer meets the financial test criteria or that he is disallowed from continuing as a guarantor for decommissioning he shall establish alternate financial assurance as specified in paragraph (4) of Rule 0400-20-10-.12 in the name of (licensee) unless (licensee) has done so.

7. Guarantor agrees to remain bound under this guarantee notwithstanding any or all of the following: amendment or modification of the license, the extension or reduction of the time of performance of decommissioning or any other modification or alteration of an obligation of the licensee pursuant to these rules.

8. Guarantor agrees to remain bound under this guarantee for so long as (licensee) must comply with the applicable financial assurance requirements of paragraph (4) of Rule 0400-20-10-.12 for the above-listed facility, except that guarantor may cancel this guarantee by sending notice by certified mail to the Division Director and to (licensee), such cancellation to become effective no earlier than 180 days after receipt of such notice by both the Department and (licensee), as evidenced by the return receipts.

9. Guarantor agrees that if (licensee) fails to provide alternate financial assurance as specified in paragraph (4) of Rule 0400-20-10-.12, and obtain written approval of such assurance from the Division Director within 30 days after a notice of cancellation by the guarantor is received by the Division Director from guarantor, guarantor shall provide such alternate financial assurance in the name of (licensee).

(Rule 0400-20-10-.12, continued)

10. Guarantor expressly waives notice of acceptance of this guarantee by the Department or by (licensee). Guarantor also expressly waives notice of amendments or modification of the facility license.

I hereby certify that the wording of this guarantee is identical to the wording specified in part (4)(l)5 of Rule 0400-20-10-.12 as such rules were in effect on the date first above written.

Effective Date: _____

(Name of guarantor)

(Authorized signature for guarantor)

(Name of person signing)

(Title of person signing)

Signature of witness or notary: _____

(m) Persons licensed at the time these financial assurance rules become effective and upon notice by the Department must, within a period of 90 days following such notice, provide the required financial assurance.

(n) The Department may reevaluate, at any time, the adequacy of existing financial assurance and may require their adjustment by either increasing or decreasing the amount of financial assurance required so that adequate funds will be available.

(o) Except that the following persons are exempt from the requirements of this paragraph:

1. State and local government agencies.

2. Educational institutions accredited by the Southern Association of Colleges and Schools.

3. Licensees of the State Licensing Board for the Healing Arts and those medical facilities possessing or utilizing radioactive materials for medical purposes when supervised by such licensees.

4. Veterinarians possessing or utilizing radioactive materials in their veterinary practice.

5. Persons possessing or utilizing radioactive materials for “in vitro” medical purposes.

6. Persons possessing or utilizing only generally licensed quantities of radioactive materials.

(p) Each person licensed under this Chapter shall keep records of information important to the decommissioning of a facility in an identified location until the site is released for unrestricted use. Before licensed activities are transferred or assigned in accordance with Rule 0400-20-10-.16, a licensee shall transfer all records described in this paragraph to the new licensee. In this case, the new licensee will be responsible for maintaining these records until the license is terminated. If records important to the decommissioning of a facility are kept for other purposes, reference to these records

(Rule 0400-20-10-.12, continued)

and their locations may be used. Information the Division considers important to decommissioning consists of:

1. Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site (These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations);

2. As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or stored, and of locations of possible inaccessible contamination such as buried pipes which may be subject to contamination (If required drawings are referenced, each relevant document need not be indexed individually. If drawings are not available, the licensee shall substitute appropriate records of available information concerning these areas and locations);

3. Except for areas containing only sealed sources (provided the sources have not leaked or no contamination remains after any leak) or byproduct materials having only half-lives of less than 65 days, a list contained in a single document and updated every two years, of the following:

   (i) All areas designated and formerly designated restricted areas as defined in paragraph (62) of Rule 0400-20-05-.32;

   (ii) All areas outside of restricted areas that require documentation under part 1 of this subparagraph;

   (iii) All areas outside of restricted areas where current and previous wastes have been buried as documented under Rule 0400-20-05-.137; and

   (iv) All areas outside of restricted areas that contain material such that, if the license expired, the licensee would be required to either decontaminate the area to meet the criteria for decommissioning in Rule 0400-20-10-.36, or apply for approval for disposal under Rule 0400-20-05-.121.

4. Records of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and records of the funding method used for assuring funds if either a funding plan or certification is used.

(5) The applicant or an existing licensee, for whom financial assurance is required and where it is intended that the licensed facility will eventually cease to operate while containing, storing or possessing radioactive sources on the premises and will require continuing and perpetual care or surveillance over the facility to protect public health, safety or welfare, shall deposit sums to a Perpetual Care Trust Fund maintained by the Commissioner in the name of the State.

(a) The Commissioner shall consider the following in making his determination of the Perpetual Care Trust Fund deposits for each individual applicant or licensee.

1. The nature of the licensed radioactive material; including its radiotoxicity, half-life, chemical and physical form and containment;

2. Size and type of facility to be decommissioned; and

3. The anticipated cost to the State of perpetual care and surveillance.

(b) The Department may reevaluate at any time the adequacy of a licensee's contributions to the existing Perpetual Care Trust Fund and may adjust by increasing or decreasing the rate of contribution or the specified amount required of a licensee so that the fund may be adequate in amount to meet perpetual care requirements of that licensee.

(6) Definitions of terms used in paragraph (4) of this rule.

(a) "Current decommissioning cost estimate" means the most recent of the estimates prepared in accordance with paragraph (4).

(b) "Director" means the Director of the Division of Radiological Health of the Department of Environment and Conservation.

(c) "Parent corporation" means a corporation which directly owns at least 50 percent of the voting stock of the corporation which is the facility owner or operator; the latter corporation is deemed a "subsidiary" of the parent corporation.

(d) The following terms are used in the specifications for the financial tests for financial assurance for decommissioning. The definitions are intended to assist in the understanding of these rules and are not intended to limit the meanings of terms in a way that conflicts with generally accepted accounting practices.

1. "Assets" means all existing and all probable future economic benefits obtained or controlled by a particular entity.

2. "Current assets" means cash or other assets or resources commonly identified as those which are reasonably expected to be realized in cash or sold or consumed during the normal operating cycle of the business.

3. "Current liabilities" means obligations whose liquidation is reasonably expected to require the use of existing resources properly classifiable as current assets or the creation of other current liabilities.

4. "Independently audited" refers to an audit performed by an independent certified public accountant in accordance with generally accepted auditing standards.

5. "Liabilities" means probable future sacrifices of economic benefits arising from present obligations to transfer assets or provide services to other entities in the future as a result of past transactions or events.

6. "Net working capital" means current assets minus current liabilities.

7. "Net worth" means total assets minus total liabilities and is equivalent to owner's equity.

8. "Tangible net worth" means the tangible assets that remain after deducting liabilities; such assets would not include intangibles such as goodwill and rights to patents of royalties.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017. Amendments filed September 1, 2021; effective November 30, 2021.*

0400-20-10-.13 SPECIAL REQUIREMENTS FOR ISSUANCE OF SPECIFIC LICENSES.

(1) Reserved.

(2) Reserved.

(3) An application for a specific license to initially transfer source material for use under Rule 0400-20-10-.09, or provisions equivalent to Rule 0400-20-10-.09, will be approved if:

(a) The applicant satisfies the general requirements specified in Rule 0400-20-10-.12; and

(b) The applicant submits adequate information on, and the Division approves, the methods to be used for quality control, labeling, and providing safety instructions to recipients.

(4) Multiple quantities of types of radioactive material for use in research and development. In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license for multiple quantities or types of radioactive material for use in research and development will be issued only if:

(a) The applicant has established an isotope committee (composed of such persons as a radiological safety officer, a representative of the business office, and one or more persons trained or experienced in the safe use of radioactive materials) which will review and approve, in advance of purchase of radioisotopes, proposals for use; and

(b) The applicant has appointed a radiological safety officer who will advise and assist on radiological safety problems.

(5) Manufacture, distribution or initial distribution of devices to persons generally licensed under paragraph (2) of Rule 0400-20-10-.10.

(a) In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license to distribute certain devices of the types enumerated in paragraph (2) of Rule 0400-20-10-.10 to persons generally licensed under paragraph (2) of Rule 0400-20-10-.10 or equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State will be issued only if:

1. The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control, labels, proposed uses, installation, servicing, leak testing, operating and safety instructions, and potential hazards of the device to provide assurance that:

(i) The device can be safely operated by persons not having training in radiological protection;

(ii) Under ordinary conditions of handling, storage and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and no person will receive in 1 year a dose in excess of 10 percent of the limits specified in Rule 0400-20-05-.50; and

(iii) Under accident conditions (such as fire and explosion) associated with handling, storage and use of the device, it is unlikely that any person would receive an external radiation dose or dose commitment in excess of the dose to the appropriate organ as specified in Table RHS 7-1:

(Rule 0400-20-10-.13, continued)

TABLE RHS 7-1
TABLE OF ORGAN DOSES

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

2. Each device bears a durable, legible clearly visible label or labels approved by the Division that contain(s) in a clearly identified and separate statement:

   (i) Instructions and precautions for safe installation, operation and servicing of the device (documents such as operating and service manuals may be identified in the label and used to provide this information);

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

   (iii) The information called for in one of the following statements in the same or similar form:

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

      CAUTION – RADIOACTIVE MATERIAL

      _____
      (Name of manufacturer or distributor)

      (II) The receipt, possession, use and transfer of this device Model _____,[10] Serial No. _____,[10] are subject to a general license or the equivalent and the regulations of a Licensing State. This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

      CAUTION – RADIOACTIVE MATERIAL

[10] If specified elsewhere in labeling affixed to the device, the model, serial number and manufacturer or distributor may be omitted from this label.

_____
(Name of manufacturer or distributor)

3. Each device having a separable source housing that provides the primary shielding for the source also bears, on the source housing, a durable label containing the device model number and serial number, the isotope and quantity, the words “CAUTION – RADIOACTIVE MATERIAL,” and, if practicable, the radiation symbol described in Rule 0400-20-05-.110 and the name of the manufacturer or initial distributor.

4. Each device meeting the criteria of Rule 0400-20-10-.10 bears a permanent (e.g., embossed, etched, stamped, or engraved) label affixed to the source housing if separable, or the device if the source housing is not separable, that includes the words, “CAUTION – RADIOACTIVE MATERIAL,” and, if practicable, the radiation symbol described in Rule 0400-20-05-.110.

5. The device has been registered in the Sealed Source and Device Registry.

(b) In the event the applicant desires that the device be tested at intervals longer than 6 months, either for proper operation of the on-off mechanism and indicator, if any, or for leakage of radioactive material, or for both, he shall include in his application information to demonstrate that such longer interval is justified by performance characteristics of the device or similar devices, and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material or failure of the on-off mechanism indicator. In determining the acceptable interval for the test for leakage of radioactive material, the Division will consider information that includes, but is not limited to:

1. Primary containment (source capsule);

2. Protection of primary containment;

3. Method of sealing containment;

4. Containment construction materials;

5. Form of contained radioactive material;

6. Maximum temperature withstood during prototype tests;

7. Maximum pressure withstood during prototype tests;

8. Maximum quantity of contained radioactive material;

9. Radiotoxicity of contained radioactive material; and

10. Operating experience with identical devices or similarly designed and constructed devices;

(c) In the event the applicant desires that the general licensee under paragraph (2) of Rule 0400-20-10-.10 or under equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State, be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on-off mechanism and indicator, or remove the device from installation, he shall include in his application written instructions to be followed by the general licensee, estimated calendar quarter doses

(Rule 0400-20-10-.13, continued)

associated with such activity or activities and the basis for such estimates. The submitted information shall demonstrate that performance of such activity or activities by an individual untrained in radiological protection, in addition to other handling, storage and use of devices under the general license, will not cause that individual to receive in one year a dose in excess of 10 percent of the limits specified in Rule 0400-20-05-.50;

(d) Before radioactive material may be transferred in a device for use under a general license, each person licensed under this paragraph shall furnish the following information to each person to whom he directly or through an intermediate person transfers radioactive material in a device. In the case of a transfer through an intermediate person, the information shall be provided to the intended user and to the intermediate person prior to initial transfer to the intermediate person.

	For use under the general license contained in paragraph (2) of Rule 0400-20-10-.10	For use under equivalent regulations of the U.S. Nuclear Regulatory Commission or an Agreement State or a Licensing State
1.	A copy of the general license contained in paragraph (2) of Rule 0400-20-10-.10.	A copy of the general license contained in the U.S. Nuclear Regulatory Commission's, Agreement State's, or Licensing State's regulations equivalent to paragraph (2) Rule 0400-20-10-.10. Alternatively, he may furnish a copy of the general license contained in paragraph (2) of Rule 0400-20-10-.10. If a copy of the general license in paragraph (2) of Rule 0400-20-10-.10 is furnished to such a person, it shall be accompanied by a note explaining that the use of the device is regulated by the U.S. Nuclear Regulatory Commission, Agreement State or Licensing State under requirements substantially the same as those in paragraph (2) of Rule 0400-20-10-.10;
	If parts (2)(c)2 through 4 or 13 of Rule 0400-20-10-.10 do not apply to the particular device, those parts may be omitted;	If parts (2)(c)2 through 4 or 13 of Rule 0400-20-10-.10, or sections of the Agreement State or Licensing State regulations equivalent to those parts, do not apply to the particular device, those parts may be omitted.
2.	A copy of Rules 0400-20-10-.26, 0400-20-05-.140 and 0400-20-05-.141.	A copy of 10 CFR §§ 31.2, 30.51, 20.2201, and 20.2202 or the Agreement State or Licensing State regulations equivalent to these NRC regulations.

3. A list of services that may only be performed by a specific licensee;

4. Information on acceptable disposal options including estimated costs of disposal;

5. A statement that regulatory agencies may issue citations and civil penalties for improper disposal; and

6. The name or title, address, and phone number of the person at the appropriate regulatory agency from whom additional information may be obtained.

(e) An alternative approach to informing customers may be proposed by the licensee for approval by the Division.

(f) Each device that is transferred on May 26, 2008 or later shall meet the labeling requirements in parts (a)2, 3, and 4 of this paragraph.

(g) 1. Each person licensed under this paragraph to distribute devices to generally licensed persons shall:

(i) Report to the Division, at its offices located at the address in Rule 0400-20-04-.07, all transfers of such devices to persons for use under the general license in paragraph (2) of Rule 0400-20-10-.10.

(ii) Report to the U.S. Nuclear Regulatory Commission all transfers of such devices to persons for use under the U.S. Nuclear Regulatory Commission general license in Section 31.5 of 10 CFR Part 31.

(iii) Report to the responsible Agreement or Licensing State agency all transfers of devices manufactured and distributed pursuant to this paragraph for use under a general license in that state's regulations equivalent to paragraph (2) of Rule 0400-20-10-.10.

2. Reports required by subparts 1(i), (ii) and (iii) of this subparagraph shall identify:

(i) Each general licensee by name and mailing address for the location of use; if there is no mailing address for the location of use, an alternate address for the general licensee shall be submitted along with information on the actual location of use;

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

(iii) The date of transfer;

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

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

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

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

5. If the licensee makes changes to a device possessed by a general licensee, such that the label must be changed to update required information, the report

(Rule 0400-20-10-.13, continued)

shall identify the general licensee, the device, and the changes to information on the device label.

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

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

(iii) If no transfers have been made to or from persons generally licensed under paragraph (2) of Rule 0400-20-10-.10 during the reporting period, the report shall so indicate.

(h) Each person licensed under this paragraph to distribute devices to generally licensed persons shall keep records showing the name, address of use, and responsible individual for each general licensee to whom he directly or through an intermediate person transfers radioactive material in devices for use pursuant to the general license provided in paragraph (2) of Rule 0400-20-10-.10 or equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State. The records shall show the date of each transfer, the model number, serial number and the isotope and quantity of radioactivity in each device transferred, the identity of any intermediate person(s), and compliance with the report requirements of subparagraph (g) of this paragraph. The records required by this subparagraph shall be maintained for a period of 3 years from the date of the recorded event.

(6) The use of sealed sources in industrial radiography.

In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license for use of sealed sources in industrial radiography will be issued only if:

(a) The applicant will have a program for training radiographers and radiographer's assistants and submits to the Division for approval a schedule or description of such program which specifies the:

1. Initial training:

(i) This initial training will consist of a complete training program as outlined in Rule 0400-20-08-.07; or

(ii) Résumés of prior training and experience of individuals that show fulfillment of the requirements of subparagraphs (7)(a) and (b) of Rule 0400-20-08-.07 and the program for the initial training of such individuals in the licensee's or registrant's specific industrial radiography program as outlined in subparagraphs (7)(c), (d) and (e) of Rule 0400-20-08-.07;

2. Periodic training;

3. On-the-job training;

4. Means to be used by the applicant to determine the radiographer's knowledge and understanding of and ability to comply with Division regulations and licensing requirements and the operating and emergency procedures of the applicant; and

(Rule 0400-20-10-.13, continued)

5. Means to be used by the applicant to determine the radiographer's assistant's knowledge and understanding of and ability to comply with the operating and emergency procedures of the applicant;

(b) The applicant has established and submits to the Division for approval written operating and emergency procedures as described in paragraph (2) of Rule 0400-20-08-.05;

(c) The applicant will have an internal inspection system to assure that Division regulations, license provisions, and the applicant's operating and emergency procedures are followed by radiographers and radiographer's assistants; the inspection system shall include the performance of internal inspections at intervals not to exceed 3 months and the retention of records of such inspections for inspection by the Division.

(d) The applicant submits to the Division a description of his overall organizational structure pertaining to the radiography program, including specified delegations of authority and responsibility for operation of the program; and

(e) The applicant who desires to conduct his own leak tests must establish procedures to be followed in testing sealed sources for possible leakage and contamination and submit to the Division for approval a description of such procedures including:

1. Instrumentation to be used;

2. Method of performing tests, e.g., points on equipment to be smeared and method of taking smear; and

3. Pertinent experience of the person who will perform the test.

(7) Multiple quantities or types of radioactive material for use in processing.

In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license for multiple quantities or types of radioactive material for use in processing for distribution to other authorized persons will be issued only if[11]:

(a) The applicant's staff has experience in the use of radioisotopes for processing and distribution; and

(b) The applicant has appointed a radiological safety officer who will advise and assist on radiological safety problems.

(8) Introduction of radioactive material into products in exempt concentrations.

In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license authorizing the introduction of radioactive material into a product or material owned by or in the possession of the licensee or another to be transferred to persons exempt under subparagraph (1)(a) of Rule 0400-20-10-.04 will be issued only if:

(a) The applicant submits a description of the product or material into which the radioactive material will be introduced, intended use of the radioactive material and the product or

[11] Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing by product material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the U.S. Nuclear Regulatory Commission, Washington, DC 20555.

(Rule 0400-20-10-.13, continued)

material into which it is introduced, method of introduction, initial concentration of the radioactive material in the product or material, control methods to assure that no more than the specified concentration is introduced into the product or material, estimated time interval between introduction and transfer of the product or material and estimated concentration of the radioactive material in the product or material at the time of transfer; and

(b) The applicant provides assurance that the concentrations of radioactive material at the time of transfer will not exceed the concentrations in Schedule RHS 8-4, that reconcentration of the radioactive material in concentrations exceeding those in Schedule RHS 8-4 is not likely, that lower concentrations cannot be used, and that the product or material is not likely to be incorporated in any food, beverage, cosmetic, drug, or other commodity or product designed for ingestion or inhalation by, or application to, a human being. Each person licensed under this paragraph, shall file an annual report with the Division which shall identify the type and quantity of each product or material into which radioactive material has been introduced during the reporting period, name and address of the person who owns or possesses the product or material into which radioactive material has been introduced at the time of introduction, the type and quantity of radioactive material introduced into each product or material, and the initial concentrations of radioactive material in the product or material at the tie of transfer of the radioactive material by the licensee. If no transfers of radioactive material have been made pursuant to this paragraph during the reporting period, the report shall so indicate. The report shall be submitted within 30 days after the end of each calendar year.

(9) Radioactive material in luminous safety devices for use in aircraft.

In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license to manufacture, assemble, repair, or distribute to persons generally licensed under paragraph (3) of Rule 0400-20-10-.10 luminous safety devices containing radioactive materials for use in aircraft will be issued only if the requirements of Sections 32.53, 32.54, 32.55, 32.56 and 32.101 of 10 CFR Part 32 or their equivalent are met.

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

(a) An application for a specific license to manufacture, prepare, or transfer for commercial distribution radiopharmaceuticals containing radioactive material for use by persons authorized pursuant to Chapter 0400-20-07 will be approved if:

1. The applicant satisfies the general requirements of Rule 0400-20-10-.12;

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 the owner or operator of a drug establishment that engages in the manufacture, preparation, propagation, compounding, or processing of a drug under 21 C.F.R. § 207.17(a);

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

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

(iv) Operating as a nuclear pharmacy within a Federal medical institution; or

(Rule 0400-20-10-.13, continued)

(v) A Positron Emission Tomography (PET) drug production facility registered with a state agency.

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 medical use licensees; and

4. The applicant commits to 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 ensures that the syringe, vial, or other container can be correlated with the information on the transport radiation shield label.

(b) A licensee described by subpart (a)2(iii) of this paragraph:

1. May prepare radiopharmaceuticals for medical use, as defined in Rule 0400-20-07-.05, provided that the radiopharmaceuticals are prepared by either an authorized nuclear pharmacist, as specified in parts 2 and 4 of this subparagraph, or an individual under the supervision of an authorized nuclear pharmacist as specified in Rule 0400-20-07-.19.

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 Rule 0400-20-07-.05;

(ii) This individual meets the requirements specified in paragraph (2) of Rule 0400-20-07-.25 and Rule 0400-20-07-.27, 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. May take the actions authorized in parts 1 and 2 of this subparagraph notwithstanding more restrictive language in license conditions.

4. May designate a pharmacist (as defined in Rule 0400-20-07-.05) as an authorized nuclear pharmacist if the individual was a nuclear pharmacist at a Government agency or Federally recognized Indian Tribe before November 30, 2007, or at all other pharmacies before August 8, 2009, or an earlier date as noticed by the U.S. Nuclear Regulatory Commission.

5. Shall provide to the Division a copy of each individual's:

(i) Certification by a specialty board whose certification process has been recognized by the Division, U.S. Nuclear Regulatory Commission, or an Agreement State as specified in paragraph (1) of Rule 0400-20-07-.25; or

(ii) The Division, U.S. Nuclear Regulatory Commission, or other Agreement State license; or

(iii) U.S. Nuclear Regulatory Commission master materials licensee permit; or

(iv) The permit issued by a licensee or U.S. Nuclear Regulatory Commission master materials permittee of broad scope or the authorization from a commercial nuclear pharmacy authorized to list its own authorization nuclear pharmacist; or

(v) Documentation that only accelerator-produced radioactive materials were used in the practice of nuclear pharmacy at a Government agency or Federally recognized Indian Tribe before November 30, 2007, or at all other locations of use before August 8, 2009, or an earlier date as noticed by the U.S. Nuclear Regulatory Commission; and

(vi) A copy of the state pharmacy licensure or registration no later than 30 days after the date that the licensee allows the individual to work as an authorized nuclear pharmacist under subparts 2(i) and (ii) of this subparagraph.

(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 measurement or by combination of measurements and calculations the 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) A licensee shall satisfy the labeling requirements of part (a)4 of this paragraph.

(e) Nothing in this rule relieves the licensee from complying with applicable FDA, other federal, and other state requirements governing radioactive drugs.

(11) Manufacture and distribution of generators or reagent kits for preparation of radiopharmaceuticals containing radioactive material. In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license to manufacture and distribute generators or reagent kits containing radioactive material for preparation of radiopharmaceuticals by persons licensed pursuant to Chapter 0400-20-07 will be issued only if[12]:

[12] Although the Department does not regulate the manufacture and distribution of reagent kits that do not contain radioactive material, it does regulate the use of such reagent kits for the preparation of radiopharmaceuticals containing radioactive material as part of its licensing and regulation of the users of radioactive material. Any manufacturer of reagent kits that do not contain radioactive material

(Rule 0400-20-10-.13, continued)

(a) The requested site for manufacture and/or distribution of generators or reagent kits is located within this State;

(b) The applicant submits evidence that:

1. The generator or reagent kit is to be manufactured, labeled and packaged in accordance with the Federal Food, Drug and Cosmetic Act or the Public Health Service Act, such as a new drug application (NDA) approved by the United States Food and Drug Administration (FDA), a biologic product license issued by FDA or a "Notice of Claimed Investigational Exemption for a New Drug" (IND) accepted by FDA; or

2. The manufacture and distribution of the generator or reagent kit are not subject to the Federal Food, Drug and Cosmetic Act and the Public Health Service Act;

(c) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material contained in the generator or reagent kit;

(d) The label affixed to the generator or reagent kit contains information on the radionuclide, quantity and date of assay;

(e) The label affixed to the generator or reagent kit, or the leaflet or brochure which accompanies the generator or reagent kit, contains:

1. Information, from a radiation safety standpoint, on the procedures to be followed and the equipment and shielding to be used in eluting the generator or processing radioactive material with the reagent kit; and

2. A statement that this generator or reagent kit, as appropriate, is approved for use by persons licensed by the Division pursuant to Chapter 0400-20-07 of these rules, or under equivalent licenses of the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State; and

(f) The labels, leaflets or brochures required by subparagraphs (d) and (e) of this paragraph are in addition to the labeling required by the FDA and they may be separate from or, with the approval of FDA, may be combined with the labeling required by FDA.

(12) Manufacture and distribution of sources or devices containing radioactive material for medical uses.

(a) In addition to the requirements set forth in Rule 0400-20-10-.12, an application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed under Chapter 0400-20-07 of these rules for use as a calibration, transmission, or reference source or for the uses listed in Rules 0400-20-07-.51, 0400-20-07-.61, 0400-20-07-.63, and 0400-20-07-.81 will be approved if:

1. The applicant satisfies the general requirements in Rule 0400-20-10-.12.

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who desires to have reagent kits approved by the Department for use by persons licensed pursuant to Chapter 0400-20-07 may submit the pertinent information specified in this paragraph.

(Rule 0400-20-10-.13, continued)

2. The applicant submits information regarding each type of source or device pertinent to an evaluation of its radiation safety, including:

   (i) The radioactive material contained, its chemical and physical form and amount;

   (ii) Details of design and construction of the source or device;

   (iii) Procedures for, and results of, prototype tests to demonstrate that the source or device will maintain its integrity under stresses likely to be encountered;

   (iv) For devices containing radioactive material, the radiation profile of a prototype device;

   (v) Details of quality control procedures to assure that production sources and devices meet the standards of the design and prototype tests;

   (vi) Procedures and standards for calibrating sources and devices;

   (vii) Legend and methods for labeling sources and devices as to their radioactive content; and

   (viii) Instructions for handling and storing the source or device for radiation safety; these instructions are to be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device; provided that instructions which are too lengthy for such label may be summarized on the label and printed in detail on a brochure which is referenced on the label;

3. The label affixed to the source or device, or to the permanent storage container for the source or device, contains information on the radionuclide, quantity, and date of assay, and a statement that the Division has approved distribution of the (name of the source or device) to persons licensed to use radioactive material identified in Rules 0400-20-07-.31, 0400-20-07-.51, 0400-20-07-.61, and 0400-20-07-.63 as appropriate, and to persons who hold an equivalent license issued by the U.S. NRC or an Agreement State.

4. The course or device has been registered in the Sealed Source and Device Registry.

(b) In the event the applicant desires that the source or device be required to be tested for leakage of radioactive material at intervals longer than 6 months, the applicant shall include in his application information to demonstrate that such longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source. In determining the acceptable interval for test of leakage of radioactive material, the Division will consider information that includes, but is not limited to:

1. Primary containment (source capsule);

2. Protection of primary containment;

3. Method of sealing containment;

(Rule 0400-20-10-.13, continued)

4. Containment construction materials;

5. Form of contained radioactive material;

6. Maximum temperature withstood during prototype tests;

7. Maximum pressure withstood during prototype tests;

8. Maximum quantity of contained radioactive material;

9. Radiotoxicity of contained radioactive material; and

10. Operating experience with identical sources or devices or similarly designed and constructed devices;

(13) Manufacture and distribution of radioactive material for certain in vitro clinical or laboratory testing under general license.

In addition to the requirements set forth in Rule 0400-20-10-.12, a specific license to manufacture or distribute radioactive material for use under the general license of paragraph (7) of Rule 0400-20-10-.10 will be issued only if:

(a) The radioactive material is to be prepared for distribution in prepackaged units of:

1. Iodine-125 in units not exceeding 10 microcuries each.

2. Iodine-131 in units not exceeding 10 microcuries each.

3. Carbon-14 in units not exceeding 10 microcuries each.

4. Hydrogen-3 (tritium) in units not exceeding 50 microcuries each.

5. Iron-59 in units not exceeding 20 microcuries each.

6. Cobalt-57 in units not exceeding 10 microcuries each.

7. Selenium-75 in units not exceeding 10 microcuries each.

8. Mock Iodine-125 in units not exceeding 0.05 microcurie of iodine-129 and 0.005 microcurie of americium-241 each.

(b) Each prepackaged unit bears a durable, clearly visible label:

1. Identifying the radioactive contents as to chemical form and radionuclide, and indicating that the amount of radioactivity does not exceed 10 microcuries of iodine-131, iodine-125, cobalt-57, selenium-75, or carbon-14; 50 microcuries of hydrogen-3 (tritium); 20 microcuries of iron-59; or Mock Iodine-125 in units not exceeding 0.05 microcurie of iodine-129 and 0.005 microcurie of americium-241 each; and

2. Displaying the radiation caution symbol described in Rule 0400-20-05-.110 and the words, “Caution, Radioactive Material” and “Not for Internal or External Use in Humans or Animals.”

(Rule 0400-20-10-.13, continued)

(c) The following statement or a substantially similar statement which contains the information called for in the following statement, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package::

1. This radioactive material may be received, acquired, possessed and used only by physicians, veterinarians in the practice of veterinary medicine, clinical laboratories or hospitals and only for “in vitro” clinical or laboratory tests not involving internal or external administration of the material, or the radiation there from, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of the U.S. Nuclear Regulatory Commission or of a state with which the Commission has entered into an agreement for the exercise of regulatory authority.

_____
(Name of Manufacturer)

(d) The label affixed to the unit, or the leaflet or brochure which accompanies the package, contains adequate information as to the precautions to be observed in handling and storing such radioactive material. In the case of the Mock Iodine-125 reference or calibration source, the information accompanying the source must also contain directions to the licensee regarding the waste disposal requirements set out in Rule 0400-20-05-.120.

(14) Distribution of radioactive material in exempt quantities[13].

(a) An application for a specific license to distribute NARM to persons exempt from these rules pursuant to paragraph (3) of Rule 0400-20-10-.04 will be approved if:

1. The radioactive material is not contained in any food, beverage, cosmetic, drug, or other commodity designed for ingestion or inhalation by, or application to, a human being;

2. The radioactive material is in the form of processed chemical elements, compounds, or mixtures, tissue samples, bioassay samples, counting standards, plated or encapsulated sources, or similar substances, identified as radioactive and to be used for its radioactive properties, but is not incorporated into any manufactured or assembled commodity, product, or device intended for commercial distribution; and

3. The applicant submits copies of prototype labels and brochures and the Division approves such labels and brochures.

(b) The license issued under subparagraph (a) of this paragraph is subject to the following conditions:

1. No more than 10 exempt quantities shall be sold or transferred in any single transaction. However, an exempt quantity may be composed of fractional parts of one or more of the exempt quantity provided the sum of the fractions shall not exceed unity.

2. Each exempt quantity shall be separately and individually packaged. No more that 10 such packaged exempt quantities shall be contained in any outer package for transfer to persons exempt pursuant to paragraph (3) of Rule 0400-

[13] See footnote 2 of this Chapter.

(Rule 0400-20-10-.13, continued)

20-10-.04. The outer package shall be such that the dose rate at the external surface of the package does not exceed 0.5 millirem per hour.

3. The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label which

(i) Identifies the radionuclide and the quantity of radioactivity; and

(ii) Bears the words “Radioactive Material.”

4. In addition to the labeling information required by part 3 of this subparagraph, the label affixed to the immediate container, or an accompanying brochure, shall:

(i) State that the contents are exempt from Licensing State requirements;

(ii) Bear the words “Radioactive Material - Not for Human Use - Incorporation into Foods, Beverages, Cosmetics, Drugs, or Medicinals, or into Products Manufactured for Commercial Distribution is Prohibited - Exempt Quantities Should Not Be Combined”; and

(iii) Set forth appropriate additional radiation safety precautions and instructions relating to the handling, use, storage and disposal of the radioactive material.

(c) Each person licensed under this paragraph shall maintain records identifying, by name and address, each person to whom radioactive material is transferred for use under paragraph (3) of Rule 0400-20-10-.04 or the equivalent regulations of a Licensing State, and stating the kinds and quantities of radioactive material transferred. An annual summary report stating the total quantity of each radionuclide transferred under the specific license shall be filed with the Division. Each report shall cover the year ending June 30, and shall be filed within 30 days thereafter. If no transfers of radioactive material have been made pursuant to this paragraph during the reporting period, the report shall so indicate.

(15) Special requirements for license to manufacture or initially transfer calibration sources containing americium-241, or radium-226 for distribution to persons generally licensed under paragraph (4) of Rule 0400-20-10-.10.

(a) An application for a specific license to manufacture or initially transfer calibration or reference sources containing americium-241, or radium-226 for distribution to persons generally licensed under paragraph (4) of Rule 0400-20-10-.10 will be approved if:

1. The applicant satisfies the general requirement of Rule 0400-20-10-.12; and

2. The applicant submits sufficient information regarding each type of calibration or reference source pertinent to evaluation of the potential radiation exposure, including:

(i) Chemical and physical form and maximum quantity of americium 241, or radium-226 in the source;

(ii) Details of construction and design;

(iii) Details of the method of incorporation and binding of the americium-241, or radium-226 in the source;

(Rule 0400-20-10-.13, continued)

(iv) Procedures for and results of prototype testing of sources, which are designed to contain more than 185 Bq (0.005 μCi) of americium-241, or radium-226, to demonstrate that the americium-241, or radium-226 contained in each source will not be released or be removed from the source under normal conditions of use;

(v) Details of quality control procedures to be followed in manufacture of the source;

(vi) Description of labeling to be affixed to the source or the storage container for the source; and

(vii) Any additional information, including experimental studies and tests, required by the Division to facilitate a determination of the safety of the source.

3. Each source will contain no more than 185 kBq (5 μCi) of americium-241, or radium-226.

4. The Division determines, with respect to any type of source containing more than 185 Bq (0.005 μCi) of americium-241, or radium-226, that:

(i) The method of incorporation and binding of the americium-241, or radium-226 in the source is such that the americium-241, or radium-226 will not be released or be removed from the source under normal conditions of use and handling of the source; and

(ii) The source has been subjected to and has satisfactorily passed appropriate tests prescribed by part 5 of this subparagraph.

5. The applicant shall subject at least five prototypes of each source that is designed to contain more than 0.185 kilobecquerel (0.005 microcurie) of americium-241 or radium-226 to tests as follows:

(i) The initial quantity of radioactive material deposited on each source is measured by direct counting of the source.

(ii) The sources are subjected to tests that adequately take into account the individual, aggregate, and cumulative effects of environmental conditions expected in service that could adversely affect the effective containment or binding of americium-241 or radium-226, such as physical handling, moisture, and water immersion.

(iii) The sources are inspected for evidence of physical damage and for loss of americium-241 or radium-226, after each stage of testing, using methods of inspection adequate for determining compliance with the criteria in subpart (iv) of this part.

(iv) Source designs are rejected for which the following has been detected for any unit: Removal of more than 0.185 kilobecquerel (0.005 microcurie) of americium-241 or radium-226 from the source or any other evidence of physical damage.

(b) Reserved.

(c) Labeling of devices.

Each person licensed under subparagraph (a) of this paragraph shall affix to each source, or storage container for the source, a label which shall contain sufficient information relative to safe use and storage of the source and shall include the following statement or a substantially similar statement which contains the information called for in the following statement:

The receipt, possession, use and transfer of this source, Model _____, Serial No. _____, are subject to a general license and the regulations of the NRC or an Agreement State. Do not remove this label.

CAUTION—RADIOACTIVE MATERIAL—
THIS SOURCE CONTAINS AMERICIUM-241 [OR RADIUM-226].
DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE.

_____
Name of manufacturer or initial transferor

(d) Leak testing of each source. Each person licensed under subparagraph (a) of this paragraph shall perform a dry wipe test upon each source containing more than 3.7 kBq (0.1 μCi) of americium-241, or radium 226 prior to transferring the source to a general licensee under paragraph (4) of Rule 0400-20-10-.10. This test must be performed by wiping the entire radioactive surface of the source with a filter paper with the application of moderate finger pressure. The radioactivity on the filter paper must be measured by using methods capable of detecting 185 Bq (0.005 μCi) of americium-241, or radium-226. If a source has been shown to be leaking or losing more than 185 Bq (0.005 μCi) of americium-241 or radium-226 by the methods described in this subparagraph, the source must be rejected and must not be transferred to a general licensee under paragraph (4) of Rule 0400-20-10-.10 or equivalent regulations of the NRC or an Agreement State.

(16) Reserved.

(17) Ice detection devices containing strontium-90; requirements for license to manufacture or initially transfer; quality assurance; prohibition of transfer.

(a) An application for a specific license to manufacture or initially transfer ice detection devices containing strontium-90 for distribution to persons generally licensed under Rule 0400-20-10-.10 will be approved if:

1. The applicant satisfies the general requirements specified in Rule 0400-20-10-.12;

2. The applicant submits sufficient information regarding each type of device pertinent to evaluation of the potential radiation exposure, including:

(i) Chemical and physical form and maximum quantity of strontium-90 in the device;

(ii) Details of construction and design of the source of radiation and its shielding;

(iii) Radiation profile of a prototype device;

(iv) Procedures for and results of prototype testing of devices to demonstrate that the strontium-90 contained in each device will not be released or be

(Rule 0400-20-10-.13, continued)

removed from the device under the most severe conditions likely to be encountered in normal handling and use;

(v) Details of quality control procedures to be followed in manufacture of the device;

(vi) Description of labeling to be affixed to the device;

(vii) Instructions for handling and installation of the device;

(viii) Any additional information, including experimental studies and tests, required by the Division to facilitate a determination of the safety of the device;

3. Each device will contain no more than 50 microcuries of strontium-90 in an insoluble form;

4. Each device will bear durable, legible labeling which includes the radiation caution symbol prescribed by Rule 0400-20-05-.110, a statement that the device contains strontium-90 and the quantity thereof, instructions for disposal and statements that the device may be possessed pursuant to a general license, that the manufacturer or civil authorities should be notified if the device is found, that removal of the labeling is prohibited and that disassembly and repair of the device may be performed only by a person holding a specific license to manufacture or service such devices;

5. The Division determines that:

(i) The method of incorporation and binding of the strontium-90 in the device is such that the strontium-90 will not be released from the device under the most severe conditions which are likely to be encountered in normal use and handling of the device;

(ii) The strontium-90 is incorporated or enclosed so as to preclude direct physical contact by any individual with it and is shielded so that no individual will receive a radiation exposure to a major portion of his body in excess of 0.5 rem in a year under ordinary circumstances of use;

(iii) The device is so designed that it cannot be easily disassembled;

(iv) Prototypes of the device have been subjected to and have satisfactorily passed the tests required by subparagraph (b) of this paragraph.

(v) Quality control procedures have been established to satisfy the requirements of subparagraph (c) of this paragraph.

6. The device has been registered in the Sealed Source and Device Registry.

(b) The applicant shall subject at least five prototypes of the device to tests as follows:

1. The devices are subjected to tests that adequately take into account the individual, aggregate, and cumulative effects of environmental conditions expected in service that could adversely affect the effective containment of strontium-90, such as temperature, moisture, absolute pressure, water immersion, vibration, shock, and weathering.

(Rule 0400-20-10-.13, continued)

2. The devices are inspected for evidence of physical damage and for loss of strontium-90 after each stage of testing, using methods of inspection adequate for determining compliance with the criteria in part 3 of this subparagraph.

3. Device designs are rejected for which the following has been detected for any unit:

(i) A leak resulting in a loss of 0.1 percent or more of the original amount of strontium-90 from the device; or

(ii) Surface contamination of strontium-90 on the device of more than 2,200 disintegrations per minute per 100 square centimeters of surface area; or

(iii) Any other evidence of physical damage.

(c) 1. Each person licensed under this paragraph shall visually inspect each device and shall reject any which has an observable physical defect that could affect containment of the strontium-90.

2. Each person licensed under this paragraph shall test each device for possible loss of strontium-90 or for contamination by wiping with filter paper an area of at least 100 square centimeters on the outside surface of the device, or by wiping the entire surface area if it is less than 100 square centimeters. The detection on the filter paper of more than 2,200 disintegrations per minute of radioactive material per 100 square centimeters of surface wiped shall be cause for rejection of the tested device.

3. Each person licensed under this paragraph shall:

(i) Maintain quality assurance systems in the manufacture of the ice detection device containing strontium-90 in a manner sufficient to provide reasonable assurance that the safety-related components of the distributed devices are capable of performing their intended functions; and

(ii) Subject inspection lots to acceptance sampling procedures, by procedures specified in part 4 of this subparagraph and in the license issued under this paragraph, to provide at least 95 percent confidence that the Lot Tolerance Percent Defective of 5.0 percent will not be exceeded.

4. Each person licensed under this paragraph shall subject each inspection lot to:

(i) Tests that adequately take into account the individual, aggregate, and cumulative effects of environmental conditions expected in service that could possibly affect the effective containment of strontium-90, such as absolute pressure and water immersion.

(ii) Inspection for evidence of physical damage, containment failure, or for loss of strontium-90 after each stage of testing, using methods of inspection adequate to determine compliance with the following criteria for defective: A leak resulting in a loss of 0.1 percent or more of the original amount of strontium-90 from the device and any other criteria specified in the license issued under this paragraph.

5. No person licensed under this paragraph shall transfer to persons generally licensed under paragraph (6) of Rule 0400-20-10-.10, or under an equivalent general license of an Agreement State:

(i) Any ice detection device containing strontium-90 tested and found defective under the criteria specified in a license issued under this paragraph, unless the defective ice detection device has been repaired or reworked, retested, and determined by an independent inspector to meet the applicable acceptance criteria; or

(ii) Any ice detection device containing strontium-90 contained within any lot that has been sampled and rejected as a result of the procedures in subpart 3(ii) of this subparagraph, unless:

(I) A procedure for defining sub-lot size, independence, and additional testing procedures is contained in the license issued under this paragraph, and

(II) Each individual sub-lot is sampled, tested, and accepted in accordance with subpart 3(ii) of this subparagraph and item (I) of this subpart and any other criteria as may be required as a condition of the license issued under this paragraph.

(18) Registration of sealed source and device product information.

(a) Any manufacturer or initial distributor of a sealed source or device containing a sealed source may submit a request to the Division for evaluation of radiation safety information about its product and for its registration.

(b) The request for review must be sent to the Tennessee Division of Radiological Health at the address given in subparagraph (1)(c) of Rule 0400-20-04-.07.

(c) The request for review of a sealed source or a device must include sufficient information about the design, manufacture, prototype testing, quality control program, labeling, proposed uses and leak testing and, for a device, the request must also include sufficient information about installation, service and maintenance, operating and safety instructions, and its potential hazards, to provide reasonable assurance that the radiation safety properties of the source or device are adequate to protect health and minimize danger to life and property.

(d) The Division normally evaluates a sealed source or a device using radiation safety criteria in accepted industry standards. If these standards and criteria do not readily apply to a particular case, the Division formulates reasonable standards and criteria with the help of the manufacturer or distributor. The Division shall use criteria and standards sufficient to ensure that the radiation safety properties of the device or sealed source are adequate to protect health and minimize danger to life and property. Rule 0400-20-10-.04 includes specific criteria that apply to certain exempt products and Rule 0400-20-10-.10 includes specific criteria applicable to certain generally licensed devices. This rule includes specific provisions that apply to certain specifically licensed items.

(e) After completion of the evaluation, the Division issues a certificate of registration to the person making the request. The certificate of registration acknowledges the availability of the submitted information for inclusion in an application for a specific license proposing use of the product, or concerning use under an exemption from licensing or general license as applicable for the category of certificate.

(f) The person submitting the request for evaluation and registration of safety information about the product shall manufacture and distribute the product in accordance with:

(Rule 0400-20-10-.13, continued)

1. The statements and representations, including quality control program, contained in the request; and

2. The provisions of the registration certificate.

(g) Authority to manufacture or initially distribute a sealed source or device to specific licensees may be provided in the license without the issuance of a certificate of registration in the following cases:

1. Calibration and reference sources containing no more than:

(i) 37 MBq (1 mCi), for beta and/or gamma emitting radionuclides; or

(ii) 0.37 MBq (10 µCi), for alpha emitting radionuclides; or

2. The intended recipients are qualified by training and experience and have sufficient facilities and equipment to safely use and handle the requested quantity of radioactive material in any form in the case of unregistered sources or, for registered sealed sources contained in unregistered devices, are qualified by training and experience and have sufficient facilities and equipment to safely use and handle the requested quantity of radioactive material in unshielded form, as specified in their licenses; and

(i) The intended recipients are licensed under paragraph (4) of this rule;

(ii) The recipients are authorized for research and development; or

(iii) The sources and devices are to be built to the unique specifications of the particular recipient and contain no more than 740 GBq (20 Ci) of tritium or 7.4 GBq (200 mCi) of any other radionuclide.

(h) After the certificate is issued, the Division may conduct an additional review as it determines is necessary to ensure compliance with current regulatory standards. In conducting its review, the Division will complete its evaluation in accordance with criteria specified in this paragraph. The Division may request such additional information as it considers necessary to conduct its review and the certificate holder shall provide the information as requested.

(19) Inactivation of certificates of registration of sealed sources and devices.

(a) A certificate holder who no longer manufactures or initially transfers any of the sealed source(s) or device(s) covered by a particular certificate issued by the Division shall request inactivation of the registration certificate. Such a request must be made to the Tennessee Division of Radiological Health at the address given in subparagraph (1)(c) of Rule 0400-20-04-.07 and must normally be made no later than two years after initial distribution of all of the source(s) or device(s) covered by the certificate has ceased. However, if the certificate holder determines that an initial transfer was in fact the last initial transfer more than two years after that transfer, the certificate holder shall request inactivation of the certificate within 90 days of this determination and briefly describe the circumstances of the delay.

(b) If a distribution license is to be terminated in accordance with Rule 0400-20-10-.17, the licensee shall request inactivation of its registration certificates associated with that distribution license before the Division will terminate the license. Such a request for

(Rule 0400-20-10-.13, continued)

inactivation of certificate(s) must indicate that the license is being terminated and include the associated specific license number.

(c) A specific license to manufacture or initially transfer a source or device covered only by an inactivated certificate no longer authorizes the licensee to initially transfer such sources or devices for use. Servicing of devices must be in accordance with any conditions in the certificate, including in the case of an inactive certificate.

(20) Emergency preparedness.

(a) Emergency preparedness for possession of radioactive material other than uranium and plutonium.

1. In addition to the requirements set forth in Rule 0400-20-10-.12, all specific licenses issued, or for which an initial application or an application to amend is submitted, to possess radioactive materials in unsealed form, on foils or plated sources, or sealed in glass in excess of the quantities in Table RHS 7-2 must contain either:

(i) An evaluation showing that the maximum dose to a person offsite due to a release of radioactive materials would not exceed 1 rem effective dose equivalent or 5 rems to the thyroid; or

(ii) An emergency plan for responding to a release of radioactive material.

2. One or more of the following factors may be used to support an evaluation submitted under subpart 1(i) of this subparagraph:

(i) The radioactive material is physically separated so that only a portion could be involved in an accident;

(ii) All or part of the radioactive material is not subject to release during an accident because of the way it is stored or packaged;

(iii) The release fraction in the respirable size range would be lower than the release fraction shown in Table RHS 7-2 due to the chemical or physical form of the material;

(iv) The solubility of the radioactive material would reduce the dose received;

(v) Facility design or engineered safety features in the facility would cause the release fraction to be lower than shown in Table RHS 7-2;

(vi) Operating restrictions or procedures would prevent a release fraction as large as that shown in Table RHS 7-2; or

(vii) Other factors appropriate for the specific facility.

(Rule 0400-20-10-.13, continued)

Table RHS 7-2
Quantities of radioactive materials requiring consideration of the need for an emergency plan for responding to a release.

Radioactive material [1]	Release fraction	Quantity (curies)
Actinium-228	0.001	4,000
Americium-241	0.001	2
Americium-242	0.001	2
Americium-243	0.001	2
Antimony-124	0.01	4,000
Antimony-126	0.01	6,000
Barium-133	0.01	10,000
Barium-140	0.01	30,000
Bismuth-207	0.01	5,000
Bismuth-210	0.01	600
Cadmium-109	0.01	1,000
Cadmium-113	0.01	80
Calcium-45	0.01	20,000
Californium-252	0.001	9 (20 mg)
Carbon-14	0.01	50,000
Cerium-141	0.01	10,000
Cerium-144	0.01	300
Cesium-134	0.01	2,000
Cesium-137	0.01	3,000
Chlorine-36	0.5	100
Chromium-51	0.01	300,000
Cobalt-60	0.001	5,000
Copper-64	0.01	200,000
Curium-242	0.001	60
Curium-243	0.001	3
Curium-244	0.001	4
Curium-245	0.001	2
Europium-152	0.01	500
Europium-154	0.01	400
Europium-155	0.01	3,000
Germanium-68	0.01	2,000
Gadolinium-153	0.01	5,000
Gold-198	0.01	30,000
Hafnium-172	0.01	400
Hafnium-181	0.01	7,000
Holmium-166m	0.01	100
Hydrogen-3	0.5	20,000
Iodine-125	0.5	10
Iodine-131	0.5	10
Indium-114m	0.01	1,000
Iridium-192	0.001	40,000
Iron-55	0.01	40,000
Iron-59	0.01	7,000
Krypton-85	1.0	6,000,000
Lead-210	0.01	8
Manganese-56	0.01	60,000
Mercury-203	0.01	10,000
Molybdenum-99	0.01	30,000
Neptunium-237	0.001	2
Nickel-63	0.01	20,000
Niobium-94	0.01	300
Phosphorus-32	0.5	100
Phosphorus-33	0.5	1,000
Polonium-210	0.01	10
Potassium-42	0.01	9,000
Promethium-145	0.01	4,000
Promethium-147	0.01	4,000
Radium-226	0.001	100
Ruthenium-106	0.01	200
Samarium-151	0.01	4,000
Scandium-46	0.01	3,000
Selenium-75	0.01	10,000
Silver-110m	0.01	1,000
Sodium-22	0.01	9,000
Sodium-24	0.01	10,000
Strontium-89	0.01	3,000
Strontium-90	0.01	90
Sulfur-35	0.5	900
Technetium-99	0.01	10,000
Technetium-99m	0.01	400,000
Tellurium-127m	0.01	5,000
Tellurium-129m	0.01	5,000
Terbium-160	0.01	4,000
Thulium-170	0.01	4,000
Tin-113	0.01	10,000
Tin-123	0.01	3,000
Tin-126	0.01	1,000
Titanium-44	0.01	100
Vanadium-48	0.01	7,000
Xenon-133	1.0	900,000
Yttrium-91	0.01	2,000
Zinc-65	0.01	5,000
Zirconium-93	0.01	400
Zirconium-95	0.01	5,000
Any other beta-gamma emitter	0.01	10,000
Mixed fission products	0.01	1,000
Mixed corrosion products	0.01	10,000
Contaminated equipment beta-gamma	0.001	10,000
Irradiated material, any form other than solid noncombustible	0.01	1,000
Irradiated material, solid noncombustible	0.001	10,000
Mixed radioactive waste, beta-gamma	0.01	1,000
Packaged mixed waste, beta-gamma[2]	0.001	10,000
Any other alpha emitter	0.001	2
Contaminated equipment, alpha	0.0001	20
Packaged waste, alpha[2]	0.0001	20
Combinations of radioactive materials listed above [1]		

[1] For combinations of radioactive materials, consideration of the need for an emergency plan is required if the sum of the ratios of the quantity of each radioactive material authorized to the quantity listed for that material in Table RHS 7-2 exceeds one.

[2] Waste packaged in Type B containers does not require an emergency plan.

(b) Emergency preparedness for possession of uranium hexafluoride.

1. In addition to the requirements set forth in Rule 0400-20-10-.12, all specific licenses to possess uranium hexafluoride in excess of 50 kilograms in a single container or 1000 kilograms total must contain either:

(i) An evaluation showing that the maximum intake of uranium by a member of the public due to a release would not exceed 2 milligrams; or

(ii) An emergency plan for responding to the radiological hazards of an accidental release of source material and to any associated chemical hazards directly incident thereto.

2. One or more of the following factors may be used to support an evaluation submitted under subpart 1(i) of this subparagraph:

(i) All or part of the radioactive material is not subject to release during an accident because of the way it is stored or packaged;

(ii) Facility design or engineered safety features in the facility would reduce the amount of the release; or

(iii) Other factors appropriate for the specific facility.

(c) Emergency preparedness for possession of plutonium.

1. In addition to the requirements set forth in Rule 0400-20-10-.12, all specific licenses to possess plutonium in excess of 2 curies in unsealed form or on foils or plated sources must contain either:

(i) An evaluation showing that the maximum dose to a member of the public offsite due to a release of plutonium would not exceed 1 rem effective dose equivalent, or

(ii) An emergency plan for responding to the radiological hazards of an accidental release of special nuclear material and to any associated chemical hazards directly incident thereto.

2. One or more of the following factors may be used to support an evaluation submitted under subpart 1(i) of this subparagraph:

(i) The plutonium is physically separated so that only a portion could be involved in an accident;

(ii) All or part of the plutonium is not subject to release during an accident because of the way it is stored or packaged;

(iii) In the case of fires or explosions, the release fraction would be lower than 0.001 due to the chemical or physical form of the material;

(iv) The solubility of the material released would reduce the dose received;

(v) The facility design or engineered safety features in the facility would cause the release fraction to be lower than 0.001;

(vi) Operating restrictions or procedures would prevent a release large enough to cause a member of the public offsite to receive a dose exceeding 1 rem effective dose equivalent; or

(vii) Other factors appropriate for the specific facility.

(d) An emergency plan for responding to a release of radioactive material submitted under subpart (a)1(ii), (b)1(ii) or (c)1(ii) of this paragraph must include the following information:

1. Facility description.

A brief description of the licensee's facility and area near the site.

2. Types of accidents.

An identification of each type of accident for which protective actions may be needed.

3. Classification of accidents.

A classification system for classifying accidents as alerts or site area emergencies.

4. Detection of accidents.

Identification of the means of detecting each type of radioactive materials accident in a timely manner.

5. Mitigation of consequences.

A brief description of the means and equipment for mitigating the consequences of each type of accident, including those provided to protect workers onsite, and a description of the program for maintaining the equipment.

6. Assessment of releases.

A brief description of the methods and equipment to assess releases of radioactive material.

7. Responsibilities.

A brief description of the responsibilities of licensee personnel should an accident occur, including identification of personnel responsible for promptly notifying offsite response organizations and the Division of Radiological Health; also responsibilities for developing, maintaining and updating the plan.

8. Notification and coordination.

A commitment to and a brief description of the means to promptly notify offsite response organizations and request offsite assistance, including medical assistance for the treatment of contaminated, injured onsite workers when

(Rule 0400-20-10-.13, continued)

appropriate. A control point must be established. The notification and coordination must be planned so that unavailability of some personnel, parts of the facility, and some equipment will not prevent the notification and coordination. The licensee shall also commit to notify the Division of Radiological Health immediately after notification of the offsite response organizations and not later than 1 hour after the licensee declares an emergency. [14]

9. Information to be communicated.

   A brief description of the types of information on facility status, radioactive releases and recommended protective actions, if necessary, to be given to offsite response organizations and to the Division of Radiological Health.

10. Training.

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

11. Safe shutdown.

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

12. Exercises.

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

13. Hazardous chemicals.

    A certification that the applicant has met its responsibilities under the Emergency Planning and Community Right-to-Know Act of 1986, Title III, Public Law 99-499 (42 U.S.C. Chapter 116), if applicable to the applicant’s activities at the proposed place of the use of the source material.

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[14] These reporting requirements do not supersede or release licensees of complying with the requirements under the Emergency Planning and Community Right-to-Know Act of 1986, Title III, Public Law 99-499 (42 U.S.C. Chapter 112) or other state or federal reporting requirements.

(Rule 0400-20-10-.13, continued)

(e) The licensee shall allow the offsite response organizations expected to respond in case of an accident 60 days to comment on the licensee's emergency plan before submitting it to the Division of Radiological Health. The licensee shall provide any comments received within the 60 days to the Division of Radiological Health with the emergency plan.

(f) Licensees required to submit emergency plans by this paragraph shall follow the emergency plan approved by the Division of Radiological Health. The licensee may change the plan without Division of Radiological Health approval if the changes do not decrease the effectiveness of the plan. The licensee shall furnish the change to the Division of Radiological Health and to affected offsite response organizations within 6 months after the change is made. Proposed changes that decrease the effectiveness of the approved emergency plan may not be implemented without application to and prior approval by the Division of Radiological Health.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017. Amendments filed September 1, 2021; effective November 30, 2021. Amendments filed December 4, 2023; effective March 3, 2024. Amendments filed February 28, 2024; effective May 28, 2024.*

0400-20-10-.14 RESERVED.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.15 ISSUANCE OF SPECIFIC LICENSES.

(1) Upon a determination that an applicant meets the requirements of T.C.A. §§ 68-202-201 et seq. and the rules of the Division will issue a specific license authorizing the proposed activity in such form and containing such conditions and limitations as it deems appropriate or necessary.

(2) The Division may incorporate in any license at the time of issuance, or thereafter by amendment, such additional requirements and conditions with respect to the licensee's receipt, possession, use and transfer of radioactive material subject to this Chapter as it deems appropriate or necessary in order to:

(a) Protect the public health and safety or property;

(b) Require such reports and the keeping of such records, and to provide for such inspection of activities under the license as may be necessary to evaluate activities conducted under the license; and

(c) Prevent loss or theft of material subject to this Chapter.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.16 SPECIFIC TERMS AND CONDITIONS OF LICENSES.

(1) Each license issued pursuant to this Chapter shall be subject to all provisions of T.C.A. §§ 68-202-201 et seq., now or hereafter in effect, and to all rules, regulations, and orders of the Division.

(Rule 0400-20-10-.16, continued)

(2) Neither the license nor any right under the license shall be assigned or otherwise transferred in violation of the provisions of T.C.A. Title 68, Chapter 202, Part 2. Rule 0400-20-10-.21 shall apply to the license and any right under the license.

(3) Each person licensed by the Division pursuant to this Chapter shall confine his or her use and possession of the material licensed to the locations and purposes authorized in the license.

(4) Each licensee authorized under paragraph (5) of Rule 0400-20-10-.13 to distribute certain devices to generally licensed persons shall:

(a) Report to the Division within 30 days after the end of each calendar quarter all transfers of such devices to persons generally licensed under paragraph (2) of Rule 0400-20-10-.10 or, if no transfers have been made during the reporting period, the report shall so indicate. For all transfers the report shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the Division and the general licensee, the type and model number of device transferred and the quantity and type of radioactive material contained in the device; and

(b) Furnish to each general licensee in this State to whom he transfers such device a copy of the general license contained in paragraph (2) of Rule 0400-20-10-.10.

(5) Each specific licensee shall notify the Division in writing when the licensee decides to permanently discontinue all activities involving radioactive materials authorized under the license.

(6) Each licensee preparing technetium-99m radiopharmaceuticals from molybdenum-99/technetium-99m generators or rubidium-82 from strontium-82/rubidium-82 generators shall test the generator eluates for molybdenum-99 breakthrough or strontium-82 and strontium-85 contamination, respectively, in accordance with Rule 0400-20-07-.41. The licensee shall record the results of each test and retain each record for three years after the record is made. The licensee shall report the results of any test that exceeds the permissible concentration listed in paragraph (1) of Rule 0400-20-07-.41 at the time of generator elution, in accordance with Rule 0400-20-07-.114.

(7) Each specific licensee and each general licensee meeting the criteria of part (2)(c)14 of Rule 0400-20-10-.10 shall:

(a) Provide the Division written notification, at the address in Rule 0400-20-04-.07, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapter of Title 11 (Bankruptcy) of the United States Code (U.S.C.):

1. By or against the licensee;

2. By or against an entity (as that term is defined in 11 U.S.C. 101(15)) controlling the licensee or listing the license or licensee as property of the estate; or

3. By or against an affiliate (as that term is defined in 11 U.S.C. 101(2)) of the licensee;

(b) Include in the notification required in subparagraph (a) of this paragraph the bankruptcy court in which the petition for bankruptcy was filed; and

(c) Include in the notification required in subparagraph (a) of this paragraph the date of the filing of the petition.

(Rule 0400-20-10-.16, continued)

(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.

(9) Each portable gauge licensee shall use a minimum of 2 independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal, whenever portable gauges are not under the control and constant surveillance of the licensee.

(10) (a) Authorization under paragraph (8) of Rule 0400-20-10-.11 to produce Positron Emission Tomography (PET) radioactive drugs for noncommercial transfer to medical use licensees in its consortium does not relieve the licensee from complying with applicable FDA, other Federal, and Agreement State requirements governing radioactive drugs.

(b) Each licensee authorized under paragraph (8) of Rule 0400-20-10-.11 to produce PET radioactive drugs for noncommercial transfer to medical use licensees in its consortium shall:

1. Satisfy the labeling requirements in part (10)(a)4 of Rule 0400-20-10-.13 for each PET radioactive drug transport radiation shield and each syringe, vial, or other container used to hold a PET radioactive drug intended for noncommercial distribution to members of its consortium; and

2. Possess and use instrumentation to measure the radioactivity of the PET radioactive drugs intended for noncommercial distribution to members of its consortium and meet the procedural, radioactivity measurement, instrument test, instrument check, and instrument adjustment requirements in subparagraph (10)(c) of Rule 0400-20-10-.13.

(c) A licensee that is a pharmacy authorized under paragraph (8) of Rule 0400-20-10-.11 to produce PET radioactive drugs for noncommercial transfer to medical use licensees in its consortium shall require that any individual that prepares PET radioactive drugs shall be:

1. An authorized nuclear pharmacist that meets the requirements in part (10)(b)2 of Rule 0400-20-10-.13, or

2. An individual under the supervision of an authorized nuclear pharmacist as specified in Rule 0400-20-07-.19.

(d) A pharmacy, authorized under paragraph (8) of Rule 0400-20-10-.11 to produce PET radioactive drugs for noncommercial transfer to medical use licensees in its consortium that allows an individual to work as an authorized nuclear pharmacist, shall meet the requirements of part (10)(b)5 of Rule 0400-20-10-.13.

(11) Each person licensed under paragraph (3) of Rule 0400-20-10-.13 shall:

(a) Label the immediate container of each quantity of source material with the type of source material and quantity of material and the words, “radioactive material.”

(b) Ensure that the quantities and concentrations of source material are as labeled and indicated in any transfer records.

(c) Provide the information specified in this subparagraph to each person to whom source material is transferred for use under Rule 0400-20-10-.09. This information must be

(Rule 0400-20-10-.16, continued)

transferred before the source material is transferred for the first time in each calendar year to the particular recipient. The required information includes:

1. A copy of Rule 0400-20-10-.09 and Rule 0400-20-10-.22.

2. Appropriate radiation safety precautions and instructions relating to handling, use, storage, and disposal of the material.

(d) Report transfers as follows:

1. File a report with the Director, Office of Federal and State Materials and Environmental Management Programs, U.S. Nuclear Regulatory Commission, Washington, DC 20555. The report shall include the following information:

   (i) The name, address, and license number of the person who transferred the source material;

   (ii) For each general licensee under Rule 0400-20-10-.09 or provisions equivalent to Rule 0400-20-10-.09 to whom greater than 50 grams (0.11 lb) of source material has been transferred in a single calendar quarter, the name and address of the general licensee to whom source material is distributed; a responsible agent, by name and/or position and phone number, of the general licensee to whom the material was sent; and the type, physical form, and quantity of source material transferred; and

   (iii) The total quantity of each type and physical form of source material transferred in the reporting period to all such generally licensed recipients.

2. File a report with the Director, Division of Radiological Health, to the address given in subparagraph (1)(c) of Rule 0400-20-04-.07, in addition to each responsible Agreement State Agency, that identifies all persons, operating under Rule 0400-20-10-.09 or provisions equivalent to 0400-20-10-.09, to whom greater than 50 grams (0.11 lb) of source material has been transferred within a single calendar quarter. The report shall include the following information (limited, for reports to other Agreement State Agencies, to information specific to those transfers made to the Agreement State being reported to):

   (i) The name, address, and license number of the person who transferred the source material;

   (ii) For each general licensee under Rule 0400-20-10-.09 or provisions equivalent to Rule 0400-20-10-.09 to whom greater than 50 grams (0.11 lb) of source material has been transferred in a single calendar quarter, the name and address of the general licensee to whom source material is distributed; a responsible agent, by name and/or position and phone number, of the general licensee to whom the material was sent; and the type, physical form, and quantity of source material transferred; and

   (iii) The total quantity of each type and physical form of source material transferred in the reporting period to all such generally licensed recipients.

3. Submit each report by January 31 of each year covering all transfers for the previous calendar year. If no transfers were made to persons generally licensed under Rule 0400-20-10-.09 or provisions equivalent to Rule 0400-20-10-.09, during the current period, a report shall be submitted to the NRC, Division, and, upon request, the appropriate Agreement State Agency indicating so.

(Rule 0400-20-10-.16, continued)

(e) Maintain all information that supports the reports required by this paragraph concerning each transfer to a general licensee for a period of one year after the event is included in a report.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed March 3, 2015; effective June 1, 2015. Amendments filed September 1, 2021; effective November 30, 2021. Amendments filed December 4, 2023; effective March 3, 2024.*

0400-20-10-.17 EXPIRATION AND TERMINATION OF LICENSES AND DECOMMISSIONING OF SITES AND SEPARATE BUILDINGS OR OUTDOOR AREAS.

(1) Expiration of specific licenses.

Except as provided in paragraph (2) of this rule, each specific license shall expire at the end of the day, in the month and year stated therein.

(2) Termination of specific licenses:

(a) Specific licenses shall continue in effect, beyond the expiration date if necessary, with respect to possession of radioactive material until the Division notifies the licensee in writing that the license is terminated. During this time, the licensee shall:

1. Limit actions involving radioactive material to those related to decommissioning; and

2. Continue to control entry to restricted areas until they are suitable for release in accordance with Division requirements.

(b) Specific licenses, including expired licenses, will be terminated by written notice to the licensee when the Division determines that:

1. The licensee has properly disposed of radioactive material;

2. The licensee has made reasonable effort to eliminate residual radioactive contamination, if present;

3. The premises are suitable for release in accordance with Division requirements. The licensee may demonstrate suitability for release by:

(i) Performance of the radiation survey described in part (3)(d)2 of this rule, or

(ii) Submission of other information that the Division determines is acceptable;

4. The licensee has complied with any requests for information from the Division; and

5. The licensee has submitted a written request for license termination to the Division.

(3) Decommissioning of sites or separate buildings or outdoor areas:

(a) Each specific licensee shall notify the Division in writing, at the address in Rule 0400-20-04-.07, within 60 days of any of the following occurrences:

(Rule 0400-20-10-.17, continued)

1. The license has expired pursuant to paragraph (2) of this rule;

2. The licensee has decided to permanently cease principal activities, as defined in this rule:

   (i) At the entire site, or

   (ii) In any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with Division requirements;

3. No principal activities under the license have been conducted for 24 months; or

4. No principal activities have been conducted for 24 months in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with Division requirements.

(b) Each specific licensee:

1. If not required by subparagraph (g) of this paragraph to submit a decommissioning plan, shall begin decommissioning its site or any separate building or outdoor area that contains residual radioactivity within 60 days of any occurrence listed in subparagraph (a) of this paragraph.

2. If required by subparagraph (g) of this paragraph to submit a decommissioning plan, shall:

   (i) Submit a decommissioning plan within 12 months of notification of any occurrence listed in subparagraph (a) of this paragraph, and

   (ii) Begin decommissioning upon Division approval of that plan.

(c) Coincident with the notification required by subparagraph (a) of this paragraph, the specific licensee shall maintain in effect all financial assurances that were established, pursuant to paragraph (3) of Rule 0400-20-10-.12 in conjunction with a license issuance or renewal, or that are required by this rule.

1. The Division will determine if the licensee shall increase, or may decrease, the amount of the financial assurance to cover the detailed cost estimate for decommissioning established pursuant to part (i)5 of this paragraph.

2. The licensee may with Division approval reduce the amount of the financial assurance as decommissioning proceeds and radiological contamination is reduced at the site.

(d) As the final steps in decommissioning, specific licensees shall:

1. Certify the disposition of all licensed material, including accumulated wastes; and

2. Demonstrate that the premises are suitable for release in accordance with Division requirements.

   (i) The licensee shall:

(Rule 0400-20-10-.17, continued)

(I) Conduct a radiation survey of the premises where the licensed activities were carried out and submit a report of the results of this survey, or

(II) Submit other information that the Division determines is acceptable.

(ii) The licensee shall, as appropriate:

(I) Report levels of gamma radiation in units of microroentgens (millisieverts) per hour at 1 meter from surfaces, and

(II) Report levels of radioactivity, including alpha and beta, in units of

I. Disintegrations per minute or microcuries (megabecquerels) per 100 square centimeters—removable and fixed—for surfaces,

II. Microcuries (megabecquerels) per milliliter for water, and

III. Picocuries (becquerels) per gram for solids such as soils or concrete, and

(III) Specify the survey instrument(s) used and certify that each instrument was properly calibrated and tested at the time of the survey.

3. Records required by paragraphs (4) and (6) of Rule 0400-20-10-.26 have been received.

(e) Except as provided in part (k)3 of this paragraph, specific licensees shall complete decommissioning of the site or separate building or outdoor area so that the site, building or outdoor area is suitable for release in accordance with Division requirements as soon as practicable but no later than 24 months following the initiation of decommissioning.

(f) Except as provided in part (k)3 of this paragraph, when decommissioning involves the entire site, the specific licensee shall request license termination as soon as practicable but no later than 24 months following the initiation of decommissioning.

(g) A specific licensee shall submit a decommissioning plan if:

1. Required to do so by license condition; or

2. The Division determines that the procedures and activities necessary to carry out decommissioning of the site or separate building or outdoor area have not been previously approved by the Division and that these procedures could increase potential health and safety impacts to workers or to the public. Some examples are procedures:

(i) That would involve techniques not applied routinely during cleanup or maintenance operations;

(ii) In which workers would be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation;

(Rule 0400-20-10-.17, continued)

(iii) That could result in significantly greater airborne concentrations of radioactive materials than are present during operation; or

(iv) That could result in significantly greater releases of radioactive material to the environment than those associated with operation.

(h) Specific licensees shall not carry out procedures with potential health and safety impacts before Division approval of the decommissioning plan.

(i) The proposed decommissioning plan for the site or separate building or outdoor area shall include:

1. A description of the conditions of the site or separate building or outdoor area sufficient to evaluate the acceptability of the plan;

2. A description of planned decommissioning activities;

3. A description of methods used to ensure protection of workers and the environment against radiation hazards during decommissioning;

4. A description of the planned final radiation survey;

5. A detailed cost estimate for decommissioning, comparison of that estimate with present funds set aside for financial assurance, and a plan for assuring the availability of adequate funds for completion of decommissioning; and

6. For decommissioning plans calling for completion of decommissioning later than 24 months after plan approval, the plan shall include a justification for the delay based on the criteria in part (k)3 of this paragraph.

(j) The Division will approve the proposed decommissioning plan if the information in the plan demonstrates that the licensee:

1. Will complete decommissioning as soon as practicable; and

2. Will adequately protect the health and safety of workers and the public.

(k) Requests for extensions:

1. A licensee may request a delay in initiating decommissioning.

(i) The Division may grant this delay, if the Division determines that this delay is not detrimental to the public health and safety and is otherwise in the public interest.

(ii) The request for a delay shall be submitted no later than 30 days before notification pursuant to subparagraph (a) of this paragraph.

(iii) The schedule for decommissioning set forth in subparagraph (b) of this paragraph shall not start until the Division has made a determination on the request.

2. A licensee may request an alternative schedule for the submittal of a decommissioning plan. The Division may approve the alternative schedule, if the Division determines that the alternative schedule is necessary to the effective

(Rule 0400-20-10-.17, continued)

conduct of decommissioning operations and presents no undue risk from radiation to the public health and safety and is otherwise in the public interest.

3. A licensee may request an alternative schedule for the completion of decommissioning of the site or separate building or outdoor area, and license termination if appropriate. The Division may approve the alternative schedule for completion of decommissioning, if the Division determines that it is warranted by consideration of the following:

(i) Whether it is technically feasible to complete decommissioning within the allotted 24-month period;

(ii) Whether sufficient waste disposal capacity is available to allow completion of decommissioning within the allotted 24 month period;

(iii) Whether allowing short-lived radionuclides to decay will achieve a significant volume reduction in wastes requiring disposal;

(iv) Whether allowing short-lived radionuclides to decay will achieve a significant reduction in radiation exposure to workers;

(v) Other site-specific factors that the Division may determine are beyond the control of the licensee.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.18 RENEWAL OF LICENSE.

(1) Applications for renewal of specific licenses shall be filed in accordance with Rule 0400-20-10-.11.

(2) In any case in which a licensee, not less than 30 days prior to expiration of his existing license, has filed an application in proper form for renewal or for a new license authorizing the same activities, such existing license shall not expire until the application has been finally determined by the Division.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.19 AMENDMENT OF LICENSES AT REQUEST OF LICENSEE.

Applications for amendment of a license shall be filed in accordance with Rule 0400-20-10-.11 and shall specify the respects in which the licensee desires his license to be amended and the grounds for such amendment.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.20 DIVISION ACTION ON APPLICATION TO RENEW OR AMEND.

In considering an application by a licensee to renew or amend his license, the Division will apply the criteria set forth in Rules 0400-20-10-.12 and 0400-20-10-.13, as applicable.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.21 INALIENABILITY OF LICENSES.

(1) No license issued or granted under this Chapter and no right to possess or utilize radioactive material granted by any license issued pursuant to this Chapter shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person unless the Division shall, after securing full information, find that the transfer is in accordance with the provisions of T.C.A. §§ 68-202-201 et seq., and shall give its consent in writing.

(2) An application for transfer of license must include:

(a) The identity, technical and financial qualifications of the proposed transferee; and

(b) Financial assurance for decommissioning information required by Rule 0400-20-10-.12.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017.*

0400-20-10-.22 TRANSFER OF MATERIAL.

(1) No licensee shall transfer radioactive material except as authorized pursuant to this rule.

(2) Any licensee may transfer radioactive material:

(a) To the Division provided such transfer is accepted by the Division in writing;

(b) To the U.S. Department of Energy;

(c) To any person exempt from the regulations in this Chapter to the extent permitted under such exemption;

(d) To any person authorized to receive such material under terms of a general license or its equivalent, or a specific license or equivalent licensing document, issued by the Division, the U.S. Nuclear Regulatory Commission, any Agreement State or a Licensing State; or

(e) As otherwise authorized by the Division in writing.

(3) Before transferring sources of radiation to a specific licensee of the Division, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State, or to a general licensee who is required to register with or report to the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State prior to receipt of the source of radiation, the transferor of the source of radiation shall verify that the transferee's authorization is for the receipt of the type, form, and quantity of the source of radiation to be transferred.

(4) The following methods for the verification required in paragraph (3) of this rule are acceptable:

(a) The transferor may have in his possession, and read, a current copy of the transferee's specific license or registration certificate;

(b) The transferor may have in his possession a written certification by the transferee that he is authorized by license or registration certificate to receive the type, form and quantity of the source of radiation to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date;

(Rule 0400-20-10-.22, continued)

(c) For emergency shipments the transferor may accept oral certification containing all of the information specified in subparagraph (b) of this paragraph provided that written certification is forwarded to the transferor within 10 days following the oral communication;

(d) The transferor may obtain other information compiled by a reporting service from official records of the Division, the U.S. Nuclear Regulatory Commission or the licensing agency of any state as to the identity of licensees and the scope and expiration dates of licenses and registrations; or

(e) When none of the methods of verification described in subparagraphs (a) through (d) of this paragraph are readily available or when a transferor desires to verify that information received by one of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the Division, the U.S. Nuclear Regulatory Commission, or the licensing agency of any state that the transferee is authorized to receive the source of radiation.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.23 MODIFICATION, REVOCATION, AND TERMINATION OF LICENSES.

(1) The terms and conditions of all licenses may be subject to amendment, revision, or modification or the license may be suspended or revoked by reason of amendments to T.C.A. §§ 68-202-201 et seq., or by reason of rules or regulations issued by the Department.

(2) Any license may be revoked, suspended, or modified, in whole or in part, for any material false statement in the application or in any statement of fact required under provisions of the Act, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means that would warrant the Department to refuse to grant a license on an original application, or for violation of, or failure to observe any of the terms and conditions of T.C.A. §§ 68-202-201 et seq., or of the license, or of any rule or regulation of the Department. This action will be taken pursuant to T.C.A. Title 68, Chapter 202.

(3) The Division may terminate a specific license upon request submitted by the licensee to the Division in writing.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.24 REGISTRATION.

(1) The owner or person having possession of any radiation machine or accelerator, except those specifically exempted in Rule 0400-20-10-.07, shall register such sources within 10 days after acquisition of such machine. Prior to processing a request for registration, the FDA Clearance 510K number specific to the particular device must be provided to the Division. The owner or possessor of any accelerator shall substitute an application for certified registration required in Chapter 0400-20-09. The application for certified registration must be received by the Department within 10 days after acquisition of the accelerator; however, an accelerator may not be energized until registered pursuant to Chapter 0400-20-09. In addition, every person who provides inspections as provided for in paragraph (4) of Rule 0400-20-10-.27 and every person who assembles, installs, or services radiation machines shall register with the Division of Radiological Health, Tennessee Department of Environment and Conservation. Registration under this rule shall be on Department Form RHS 8-4, Form RHS 8-4a or Form RHS 8-4b, as appropriate, as furnished by the Department and may be

(Rule 0400-20-10-.24, continued)

obtained from the Division of Radiological Health, at the address given in Rule 0400-20-04-.07. A registration fee in accordance with the Classification and Fee Schedule in paragraph (3) of this rule shall be due upon receipt of an invoice from the Division of Radiological Health following the submittal of the completed registration form. The check for the fee shall be made payable to "Treasurer, State of Tennessee."

(2) An annual registration fee will be required each year as long as the radiation machine or service is subject to registration. Each registrant shall submit the annual fee payable to, "Treasurer, State of Tennessee," in the appropriate dollar amount in accordance with the Classification and Fee Schedule in paragraph (3) of this rule to the Division of Radiological Health. Payment shall be accompanied by a copy of the fee invoice properly completed. The invoice for the annual fee will be dated May 1st and will require payment by June 15th of the indicated year. The annual registration fee shall be due within 45 days of issuance of an invoice. At the time of the annual payment, a registrant of only Class II radiation machines may request specific times or list restricted hours during normal work hours for inspections pursuant to Rule 0400-20-10-.27 by personnel of the Division of Radiological Health, Tennessee Department of Environment and Conservation.

(3) Classification and fee schedule. For purposes of inspections and payment of fees the classification and fee schedule shall be as follows:

(a) Radiation Machines

CLASS I

Dental Radiation Machines: $85.00 per tube

All diagnostic equipment used exclusively for dental diagnostic procedures.

CLASS II

Priority Two Medical Radiation Machines: $195.00 per tube

All medical diagnostic x-ray equipment, not in Class III, used exclusively for medical or veterinary diagnostic procedures.

CLASS III

Priority One Medical Radiation Machines: $286.00 per tube

All diagnostic x-ray equipment used in radiologists' offices, orthopedic surgeon's offices or hospitals exclusively for medical diagnostic procedures.

CLASS IV

Therapy Medical Radiation Machines: $390.00 per tube

All x-ray equipment with energies less than 0.9 MeV used for the purpose of medical or veterinary radiation therapy.

CLASS V

Priority Two Industrial and Educational Radiation Machines: $780.00 per tube

Closed-beam analytical radiation machines, gauges or

(Rule 0400-20-10-.24, continued)

industrial radiation machines used in shielded room or cabinet radiography.	
CLASS VI	
Priority One Industrial and Educational Radiation Machines:	$1,170.00 per tube
All x-ray machines used for industrial radiography and all open-beam analytical x-ray machines and all radiation machines not specifically included in Class I, II, III, IV, V, VII.	
CLASS VII	
Accelerators:	$2,600.00 annual fee, plus an initial fee of $375.00 per maximum nominal rated MeV for initial certified registration review initial review fee not to exceed $150,000.00)
All devices defined as accelerators as per “State Regulations for Protection Against Radiation.”	

(b) A person providing inspection services as permitted by paragraph (4) Rule 0400-20-10-.27 shall pay of an annual registration fee of eight hundred fifty dollars. $850.00

(c) A person providing assembly/installation/servicing shall pay an annual registration fee of eight hundred fifty dollars. $850.00

(d) A registrant may qualify to pay a registration fee equal to 18 percent of that listed in this paragraph, subject to the following conditions:

1. All tubes subject to registration are inspected in accordance with paragraphs (3), (4) and (5) of Rule 0400-20-10-.27.

   (i) For purposes of the 18 percent fee, the first inspection performed on an x-ray tube on or after December 6, 2011, will establish a new baseline date for that tube. Previous baseline dates will be reset to the last day of the month of performance of the previous inspections.

      (I) Each subsequent inspection of a tube shall be performed during the same month as the preceding inspection or the month immediately following resulting in “baseline periods” of from 59 days to 62 days, depending upon applicable new 2 month periods, according to the schedule set out in subparagraph (3)(a) of Rule 0400-20-10-.27.

      (II) An inspection performed prior to or after the applicable new 2 month period shall establish a new baseline date for that tube.

      (III) An inspection performed after the applicable new 2 month period shall not qualify the registrant for the 18 percent fee.

      (IV) An inspection performed prior to the applicable new 2 month period and meeting all other requirements found in paragraphs (3), (4) and

(Rule 0400-20-10-.24, continued)

(5) of Rule 0400-20-10-.27 shall qualify the registrant for the 18 percent fee.

(ii) Reserved.

2. Each newly acquired tube subject to registration is inspected within 3 months of ownership or possession.

3. An individual who satisfies the requirements in paragraph (4) of Rule 0400-20-10-.27 performs all inspections.

4. The registrant submits to the Division, at the address given in Rule 0400-20-04-.07:

(i) Copies of the appropriate State evaluation forms within 60 days after the inspection.

(ii) Copies of applicable service reports to document correction of any deficiencies noted within 60 days after the inspection.

(iii) A signed "X-Ray Inspection Notification and Certification of Compliance" form within 60 days of the inspection.

5. Inspections found by the Division to be unsatisfactory under this subparagraph or under paragraph (4) or (5) of Rule 0400-20-10-.27 shall not qualify for the 18 percent.

(i) The registrant shall correct and re-submit the report(s) and documentation of an inspection found to be unsatisfactory within 30 days of the date of notification by the Division. Failure to correct and re-submit the report(s) and documentation of an unsatisfactory inspection will subject the registrant to the Division's normal enforcement actions, penalties and assessments.

(ii) The 30-day correction period shall not establish a new baseline. It shall not:

(I) Qualify an existing tube for reduced fee for the following calendar year, or

(II) Qualify a newly acquired tube for reduced fee for the current calendar year.

(e) Reserved.

(4) Any failure to pay an invoiced amount by the date specified on the invoice, unless qualified by subparagraph (3)(d) of this rule, shall be deemed to constitute a violation of T.C.A. §§ 68-203-101 et seq.

(5) Whenever there is a change in information such as address, ownership, possessor, or location of use from that declared on the last previous registration, the completion of a new Form RHS 8-4 shall be required within 10 days of the change.

(6) Each registrant, or his estate, who permanently discontinues the use of or transfers all of his radiation machines at an installation shall notify the Division in writing within 60 days of such

(Rule 0400-20-10-.24, continued)

action. In the event of a transfer, the notification shall include the name and address of the transferee.

(7) No person shall state or imply that any activity under such a registration has been approved by the Division.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendment filed February 13, 2013; effective May 14, 2013. Amendments filed September 25, 2014; effective December 24, 2014. Amendments filed March 3, 2015; effective June 1, 2015. Amendments filed February 28, 2024; effective May 28, 2024.*

0400-20-10-.25 REPORTS.

(1) Any person who sells, leases, transfers, assembles, reassembles, or lends radiation machines, except those exempted from registration by Rule 0400-20-10-.07 shall report to the Division, within 30 days after the end of each calendar quarter, the name and address of persons to whom they have transferred such items and the date of transfer. Persons routinely engaged in the sale, transfer, leasing, lending, assembling, or reassembling of x-ray equipment shall report each calendar quarter, including a report for calendar quarters in which no radiation machine transfer occurs. Such reports shall be held proprietary by the Division.

(2) Each out-of-state person who brings radiation machines into the State, except those exempted in Rule 0400-20-10-.07, for any temporary use shall:

(a) Notify the Division in writing at least 3 days prior to engaging in such use. Such notification shall indicate the location, period, and type of proposed use within the State. If, for a specific case, the 3-day period would impose an undue hardship, he may, upon application to the Division obtain permission to proceed sooner;

(b) Register the radiation machines with this Division on Form RHS 8-4 prior to entry into the State; and

(c) Comply with all applicable regulations of the Division including the payment of the fee for the Class, as appropriate, contained in paragraph (3) of Rule 0400-20-10-.24.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.26 RECORDS.

(1) Each person who receives radioactive material pursuant to a license issued pursuant to these rules shall keep records showing the receipt, transfer, and disposal of the radioactive material as follows:

(a) The licensee shall retain each record of receipt of radioactive material as long as the material is possessed and for 3 years following transfer or disposal of the material.

(b) The licensee who transferred the material shall retain each record of transfer until the Division terminates each license that authorizes the activity that is subject to the recordkeeping requirement.

(c) The licensee who disposed of the material shall retain each record of disposal of radioactive material until the Division terminates each license that authorizes disposal of the material.

(Rule 0400-20-10-.26, continued)

(2) A licensee shall retain each record that is required by these rules or by license condition for the period specified by the appropriate rule or license condition. If a retention period is not otherwise specified by rule or license condition, the record must be retained until the Division terminates each license that authorizes the activity that is subject to the recordkeeping requirement.

(3) Records which must be maintained pursuant to this rule may be the original or a reproduced copy. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures. A licensee shall maintain adequate safeguards against tampering with and loss of records.

(4) Prior to license termination, each licensee authorized to possess radioactive material with a half-life greater than 120 days, in an unsealed form, shall forward the following records to the Division:

(a) Records of disposal of licensed material made under Rules 0400-20-05-.121 (including burials authorized before January 28, 1981), 0400-20-05-.122, 0400-20-05-.123, 0400-20-05-.124; and

(b) Records required by subparagraph (2)(d) of Rule 0400-20-05-.132.

(5) If licensed activities are transferred or assigned in accordance with paragraph (2) of Rule 0400-20-10-.16, each licensee authorized to possess radioactive material, with a half-life greater than 120 days, in an unsealed form, shall transfer the following records to the new licensee and the new licensee will be responsible for maintaining these records until the license is terminated:

(a) Records of disposal of licensed material made under Rules 0400-20-05-.121 (including burials authorized before January 28, 1981), 0400-20-05-.122, 0400-20-05-.123, 0400-20-05-.124; and

(b) Records required by subparagraph (2)(d) of Rule 0400-20-05-.132.

(6) Prior to license termination, each licensee shall forward the records required subparagraph (4)(n) of Rule 0400-20-10-.12 to the Division.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed September 1, 2021; effective November 30, 2021.*

0400-20-10-.27 INSPECTIONS.

(1) Each licensee or registrant shall afford the Division at all reasonable times opportunity to inspect sources of radiation, premises, facilities and activities subject of these regulations and records maintained pursuant to these regulations.

(a) Department inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of the regulations, license, and Certified Registration to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection.

1. During the course of an inspection, any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present

(Rule 0400-20-10-.27, continued)

condition which he has reason to believe may have contributed to or caused any violation of the Act, these regulations, or license or Certified Registration condition, or any unnecessary exposure to radiation or radioactive material under the licensee's or registrant's control. Any such notice in writing shall comply with paragraph (2) of this rule.

2. The licensee or registrant or licensee's or registrant's representative may accompany Division inspectors during other phases of an inspection.

3. The provision of part 1 of this subparagraph shall not be interpreted as authorization to disregard instructions pursuant to Rule 0400-20-04-.12.

(b) If at the time of inspection, an individual has been authorized by the workers to represent them during inspections by the Division, the licensee or registrant shall notify the inspectors of such authorization and shall give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions.

1. Different representative of licensees or registrants and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one worker's representative at a time may accompany the inspectors.

2. Any worker's representative shall be an employee of the licensee or registrant and should be a worker as defined in Rule 0400-20-04-.04 and shall have received instructions as specified in Rule 0400-20-04-.12.

3. In addition to the licensee's or registrant's representative and with the approval of the licensee or registrant and the workers' representative, an individual who is not routinely engaged in work under control of the licensee or registrant, for example, a consultant to the licensee or registrant or to the workers' representative, shall be afforded the opportunity to accompany Division inspectors during the inspection of physical working conditions.

4. The workers' representative for any area containing proprietary information shall be an individual previously authorized by the licensee or registrant to enter that area.

5. Notwithstanding the other provisions of this rule, Division inspectors are authorized to refuse to permit accompaniment by any individual who deliberately interferes with a fair and orderly inspection.

(2) Requests by Workers for Inspection.

(a) Any worker or representative of workers who believes that a violation of T.C.A. §§ 68-202-201 et seq., these rules, conditions of a Certified Registration, or license conditions exists or has occurred in activities subject to these regulations with regard to radiological working conditions in which the worker is engaged, may request an inspection by registering a complaint of the alleged violation with the Commissioner, Tennessee Department of Environment and Conservation; Director, Division of Radiological Health; or Division inspectors.

1. Any such complaint shall be in writing, shall set forth the specific grounds for the complaint and shall be signed by the worker or representative of workers.

(Rule 0400-20-10-.27, continued)

2. A copy of the complaint shall be provided the licensee or registrant by the Division no later than at the time of inspection except that, upon request of the worker registering such complaint, his name and the name of individuals referred to therein shall not appear in such a copy or on any record published, released or made available by the Division except for good cause shown.

(b) If, upon receipt of such complaint, the Division determines that the complaint meets the requirements set forth in subparagraph (a) of this paragraph and that there are reasonable grounds to believe that the alleged violation exists or has occurred, an inspection will be made as soon as practicable, to determine if such alleged violation exists or has occurred. Inspections pursuant to this paragraph need not be limited to matters referred to in the request for an inspection.

(c) If it is determined that there are no reasonable grounds to believe that a violation exists or has occurred, the complainant shall be notified by the Division in writing.

(d) No licensee or registrant shall discharge or in any manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under these regulations or has testified or is about to testify in any such proceeding or because of the exercise by such worker on behalf of himself or others of any option afforded by these regulations.

(3) Inspections of radiation machines are to be conducted:

(a) According to Class as follows:

CLASS I - once every 4 years

CLASSES II and V - once every 2 years

CLASSES III, IV, VI and VII - annually

(b) By personnel of the Division of Radiological Health, Tennessee Department of Environment and Conservation, or

(c) As provided in paragraph (4) of this rule, and

(d) According to the same criteria and to the satisfaction of the Division and provided the appropriate Division forms are completed and submitted along with any documentation required by subparagraph (e) of this paragraph, and

(e) By the Division of Radiological Health on a selected number of those facilities providing an inspection report as permitted by paragraph (4) of this rule.

(4) The Division will accept, as inspections for a reduced registration fee as provided for in subparagraph (3)(d) of Rule 0400-20-10-.24, inspections by individuals other than employees of the Division:

(a) Whose inspections are satisfactory to the Division;

(b) Who are registered with the Division;

(c) Who have paid an annual registration fee to the Division; and

(d) Who meet one set of the following criteria:

	Formal Education or Certification	Plus	Experience
1.	Bachelor's degree in a physical science or mathematics		4 years of applied health physics experience in a program with radiation safety problems similar to those in the program to be surveyed
2.	Bachelor's degree in a physical science or a biological science with a physical science minor and 1 year of graduate work in health physics		3 years of applied health physics experience in a program with radiation safety problems similar to those in the program to be surveyed
3.	Master's degree in health physics or radiological health		2 years of applied health physics experience in a program with radiation safety problems similar to those in the program to be surveyed
4.	Doctor's degree in health physics or radiological health		1 year of applied health physics experience in a program with radiation safety problems similar to those in the program to be surveyed
5.	Certification by the American Board of Health Physics or by the American Board of Radiology or be a Fellow, Canadian College of Physicists in Medicine		1 year of applied health physics experience in a program with radiation safety problems similar to those in the program to be surveyed
6.	2 notarized letters of reference from persons registered to provide inspections for reduction in fees and meeting any of the above sets of criteria certifying to the individual's capabilities to perform the necessary inspections		5 years of applied health physics experience in a program with radiation safety problems similar to those in the program to be surveyed

(5) Inspections satisfactory to the Division. The following constitute a proper inspection and must occur:

(a) The inspection of an x-ray facility subject to registration under "State Regulations for Protection Against Radiation" shall identify the compliance status of the facility and each piece of equipment subject to registration with respect to requirements in Chapters 0400-20-04, 0400-20-05, 0400-20-06, 0400-20-08, 0400-20-09 and this Chapter.

(b) The qualified individual performing the inspection shall record the results of the inspection on evaluation forms provided by the Division, one form for each facility plus an appropriate form, or forms, for each piece of equipment. The evaluation forms shall describe the compliance status of the facility and equipment as it exists at the time of the inspection.

(c) The qualified individual shall provide signed and dated evaluation and certification of compliance forms to the registrant promptly.

(Rule 0400-20-10-.27, continued)

(d) The registrant shall submit evaluation and certification of compliance forms to the Division as set out in subparagraph (3)(d) of Rule 0400-20-10-.24.

(e) A registrant whose inspection reveals an item of non-compliance shall correct the item promptly following notification by the qualified individual. The registrant shall provide appropriate documentation of the correction to the Division as set out in paragraph (3) of Rule 0400-20-10-.24.

(f) If as a result of inadvertent error or excusable neglect a tube(s) is not inspected, the Commissioner or the Commissioner's designee may grant the 18 percent fee for all other tubes provided they were timely inspected by a qualified individual.

(g) For a tube that is inoperable at the time of inspection, the qualified individual shall submit a form indicating the tube was inoperable. The tube shall be inspected within 60 days of its becoming functional.

(6) If a registrant who has previously employed inspection services of registered individuals, other than employees of the Division, as authorized by paragraph (4) of Rule 0400-20-10-.27, chooses to discontinue those services, then the registrant shall notify the Division 90 days prior to the end of the respective inspection cycle. Should the registrant fail to notify the Division within this time frame, a penalty consistent with T.C.A. § 68-202-212(b) may be assessed.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed December 4, 2023; effective March 3, 2024. Amendments filed February 28, 2024; effective May 28, 2024.*

0400-20-10-.28 TESTS.

Each licensee and registrant shall perform, upon instruction from the Division, or shall permit the Division to perform, such tests as the Division may require including, but not limited to, tests of:

(1) Sources of radiation;

(2) Facilities wherein sources of radiation are used or stored;

(3) Radiation detection and monitoring instruments; and

(4) Other equipment and devices used in connection with utilization or storage of licensed or registered sources of radiation.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.29 RECIPROCAL RECOGNITION OF LICENSES.

(1) Subject to these regulations, any individual in another state who holds a specific license from the U.S. Nuclear Regulatory Commission, an Agreement State or Licensing State, and issued by the agency having primary jurisdiction, where the licensee maintains an office for directing the licensed activities and at which radiation safety records are normally maintained, may possess or use the licensed radioactive material to conduct the activities authorized by such license within this State for a period not in excess of 180 days in any calendar year and will be considered, without obtaining a specific licensing document from this Division, a licensee of this State provided that:

(Rule 0400-20-10-.29, continued)

(a) The out-of-state licensing document does not limit the activity authorized by such document to specified installations or locations;

(b) The out-of-state licensee notifies the Division in writing at least three days prior to each entry into this State to engage in such activity. Such notification shall indicate the location, period, type of proposed possession, use and supervisor within this State, and shall be accompanied by a copy of the pertinent licensing document or shall indicate in the notification that such licensing document has previously been submitted to this Division. If for a specific case, the three-day period would impose an undue hardship, the Division may authorize such person to proceed sooner upon notification by telephone of intent to conduct the proposed activity provided that the licensee shall file in writing the information required in this paragraph within three days of the telephone notification;

(c) The out-of-state licensee shall not transfer or dispose of radioactive material possessed or used under the provisions of this rule except by transfer to a person:

1. Specifically licensed by the Division, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State to receive such material; or

2. Exempt from the requirements for a license for such material under subparagraph (1)(a) of Rule 0400-20-10-.04;

(d) The out-of-state licensee complies with all applicable regulations of the Division and with all the terms and conditions of his licensing document, except any such terms and conditions which may be inconsistent with applicable regulations of the Division; and

(e) The Division may require the out-of-state licensee to supply such other information as the Division may request.

(2) Notwithstanding the provision of paragraph (1) of this rule, any person who holds a specific license issued by the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State authorizing the holder to manufacture, install, or service a device described in subparagraph (2)(a) of Rule 0400-20-10-.10 within the areas subject to the jurisdiction of the licensing body is hereby granted a general license to install and service such device in this State provided that:

(a) The device has been manufactured, labeled, installed and serviced in accordance with applicable provisions of the specific license issued to such person by the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State; and

(b) Such person shall assure that any labels required to be affixed to the device under regulations of the authority which licensed manufacture of the device bear a statement that “Removal of this label is prohibited.”

(3) The Division may withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by another agency, or any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to protect the public health and safety or property.

(4) Before radioactive materials can be used at a temporary job site within the State at any Federal facility, the jurisdictional status of the job site shall be determined. If the jurisdictional status is unknown, the Federal agency should be contacted to determine if the job site is under exclusive Federal jurisdiction.

(Rule 0400-20-10-.29, continued)

(a) In areas of exclusive Federal jurisdiction, the general license is subject to all the applicable rules, regulations, orders and fees of the NRC, and

(b) Authorizations for use of radioactive materials at job sites under exclusive Federal jurisdiction shall be obtained from the NRC by either:

1. Filing a NRC Form-241 in accordance with 10 CFR 150.20(b); or

2. By applying for a specific NRC license.

(5) Before radioactive material can be used at a temporary job site in another State, authorization shall be obtained for the State if it is an Agreement State, or from the NRC for any non-Agreement State, either by filing for reciprocity or applying for a specific license.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed February 28, 2024; effective May 28, 2024.*

0400-20-10-.30 PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIAL.

(1) This rule establishes requirements for packaging, preparation for shipment, and transportation of radioactive material and applies to any licensee or registrant authorized by specific or general license to receive, possess, use, or transfer licensed material, if the person delivers that material to a carrier for transport, transports the material outside the site of usage as specified in the license, or transports that material on public highways. This rule does not authorize possession of licensed material.

(2) 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.

(3) Any physician as defined in Rule 0400-20-04-.04 is exempt from paragraph (4) of this rule with respect to transport by the physician of licensed material for use in the practice of medicine. However, any physician operating under this exemption must be licensed under Chapter 0400-20-07 or 10 CFR Part 35.

(4) 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 applicable requirements of this rule and with the applicable requirements of the U.S. DOT regulations in 49 CFR Parts 107, 171 through 180, and 390 through 397, 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, and 172.436 through 172.441 of 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;

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

8. Security plans: 49 CFR Part 172, Subpart I.

(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.

(5) 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 in subparagraph (4)(a) of this rule 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 0400-20-04-.07.

(6) Exemptions.

(a) Carriers.

Common and contract carriers, freight forwarders, warehousemen, and the U.S. Postal Service are exempt from the rules in this Chapter and the requirements for a license set in this Chapter to the extent that they transport or store byproduct material in the regular course of carriage for another or storage incident thereto.

(b) Exemption for low-level materials.

1. A licensee is exempt from all requirements of this rule with respect to shipment or carriage of the following low-level materials:

(i) Natural material and ores containing naturally occurring radionuclides that are either in their natural state, or have only been processed for purposes other than for the extraction of the radionuclides, and which are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed ten times the values specified in Table A-2 or Table A-3 of Schedule 10-6 in Rule 0400-20-10-.38; and

(ii) Materials for which the activity concentration is not greater than the activity concentration values specified in Table A-2 or Table A-3 of Schedule 10-6 in Rule 0400-20-10-.38, or for which the consignment activity is not greater than the limit for an exempt consignment found in Table A-2 or Table A-3 of Schedule 10-6 in Rule 0400-20-10-.38.

(Rule 0400-20-10-.30, continued)

(iii) Non-radioactive solid objects with radioactive substances present on any surfaces in quantities not in excess of the levels cited in the definition of contamination in Rule 0400-20-04-.04.

2. Reserved.

3. Reserved.

(c) Exemption from classification as fissile material.

1. Fissile material meeting the requirements of at least one of the subparts (i) through (vi) of this part are exempt from classification as fissile material, but are subject to all other requirements of this rule, except as noted;

(i) Individual package containing 2 grams or less fissile material;

(ii) Individual or bulk packaging containing 15 grams or less of fissile material provided the package has at least 200 grams of solid nonfissile material for every gram of fissile material. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass for solid nonfissile material;

(iii) (I) Low concentrations of solid fissile material commingled with solid nonfissile material, provided that:

I. There is at least 2000 grams of solid nonfissile material for every gram of fissile material, and

II. There is no more than 180 grams of fissile material distributed within 360 kg of contiguous nonfissile material;

(II) Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass of solid nonfissile material;

(iv) Uranium enriched in uranium-235 to a maximum of 1 percent by weight, and with total plutonium and uranium-233 content of up to 1 percent of the mass of uranium-235, provided that the mass of any beryllium, graphite, and hydrogenous material enriched in deuterium constitutes less than 5 percent of the uranium mass, and that the fissile material is distributed homogeneously and does not form a lattice arrangement within the package;

(v) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 percent by mass, with a total plutonium and uranium-233 content not exceeding 0.002 percent of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2. The material must be contained in at least a DOT Type A package; and

(vi) Packages containing, individually, a total plutonium mass of not more than 1000 grams, of which not more than 20 percent by mass may consist of plutonium-239, plutonium-241, or any combination of these radionuclides.

(7) General license: U.S. NRC-approved package.

(Rule 0400-20-10-.30, continued)

(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) 1. This general license applies only to a licensee who has a quality assurance program approved by the Division as satisfying the provisions of this rule.

2. Each licensee issued a general license under subparagraph (a) of this paragraph shall:

(i) Maintain a copy of the NRC-issued certificate of compliance, or other approval of the package, and 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;

(ii) Comply with the terms and conditions of the license, certificate, or other approval, as applicable, and the applicable requirements of this rule; and

(iii) Submit in writing before the first use of the package to: ATTN: Document Control Desk, Director, Division of Fuel Management, Office of Nuclear Material Safety and Safeguards, using an appropriate method listed in 10 C.F.R. § 71.1(a), the licensee's name and license number and the package identification number specified in the package approval.

(c) This general license applies only when the package approval authorizes use of the package under this general license.

(d) 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 in 10 CFR 71.19.

(8) Reserved.

(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 171.23.

(b) Except as otherwise provided in this paragraph, the general license applies only to a licensee who has a quality assurance program approved by the Division as satisfying the applicable provisions of this rule.

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

(d) Each licensee issued a general license under subparagraph (a) of this paragraph shall:

1. Maintain 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. Comply with the terms and conditions of the certificate and revalidation and with the applicable requirements of this rule.

(Rule 0400-20-10-.30, continued)

(10) General license: Fissile material

(a) A general license is issued to any licensee of the Division or U.S. NRC to transport fissile material, or to deliver fissile material to a carrier for transport, if the material is shipped in accordance with this paragraph. The fissile material need not be contained in a package which meets the standards of 10 CFR Part 71 subparts E and F of U.S. NRC regulations; however, the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 49 CFR 173.417(a).

(b) The general license applies only to a licensee who has submitted to the Division and received Division approval for a quality assurance program that satisfies the provisions found in this rule.

(c) The general license applies only when a package's contents:

1. Contain less than a Type A quantity of fissile material; and

2. Contain less than 500 total grams of beryllium, graphite, or hydrogenous material enriched in deuterium.

(d) The general license applies only to packages containing fissile material that are labeled with a CSI which:

1. Has been determined in accordance with subparagraph (e) of this paragraph;

2. Has a value less than or equal to 10; and

3. For a shipment of multiple packages containing fissile material, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and less than or equal to 100 (for shipment on an exclusive use conveyance).

(e) 1. The value for the CSI must be greater than or equal to the number calculated by the following equation:

$$CSI = 10\left[\frac{\text{grams of } {}^{235}U}{X} + \frac{\text{grams of } {}^{233}U}{Y} + \frac{\text{grams of Pu}}{Z}\right];$$

2. The calculated CSI must be rounded up to the first decimal place;

3. The values of X, Y, and Z used in the CSI equation must be taken from Tables RHS 7-3 or 7-4, as appropriate;

4. If Table RHS 7-4 is used to obtain the value of X, then the values for the terms in the equation for uranium-233 and plutonium must be assumed to be zero; and

5. Table RHS 7-3 values for X, Y, and Z must be used to determine the CSI if:

(i) Uranium-233 is present in the package;

(ii) The mass of plutonium exceeds 1 percent of the mass of uranium-235;

(Rule 0400-20-10-.30, continued)

(iii) The uranium is of unknown uranium-235 enrichment or greater than 24 weight percent enrichment; or

(iv) Substances having a moderating effectiveness (i.e., an average hydrogen density greater than H_2O) (e.g., certain hydrocarbon oils or plastics) are present in any form, except as polyethylene used for packing or wrapping.

Table RHS 7-3. Mass Limits for General License Packages Containing Mixed Quantities of Fissile Material or Uranium-235 of Unknown Enrichment per subparagraph (10)(e) of Rule 0400-20-10-.30

Fissile material	Fissile material mass mixed with moderating substances having an average hydrogen density less than or equal to H_2O (grams)	Fissile material mass mixed with moderating substances having an average hydrogen density greater than H_2O[a] (grams)
^{235}U (X)	60	38
^{233}U (Y)	43	27
^{239}Pu or ^{241}Pu (Z)	37	24

[a] When mixtures of moderating substances are present, the lower mass limits shall be used if more than 15 percent of the moderating substance has an average hydrogen density greater than H_2O.

Table RHS 7-4 Mass Limits for General License Packages Containing Uranium-235 of Known Enrichment per subparagraph (10)(e) of Rule 0400-20-10-.30

Uranium enrichment in weight percent of ^{235}U not exceeding	Fissile material mass of ^{235}U (X) (grams)
24	60
20	63
15	67
11	72
10	76
9.5	78
9	81
8.5	82
8	85
7.5	88
7	90
6.5	93
6	97
5.5	102
5	108
4.5	114
4	120
3.5	132

(Rule 0400-20-10-.30, continued)

3	150
2.5	180
2	246
1.5	408
1.35	480
1	1,020
0.92	1,800

(11) General license: Plutonium-beryllium special form material.

(a) A general license is issued to any licensee of the Division or the U.S. NRC to transport fissile material in the form of plutonium-beryllium (Pu-Be) special form sealed sources, or to deliver Pu-Be sealed sources to a carrier for transport, if the material is shipped in accordance with this rule. This material need not be contained in a package which meets the standards of 10 CFR Part 71 subparts E and F; however, the material must be contained in a Type A package. The Type A package must also meet the DOT requirements of 49 CFR 173.417(a).

(b) The 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 this rule.

(c) The general license applies only when a package's contents:

1. Contain no more than a Type A quantity of radioactive material; and

2. Contain less than 1000 g of plutonium, provided that: plutonium-239, plutonium-241, or any combination of these radionuclides, constitutes less than 240 g of the total quantity of plutonium in the package.

(d) The general license applies only to packages labeled with a CSI which:

1. Has been determined in accordance with subparagraph (e) of this paragraph;

2. Has a value less than or equal to 100; and

3. For a shipment of multiple packages containing Pu-Be sealed sources, the sum of the CSIs must be less than or equal to 50 (for shipment on a nonexclusive use conveyance) and less than or equal to 100 (for shipment on an exclusive use conveyance).

(e) 1. The value for the CSI must be greater than or equal to the number calculated by the following equation:

$$CSI = 10 \left[\frac{\text{Grams of } {}^{239}\text{Pu} + \text{grams of } {}^{241}\text{Pu}}{24} \right]; \text{ and}$$

2. The calculated CSI must be rounded up to the first decimal place.

(12) Fissile Material: Assumptions as to unknown properties of fissile material.

(Rule 0400-20-10-.30, continued)

(a) When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee shall package the fissile material as if the unknown properties have credible values that will cause the maximum neutron multiplication.

(13) Before the first use of any packaging for the shipment of licensed material, a licensee shall ascertain that the determinations in 10 CFR 71.85(a)-(c) have been made.

(14) 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;

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.

(15) Air transport of plutonium.

(Rule 0400-20-10-.30, continued)

(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 less than or equal to the activity concentration values for plutonium specified in Table A-2 of Schedule 10-6 in Rule 0400-20-10-.38 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 (4) and (5) of this rule; 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 of this paragraph, 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.

(16) 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 subparagraphs (5)(a) and (b) of Rule 0400-20-05-.115.

(17) Records.

(a) Each licensee shall maintain, for a period of 3 years after shipment, a record of each shipment of licensed material not exempt under paragraph (6) of this rule, 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;

(Rule 0400-20-10-.30, continued)

(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 (14) of this rule 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.

(c) 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 (13) of this rule; 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 must 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 must be retained for three years after the life of the packaging to which they apply.

(18) Reserved.

(19) Inspection and tests.

In addition to the requirements in paragraph (1) of Rule 0400-20-10-.27 and Rule 0400-20-10-.28, the licensee shall notify the Director, Division of Radiological Health, at the address given in Rule 0400-20-10-.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.

(20) 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.

(21) Advance notification of shipment of nuclear waste.

(Rule 0400-20-10-.30, continued)

(a) 1. As specified in subparagraphs (b), (c) and (d) of this paragraph, each licensee shall provide advance notification to the governor of a state, or the governor's designee, and to the Director, Division of Radiological Health, of the shipment of licensed material, within 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.

2. As specified in subparagraphs (b), (c), and (d) of this paragraph, each licensee shall provide advance notification to the Tribal official of participating Tribes referenced in subpart (c)3(iii) of this paragraph, or the official's designee, of the shipment of licensed material, within or across the boundary of the Tribe's reservation, 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 also required under this paragraph 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 Schedule 10-6 in Rule 0400-20-10-.38, Table A-1 for special form radioactive material;

(ii) 3000 times the A_2 value of the radionuclides as specified in Schedule 10-6 in Rule 0400-20-10-.38, 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, the office of each appropriate Tribal official or Tribal official's designee, the Director, Division of Radiological Health, and to the Director, Office of Nuclear Security and Incident Response, U.S. Nuclear Regulatory Commission.

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

3. A notification delivered by any other means than mail shall reach the office of the governor, or of the governor's designee, the Tribal official or Tribal official's designee, and the Director, Division of Radiological Health, at least four days before the beginning of the seven-day period during which departure of the shipment is estimated to occur.

(i) Reserved.

(Rule 0400-20-10-.30, continued)

(ii) Contact information for each state, including telephone and mailing addresses of governors and governors' designees, and participating Tribes, including telephone and mailing addresses of Tribal officials and Tribal officials' designees, is available on the U.S. Nuclear Regulatory Commission Web site at: https://scp.nrc.gov/special/designee.pdf.

(iii) A list of the names and mailing addresses of the governors' designees and Tribal officials' designees of participating Tribes is available on request from the Director, Division of Materials Safety, Security, State, and Tribal Programs, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

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

(d) Information to be furnished in advance notification of shipment. Each advance notification of shipment nuclear waste shall contain the following information:

1. The name, address and telephone number of the shipper, carrier and receiver of the nuclear waste shipment;

2. A description of the 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 7-day period during which departure of the shipment is estimated to occur;

4. The 7-day period during which arrival of the shipment at the State boundaries or Tribal reservation boundaries is estimated to occur;

5. The destination of the shipment and the 7-day period during which arrival of the shipment is estimated to occur; and

6. A point of contact, with a telephone number, for current shipment information.

(e) Revision notice.

A licensee who finds that schedule information previously furnished to the governor, or governor's designee, or a Tribal official or Tribal official's designee, and to the Director, Division of Radiological Health, in accordance with this paragraph, will not be met, shall telephone a responsible individual in the office of the governor of the State, or of the governor's designee, or a Tribal official or Tribal official'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 3 years.

(f) Cancellation notice.

1. Each licensee who cancels a 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, each Tribal official or to the Tribal official's designee previously notified, and to the Director, Division of Radiological Health.

(Rule 0400-20-10-.30, continued)

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 3 years.

(22) Quality assurance.

(a) Quality assurance requirements.

1. This subparagraph describes quality assurance requirements applying to design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of components of packaging that are important to safety. As used in this paragraph, “quality assurance” comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of the material or component to predetermined requirements. Each licensee is responsible for the quality assurance requirements that apply to its use of a packaging for the shipment of licensed material subject to this paragraph.

2. Establishment of program.

Each licensee shall establish, maintain, and execute a quality assurance program satisfying each of the applicable criteria of this rule and satisfying any specific provisions that are applicable to the licensee’s activities including procurement of packaging. The licensee shall execute the applicable criteria in a graded approach to an extent that is commensurate with the quality assurance requirement’s importance to safety.

3. Approval of program.

Before the use of any package for the shipment of licensed material subject to this paragraph, each licensee shall obtain Division approval of its quality assurance program. Using an appropriate method listed in Rule 0400-20-04-.07 each licensee shall file a description of its quality assurance program, including a discussion of which requirements of this paragraph are applicable and how they will be satisfied.

4. Radiography containers.

A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of subparagraph (8)(b) of Rule 0400-20-08-.04 or equivalent Nuclear Regulatory Commission, or Agreement State requirement, is deemed to satisfy the requirements of part (7)(b)4 of this rule and part 2 of this subparagraph.

(b) Quality assurance organization.

1. A licensee[15] shall be responsible for the establishment and execution of the quality assurance program. The licensee may delegate to others, such as

[15] While the term “licensee” is used in these criteria, the requirements are applicable to whatever design, fabrication, assembly, and testing of the package is accomplished with respect to a package before the time a package approval is issued.

(Rule 0400-20-10-.30, continued)

contractors, agents, or consultants, the work of establishing and executing the quality assurance program, or any part of the quality assurance program, but shall retain responsibility for the program. These activities include performing the functions associated with attaining quality objectives and the quality assurance functions.

2. The quality assurance functions are:

(i) Assuring that an appropriate quality assurance program is established and effectively executed; and

(ii) Verifying, by procedures such as checking, auditing, and inspection, that activities affecting the functions that are important to safety have been correctly performed.

3. The persons and organizations performing quality assurance functions must have sufficient authority and organizational freedom to:

(i) Identify quality problems;

(ii) Initiate, recommend, or provide solutions; and

(iii) Verify implementation of solutions.

(c) Quality assurance program.

1. A licensee shall establish, at the earliest practicable time consistent with the schedule for accomplishing the activities, a quality assurance program that complies with the requirements of this rule. The licensee shall document the quality assurance program by written procedures or instructions and shall carry out the program in accordance with those procedures throughout the period during which the packaging is used. The licensee shall identify the material and components to be covered by the quality assurance program, the major organizations participating in the program, and the designated functions of these organizations.

2. A licensee, through its quality assurance program, shall provide control over activities affecting the quality of the identified materials and components to an extent consistent with their importance to safety, and as necessary to assure conformance to the approved design of each individual package used for the shipment of radioactive material. The licensee shall assure that activities affecting quality are accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanliness; and assurance that all prerequisites for the given activity have been satisfied. The licensee shall take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality, and the need for verification of quality by inspection and test.

3. A licensee shall base the requirements and procedures of its quality assurance program on the following considerations concerning the complexity and proposed use of the package and its components:

(i) The impact of malfunction or failure of the item to safety;

(ii) The design and fabrication complexity or uniqueness of the item;

(iii) The need for special controls and surveillance over processes and equipment;

(iv) The degree to which functional compliance can be demonstrated by inspection or test; and

(v) The quality history and degree of standardization of the item.

4. A licensee shall provide for indoctrination and training of personnel performing activities affecting quality, as necessary to assure that suitable proficiency is achieved and maintained. The licensee shall review the status and adequacy of the quality assurance program at established intervals. Management of other organizations participating in the quality assurance program shall review regularly the status and adequacy of that part of the quality assurance program they are executing.

(d) Handling, storage, and shipping control.

The licensee shall establish measures to control, in accordance with instructions, the handling, storage, shipping, cleaning, and preservation of materials and equipment to be used in packaging to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere, and specific moisture content and temperature levels must be specified and provided.

(e) Inspection, test, and operating status.

1. A licensee shall establish measures to indicate, by the use of markings such as stamps, tags, labels, routing cards, or other suitable means, the status of inspections and tests performed upon individual items of the packaging. These measures must provide for the identification of items that have satisfactorily passed required inspections and tests, where necessary to preclude inadvertent bypassing of the inspections and tests.

2. A licensee shall establish measures to identify the operating status of components of the packaging, such as tagging valves and switches, to prevent inadvertent operation.

(f) Nonconforming materials, parts, or components.

A licensee shall establish measures to control materials, parts, or components that do not conform to the licensee’s requirements to prevent their inadvertent use or installation. These measures must include, as appropriate, procedures for identification, documentation, segregation, disposition, and notification to affected organizations. Nonconforming items must be reviewed and accepted, rejected, repaired, or reworked in accordance with documented procedures.

(g) Corrective action.

A licensee shall establish measures to assure that conditions adverse to quality, such as deficiencies, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. In the case of a significant condition adverse to quality, the measures must assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken must be documented and reported to appropriate levels of management.

(Rule 0400-20-10-.30, continued)

(h) Quality assurance records.

A licensee shall maintain sufficient written records to describe the activities affecting quality. The records must include changes to the quality assurance program as required by this rule, the instructions, procedures, and drawings required by 10 CFR 71.111 to prescribe quality assurance activities and must include closely related specifications such as required qualifications of personnel, procedures, and equipment. The records must include the instructions or procedures which establish a records retention program that is consistent with applicable regulations and designates factors such as duration, location, and assigned responsibility. The licensee shall retain these records for three years beyond the date when the licensee last engages in the activity for which the quality assurance program was developed. If any portion of the quality assurance program, written procedures or instructions is superseded, the licensee shall retain the superseded material for three years after it is superseded.

(i) Audits.

A licensee shall carry out a comprehensive system of planned and periodic audits to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. The audits must be performed in accordance with written procedures or checklists by appropriately trained personnel not having direct responsibilities in the areas being audited. Audited results must be documented and reviewed by management having responsibility in the area audited. Follow up action, including re-audit of deficient areas, must be taken where indicated.

(j) Changes to quality assurance program

1. Each quality assurance program approval holder shall submit, in accordance with Rule 0400-20-04-.07, a description of a proposed change to its Division-approved quality assurance program that will reduce commitments in the program description as approved by the Division. The quality assurance program approval holder shall not implement the change before receiving Division approval.

   (i) The description of a proposed change to the Division-approved quality assurance program must identify the change, the reason for the change, and the basis for concluding that the revised program incorporating the change continues to satisfy the applicable requirements of this paragraph.

   (ii) Reserved.

2. Each quality assurance program approval holder may change a previously approved quality assurance program without prior approval, if the change does not reduce the commitments in the quality assurance program previously approved by the Division. Changes to the quality assurance program that do not reduce the commitments shall be submitted to the Division every 24 months, in accordance with this rule. In addition to quality assurance program changes involving administrative improvements and clarifications, spelling corrections, and non-substantive changes to punctuation or editorial items, the following changes are not considered reductions in commitment:

   (i) The use of a quality assurance standard approved by the Division that is more recent than the quality assurance standard in the program approval holder’s current quality assurance program at the time of the change;

(Rule 0400-20-10-.30, continued)

(ii) The use of generic organizational position titles that clearly denote the position function, supplemented as necessary by descriptive text, rather than specific titles, provided that there is no substantive change to either the functions of the position or reporting responsibilities;

(iii) The use of generic organizational charts to indicate functional relationships, authorities, and responsibilities, or alternatively, the use of descriptive text, provided that there is no substantive change to the functional relationships, authorities, or responsibilities;

(iv) The elimination of quality assurance program information that duplicates language in quality assurance regulatory guides and quality assurance standards to which the quality assurance program approval holder has committed to on record; and

(v) Organizational revisions that ensure that persons and organizations performing quality assurance functions continue to have the requisite authority and organizational freedom, including sufficient independence from cost and schedule when opposed to safety considerations.

3. Each quality assurance program approval holder shall maintain records of quality assurance program changes.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendment filed March 3, 2015; effective June 1, 2015. Amendments filed September 1, 2021; effective November 30, 2021. Amendments filed December 4, 2023; effective March 3, 2024.*

0400-20-10-.31 FEES FOR LICENSES.

(1) A fee shall be assessed and collected on the application for and annual maintenance of licenses regarding radioactive materials, as follows:

(a) Application filing fees from applicants for licenses to use or possess radioactive materials or any other activity authorized under this Chapter that requires a license from the Department.

(b) Annual maintenance fees from licensees or persons required to possess a license under this Chapter, including reciprocal activity under Rule 0400-20-10-.29.

(2) The application filing fees shall be the same amount as the annual maintenance fees set forth in paragraphs (6) through (19) of this rule. A radioactive material license application will not be considered for completeness unless the application filing fee has been paid in full. Within 15 days of receipt of an application, an invoice for the fee will be prepared and mailed to the applicant. The application filing fee is not refundable, except as specified in T.C.A. § 68-203-103. Applicants for licenses greater than Category 8 shall pay the application fee annually until such time as the license is issued or denied. (An application filing fee shall be required when a licensee applies for a license modification to change to a higher numbered category, in which case the application fee will be the amount of the proposed new Category. The application filing fee shall serve as full payment of fees for the balance of the calendar year in which the license is issued.)

(3) If a license authorizes activities under more than one Category, the application and annual maintenance fee shall be the cumulative total for each applicable category under which the license is issued.

(Rule 0400-20-10-.31, continued)

(4) The annual maintenance fees, based on the categories in paragraphs (6) through (19) of this rule shall be payable to the Division of Radiological Health by check made payable to "Treasurer State of Tennessee" by February 17 of each year, as indicated on the annual invoice, until the license is terminated in accordance with these regulations.

(a) Provided that the licensee has demonstrated to the satisfaction of the Department that all of the requirements concerning disposal of radioactive material and the decontamination of facilities are met, the termination of the license is administratively accomplished by using one of the following:

1. As requested by the licensee;

2. By the Department for cause; or

3. In accordance with these regulations.

(b) The failure to acquire radioactive material or the disposal of radioactive material without notifying the Department and requesting termination in writing does not constitute termination of the license.

(5) Complete Applications

(a) For the purpose of determining whether or not the Division has acted in the time frame established to process applications set forth in subparagraph (e) of this paragraph, the evaluation period shall not begin until a complete application has been filed in the Division of Radiological Health Central Office. All items on the application form shall be completed in sufficient detail to allow the Division to determine that the applicant's equipment, facilities and radiation protection program are adequate to protect health and minimize danger to life and property.

(b) The Division shall denote the date that all applications for radioactive material license are received in its Nashville office.

(c) Upon receipt of an application, the Division must examine it to ensure that it is complete and advise the applicant in writing of its findings via electronic mail. Sixty days will be allowed for the initial and each subsequent review per part 3 of this subparagraph.

1. If an application is determined to be incomplete, the Division must notify the applicant in writing via electronic mail of the finding with a brief explanation of the deficiencies. The application filing fee shall be retained by the Division.

2. After receiving notice from the Division that the application was incomplete, the applicant shall have 180 calendar days to correct the deficiencies. If properly corrected, the application will be processed and no additional application fee is required, except for the possibility of those above Category 8. If the deficiencies are not corrected within the 180-day correction period, the fee will be forfeited in its entirety to the Division with no further action taken on the application by the Division. If the applicant re-applies, a new application fee must be paid in full.

3. Upon receipt of a corrected application revised pursuant to part 1 or 2 of this subparagraph, the Division shall re-evaluate the application and notify the applicant of its finding as to whether the deficiencies in the application have been corrected. The same procedure to notify an applicant as to whether the application is complete will follow the requirements specified by this

(Rule 0400-20-10-.31, continued)

subparagraph, with the exception being that the 180-day correction period begins from the receipt of the initial application—not receipt of the revised application.

4. Any person possessing licensable quantities of unlicensed radioactive material during the review of an application for a license for the radioactive material shall be in violation of Rule 0400-20-10-.02.

(d) Revisions to an application, to reflect changes in radioactive material or its use, will be accepted by the Division during the application processing period. However, notwithstanding subparagraph (e) of this paragraph, the deadline for evaluation as to issuance of a license will restart upon each and every revision.

(e) The Division shall make a decision to issue or deny a request for a new radioactive material license, except Category 12, and notify the applicant of that decision in no more than 365 days after receipt of a complete application, unless the Division has requested technical assistance in the review of the application from the Nuclear Regulatory Commission.

(6) CATEGORY GL ---------- $350.00

Any person possessing radioactive material, under the terms of any general license issued these regulations, in a form or device on which a test for leakage of radioactive material is required.

(7) CATEGORY 1---------- $425.00

A specific license for source material used exclusively for shielding radiation.

(8) CATEGORY 2---------- $850.00

(a) Reserved.

(b) The application, use or possession of radioactive material as chromatography sources or gauges not requiring assignment to another category.

(c) The application, use or possession of radioactive material for in vitro use only, total quantity not to exceed 200 microcuries.

(d) Any person who packages or containerizes, loads transport vehicles or ships radioactive materials to a licensed disposal/processing facility in Tennessee. In addition to application and annual maintenance fees, there is also a levied fee of two cents per pound ($0.02/lb) on all items contaminated or potentially contaminated with radioactive material or on low-level radioactive waste received at a processing, storage, disposal or refurbishing facility in Tennessee.

Not withstanding the requirements of this paragraph and Rule 0400-20-10-.32, licensees with multiple sites within the state will be levied only one fee if items are moved directly from one site to another.

The operator of the disposal/processing facility shall collect the fee of two cents per pound ($0.02/lb). For each calendar month, he shall remit the total of fees collected for the month to the Division of Radiological Health by the 25th day of the following month.

(e) The application, use or possession of radioactive material for the calibration for hire of radiation detection, monitoring and measuring instruments.

(Rule 0400-20-10-.31, continued)

(f) The performance for hire of leak tests on sealed sources of radioactive material.

(9) CATEGORY 3---------- $1,170.00

(a) The application, use or possession of radioactive material, unless specific to a higher numbered category, by an academic institution, but does not include licenses authorizing all radioisotopes with atomic number 3 through 83.

(b) The possession and use of radioactive material for civil defense activities.

(c) The application, use or possession of radioactive material by a medical, institution or physicians for use in radiopharmaceuticals for the diagnosis or therapy of humans.

(d) Reserved.

(e) Reserved.

(f) Reserved.

(g) The application, use or possession of radioactive material for demonstration or training purposes.

(h) The application, use or possession of radioactive material for in vitro use only, total quantity exceeding 200 microcuries.

(i) The use of sealed sources for soil and/or construction materials testing at temporary job-sites by licensees with licensed authorization for no more than two (2) devices.

(j) The use of radioactive material as chromatography sources at temporary job-sites by licensees with licensed authorization for no more than two (2) devices.

(k) The use of gauging and measuring devices at temporary job-sites by licensees with licensed authorization for no more than two (2) devices.

(10) CATEGORY 4---------- $1,950.00

(a) The application, use or possession of radioactive material by a medical institution or physicians for interstitial, intracavitary or superficial treatment of humans using sealed sources, seeds or wires.

(b) The application, use or possession of radioactive material in sealed sources for irradiation of materials in which the source is not removed from its shield (self-contained irradiators).

(c) The application, use or possession of radioactive material for analytical testing purposes.

(11) CATEGORY 5---------- $2,730.00

(a) The use of radioactive material in research and development, manufacturing, testing, processing and assembling of products. This group includes the use of source material in the manufacture of items such as mantles, alloys, gases, liquids, metals, ceramics, glass or photographic products.

(b) The use of radioactive material in a process that incorporates that material into a product in exempt concentrations.

(Rule 0400-20-10-.31, continued)

(c) The possession and use of radioactive material in curie quantities in a number of sources in gauges and gauging applications that require frequent changes and therefore frequent review of the program to ensure that the hazard potential does not exceed the scope of the radiation safety program.

(d) The use of a single radioactive material in the fabrication of sealed sources or ampoules.

(e) The receipt of prepackaged radioactive material waste from other persons by a nuclear waste handler for storage for less than three (3) months before, transfer only to persons licensed to receive or dispose of the material.

(f) The use of sealed sources for soil and/or construction materials testing at temporary job-sites by licensees with licensed authorization for more than two (2) devices.

(g) The use of radioactive material as chromatography sources at temporary job-sites by licensees with licensed authorization for more than two (2) devices.

(h) The use of gauging and measuring devices at temporary job-sites by licensees with licensed authorization for more than two (2) devices.

(i) The application, use or possession of radioactive material by a medical institution or physicians for the treatment of humans with sealed sources contained in teletherapy devices.

(j) The application, use or possession of radioactive material by a veterinarian for the treatment of animals using sealed sources, seeds or wires.

(12) CATEGORY 6---------- $7,800.00

(a) The application, use or possession of radioactive material including source and/or special nuclear material in unsealed form in less than multi-curie quantities for use in the fabrication of sealed sources without regard to amount of contained radioactivity.

(b) The manufacture of devices and/or sources that require in-depth review before approval by the Division. Each device and/or source reviewed shall be subject to this fee.

(c) The preparation, use or distribution of radiopharmaceuticals to locations other than the licensee’s address for use in medical diagnosis or therapy.

(d) The use of radiography (the examination of the structure of materials by nondestructive methods using radioactive material) on the licensee’s premises in a permanent shielded facility or temporary job-sites.

(e) The possession and use of radioactive material by academic and medical institutions under a license authorizing all radioisotopes with atomic numbers 3 through 83.

(f) Reserved.

(g) The application of radioactive material to soil, water, air, plants and animals, if the application involves an actual or potential release in or to unrestricted areas.

(Rule 0400-20-10-.31, continued)

(h) The possession, use and distribution of radioactive material at one or more satellite facilities, or the possession and use of radioactive material at one or more satellite facilities, by medical institutions.

(i) The application, use or possession of radioactive material by a medical institution or physicians for research using humans and/or animals.

(13) CATEGORY 7---------- $5,200.00

(a) Reserved.

(b) Reserved.

(c) The application, use or possession of radioactive material for well logging, well surveys or tracer studies.

(14) CATEGORY 8---------- $14,625.00

(a) The receipt of radioactive material waste from other persons by a nuclear waste handler, for the purpose of packaging or repackaging the material prior to transfer only to persons licensed to receive or dispose of the material.

(b) The commercial collection, laundering or dry cleaning of wearing apparel that is contaminated with radioactive material.

(15) CATEGORY 9---------- $19,500.00

(a) The possession of radioactive material or equipment contaminated or potentially contaminated with radioactive material as a result of operations involving the recovery of an element, compound or mixture from ores not subject to licensure because of the radioactive material content of the ore.

(b) Facilities that possess radioactive material as a result of operations (not directly involving radioactive decontamination activities) involving recovery of materials or other manufacturing processes (not directly manufacturing radioactive items or products).

(16) CATEGORY 10---------- $27,000.00

(a) Facilities storing radioactive material, contaminated equipment and/or potentially contaminated equipment for transfer to authorized recipients as a service to the nuclear industry.

(b) Possession and refurbishment of contaminated equipment and/or potentially contaminated equipment that has been used at nuclear power plants.

(17) CATEGORY 11---------- $36,000.00

(a) The collection, transfer, sorting and/or brokerage of radioactive material as sealed source, residue, product or as material in or on equipment; and/or

The decontamination of products and/or equipment containing radioactive material and/or contaminated with radioactive material; and/or

The possession, storage and incineration of radioactive material or items contaminated with radioactive materials.

(Rule 0400-20-10-.31, continued)

(b) On site possession and storage of radioactive material and/or equipment contaminated with radioactive material as a result of operations involving the recovery of an element, compound or mixture from ores subject to licensure because of the radioactive material content of the ore or concentration of the radioactive material during the processing of the ore.

(c) Facilities involved in the manufacture of product lines containing radioactive material in the manufactured product.

(d) Possession of radioactive material for processing. This material may exist in ores, concentrates, compounds or metals.

(e) The possession of multi-curie quantities of unsealed radioactive material either as waste or for further processing and/or conversion into specific marketable products.

(f) Operations involving the fabrication of sealed sources or manufacture of compounds for distribution to other specific or general licensees.

(g) The possession and use of radioactive material in a sealed source for irradiation of materials in which the source is exposed for irradiation purposes (non self-contained irradiators).

(18) CATEGORY 12 ---------- $450,000.00

(a) The application for and/or operation of a low-level radioactive waste disposal facility.

(b) The maximum length of reviewing time (the period of time when there are no outstanding unanswered questions) after receipt of a new application and the appropriate fee for a Category 12 specific license and the issuance of a license is 60 months.

(19) CATEGORY 13 ---------- At least $200.00 not greater than $375,000.00

The application, use or possession of radioactive material for uses or procedures not specifically included in any other category.

The fee shall be determined on a case-by-case basis.

The determination shall be based on an analysis of the hazard, the scope of the difficulty encountered in the review process and the specifics of the activity pursuant to the categories established in paragraphs (6) through (18) of this rule.

(20) CATEGORY NUCLEAR POWER PLANTS AND OTHER FUEL FACILITIES ---------- Actual cost of program

The Department may set and collect an annual fee from persons engaged in the business of producing electricity by utilizing nuclear energy and persons operating facilities for the fabrication of nuclear fuel. The amount of fees collected may not exceed the actual expenses that arise from emergency planning and implementation and environmental surveillance activities.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendment filed February 13, 2013; effective May 14, 2013. Amendments filed December 4, 2023; effective March 3, 2024.*

0400-20-10-.32 LICENSING OF SHIPPERS OF RADIOACTIVE MATERIAL INTO OR WITHIN TENNESSEE.

(1) This rule applies to any shipper who transports or offers for transport into or within Tennessee on public waterways, roadways, railways or other transportation facilities upon which United States Department of Transportation (USDOT) regulations are applicable, any radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities for packaging, repackaging, processing, refurbishing, storage pending disposal or disposal.

(2) All persons subject to the provisions of this rule shall comply with all applicable provisions of the USDOT Regulations (49 CFR) of October 1, 1990, as amended, the U.S. Nuclear Regulatory Commission (NRC) Regulations (10 CFR) of November 30, 1988, as amended, and any disposal/processing facility radioactive material license requirements with special emphasis regarding the packaging, transportation, disposal, storage pending disposal or delivery of radioactive material.

(3) Definitions used in this rule.

(a) “Carrier” means any person who transports radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities.

(b) “Disposal” means isolation of radioactive waste from the biosphere.

(c) “Disposal/Processing Facility” means any facility located within Tennessee that accepts radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities for packaging, repackaging, processing, refurbishing, storage pending disposal or disposal.

(d) Reserved.

(e) Reserved.

(f) “License for delivery” means an authorization issued by the Division to any shipper of radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities to transport such radioactive material or offer such material for transport to a disposal/processing facility.

(g) “Shipper” means any person, whether a resident of Tennessee or a non-resident:

1. Who transfers radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities to a carrier for transport;

2. Who transports his own radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities;

3. Who transports radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities he has packaged, repackaged, processed or stored pending disposal for another person; or

(Rule 0400-20-10-.32, continued)

4. Who transfers radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities to another person if such materials are transported into or within the state.

(h) "Transport" means the movement of radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities into or within the State of Tennessee on waterways, roadways, railways or other transportation facilities upon which USDOT regulations are applicable.

(4) Licensing for delivery.

(a) Before any shipper transports or causes to be transported radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities to a disposal/processing facility within the State for subsequent processing, he shall obtain a license for delivery of such materials from the Division. An application for a license for delivery shall be submitted on Division Form RHS-30, together with any necessary fee, to the Division at the address in Rule 0400-20-04-.07. The check for payment of the fee is to be made payable to "Treasurer: State of Tennessee."

(b) Except as provided in part 6 of this subparagraph, before a license for delivery shall be issued, the shipper must deposit and maintain with the Division an acceptable form of financial assurance in the amount of $500,000; or, provide to the Division satisfactory evidence of liability insurance.

1. For purposes of this paragraph, liability insurance shall mean coverage of $500,000 per occurrence and $1,000,000 aggregate, or as otherwise provided by State law.

2. Any insurance carried pursuant to Section 2210 of Title 42 of the United States Code and U.S. NRC Regulations (10 CFR Part 140) of November 30, 1988, as amended shall be sufficient to meet the requirements of this subparagraph.

3. Liability insurance shall be specific to the packaging, transportation, disposal, storage and delivery of radioactive waste.

4. Shippers maintaining liability insurance for the purpose of this paragraph may provide to the Division a certificate of insurance from their insurer indicating the policy number, limits of liability, policy date and specific coverage for packaging, transportation, disposal, storage pending disposal and delivery of radioactive materials.

5. A cash or corporate surety bond previously posted will be returned to the shipper upon notification to the Division in writing of his intention to cease shipments of radioactive waste into or within the State. Such bond will be returned after the last such shipment is accepted safely at its destination.

6. The requirements of this subparagraph shall not apply to any contractor or subcontractor to the United States Department of Energy that has contract terms consistent with the Price-Anderson Act, 42 U.S.C. § 2210.

(c) Each license for delivery application shall include a certification to the Division that the shipper will comply fully with all applicable State and Federal laws, administrative rules and regulations, licenses, or license conditions of the disposal/processing facility

(Rule 0400-20-10-.32, continued)

regarding the packaging, transportation, storage pending disposal, disposal and delivery of radioactive materials.

(d) Each license for delivery application shall include a certification that the shipper will hold the State of Tennessee harmless for all claims, actions or proceedings in law or equity arising out of radiological injury or damage to persons or property occurring during the transportation of its radioactive waste into or within the State including all costs of defending the same; provided, however, that nothing contained herein shall be construed as a waiver of the State's sovereign immunity; and, further provided that agencies of the State of Tennessee shall not be subject to the requirements of subparagraph (b) of this paragraph.

(5) Disposal/processing facility operator.

(a) Owners and operators of disposal/processing facilities shall permanently record, and report to the Division within 24 hours after discovery, all conditions in violation of the requirement of this rule discovered as a result of inspections required by any license under which the facility is operated. In addition, owners and operators of disposal/processing facilities shall record all violations of these regulations and license conditions and maintain the record for inspection by the Division.

(b) Prior to the receipt of radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive materiel or from licensable activities at a disposal/processing facility in Tennessee, the owners and operators of such facility shall notify each shipper of any special requirements, if any, in effect regarding the packaging, transportation, storage pending disposal, disposal or delivery of such wastes at that facility.

(c) No owner or operator of a disposal/processing facility located within this State shall accept radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or from licensable activities for packaging, repackaging, processing, refurbishing, storage pending disposal or disposal unless the shipper of such waste has a valid license for delivery issued pursuant to this rule.

(d) The owner or operator of a disposal/processing facility shall, along with the remittance of the fee collected pursuant to subparagraph (8)(d) of Rule 0400-20-10-.31, submit a listing containing the name and address of each shipper and the volume and poundage from each shipper for the calendar month.

(e) Any contractor or subcontractor to the United States Department of Energy is not required to meet the requirements of subparagraph (d) of this paragraph as long as it has a contract provision based on the DOE regulations implementing the Price-Anderson Act, 42 U.S.C. § 2210.

(6) Penalties.

All shippers shall be subject to fees and Civil Penalties as authorized and specified in T.C.A. § 68-202-212 and other pertinent rules of the Division.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendment filed March 17, 2014; effective June 15, 2014.*

0400-20-10-.33 RESERVED.

(Note: The following has been moved to the Appendix to this Chapter (Rule 0400-20-10-.38):

(Rule 0400-20-10-.33, continued)

Schedule RHS 8-3 Exempt Quantities
Schedule RHS 8-4 Exempt Concentrations)

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017.*

0400-20-10-.34 RESERVED.

Authority: *T.C.A. §§ 4-5-201, et seq., and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendment filed February 13, 2013; effective May 14, 2013. Amendments filed December 4, 2023; effective March 3, 2024.*

0400-20-10-.35 RESERVED.

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.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 this Chapter and Chapters 0400-20-07, 0400-20-08, 0400-20-09, 0400-20-11 and 0400-20-12. For low-level waste disposal facilities (Chapter 0400-20-11), 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:

(Rule 0400-20-10-.36, continued)

(a) A licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of paragraph (2) of this rule:

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 (4) of Rule 0400-20-10-.12; 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 of this subparagraph:

(I) Are not technically achievable;

(II) Would be prohibitively expensive; or

(III) Would result in net public or environmental harm;

(ii) Makes provisions for durable institutional controls; and

(iii) Provides sufficient financial assurance in the form of a trust fund segregated from the licensee's assets and outside the licensee's administrative control, and in which the adequacy of the trust funds is to be assessed based on an assumed annual 1 percent real rate of return on investment 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 5 years to assure that the institutional controls remain in place as necessary to meet the criteria of subparagraph (b) of this paragraph.

(4) Alternate criteria for license termination.

(Rule 0400-20-10-.36, continued)

(a) The Division may terminate a license using alternate criteria greater than the dose criterion of paragraph (2) of this rule and subparagraph (3)(b) of this rule, 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 0400-20-05-.60 and 0400-20-05-.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 (3) of this rule 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; and

(ii) Reserved; and

3. Provides sufficient financial assurance in the form of a trust fund 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 the site. Periodic rechecks shall be carried out no less frequently than every 5 years to assure that the institutional controls remain in place as necessary to meet the criteria of subparagraph (b) of this paragraph.

(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) of this rule.

(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 (4) of this rule.

(b) Publish a notice on the Tennessee Administrative Register web site, 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.

(6) Minimization of contamination.

Licensees shall, to the extent practical, conduct operations to minimize the introduction of residual radioactivity, as defined in subparagraph (1)(ppp) of Rule 0400-20-04-.04, into the site, including the subsurface, in accordance with the existing radiation protection requirements in Rule 0400-20-05-.40 and radiological criteria for license termination in this rule.

(Rule 0400-20-10-.36, continued)

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendments filed June 14, 2017; effective September 12, 2017. Amendments filed September 1, 2021; effective November 30, 2021.*

0400-20-10-.37 RESERVED.

(Note: The contents of Rule 0400-20-10-.37 Schedule 10-6: Determination of A_1 and A_2 have moved to the Appendix to Rule 0400-20-10-.38.)

Authority: *T.C.A. §§ 4-5-201, et seq.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012.*

0400-20-10-.38 APPENDIX–SCHEDULES.

SCHEDULE RHS 8-3: EXEMPT QUANTITIES

Radioactive Material	Micro–curies
Antimony–122 (Sb 122)	100
Antimony–124 (Sb 124)	10
Antimony–125 (Sb 125)	10
Arsenic–73 (As 73)	100
Arsenic–74 (As 74)	10
Arsenic–76 (As 76)	10
Arsenic–77 (As 77)	100
Barium–131 (Ba 131)	10
Barium–133 (Ba 133)	10
Barium–140 (Ba 140)	10
Bismuth–210 (Bi 210)	1
Bromine–82 (Br 82)	10
Cadmium–109 (Cd 109)	10
Cadmium–115m (Cd 115m)	10
Cadmium–115 (Cd 115)	100
Calcium–45 (Ca 45)	10
Calcium–47 (Ca 47)	10
Carbon–14 (C 14)	100
Cerium–141 (Ce 141)	100
Cerium–143 (Ce 143)	100
Cerium–144 (Ce 144)	1
Cesium–129 (Cs 129)	100
Cesium–131 (Cs 131)	1,000
Cesium–134m (Cs 134m)	100
Cesium–134 (Cs 134)	1
Cesium–135 (Cs 135)	10
Cesium–136 (Cs 136)	10
Cesium–137 (Cs 137)	10
Chlorine–36 (Cl 36)	10
Chlorine–38 (Cl 38)	10
Chromium–51 (Cr 51)	1,000
Cobalt–57 (Co 57)	100
Cobalt–58m (Co 58m)	10
Cobalt–58 (Co 58)	10
Cobalt–60 (Co 60)	1

Radioactive Material	Micro–curies
Copper–64 (Cu 64)	100
Dysprosium–165 (Dy 165)	10
Dysprosium–166 (Dy 166)	100
Erbium–169 (Er 169)	100
Erbium–171 (Er 171)	100
Europium–152 (Eu 152)9.2 h	100
Europium–152 (Eu 152)13 yr	1
Europium–154 (Eu 154)	1
Europium–155 (Eu 155)	10
Fluorine–18 (F 18)	1,000
Gadolinium–153 (Gd 153)	10
Gadolinium–159 (Gd 159)	100
Gallium–67 (Ga 67)	100
Gallium–72 (Ga 72)	10
Germanium–68 (Ge 68)	10
Germanium–71 (Ge 71)	100
Gold–195 (Au 195)	10
Gold–198 (Au 198)	100
Gold–199 (Au 199)	100
Hafnium–181 (Hf 181)	10
Holmium–166 (Ho 166)	100
Hydrogen–3 (H 3)	1,000
Indium–111 (In 111)	100
Indium–113m (In 113m)	100
Indium–114m (In 114m)	10
Indium–115m (In 115m)	100
Indium–115 (In 115)	10
Iodine–123 (I 123)	100
Iodine–125 (I 125)	1
Iodine–126 (I 126)	1
Iodine–129 (I 129)	0.1
Iodine–131 (I 131)	1
Iodine–132 (I 132)	10
Iodine–133 (I 133)	1
Iodine–134 (I 134)	10

(Rule 0400-20-10-.38, continued)

Radioactive Material	Micro–curies
Iodine–135 (I 135)	10
Iridium–192 (Ir 192)	10
Iridium–194 (Ir 194)	100
Iron–52 (Fe 52)	10
Iron–55 (Fe 55)	100
Iron–59 (Fe 59)	10
Krypton–85 (Kr 85)	100
Krypton–87 (Kr 87)	10
Lanthanum–140 (La 140)	10
Lutetium–177 (Lu 177)	100
Manganese–52 (Mn 52)	10
Manganese–54 (Mn 54)	10
Manganese–56 (Mn 56)	10
Mercury–197m (Hg 197m)	100
Mercury–197 (Hg 197)	100
Mercury–203 (Hg 203)	10
Molybdenum–99 (Mo 99)	100
Neodymium–147(Nd 147)	100
Neodymium–149 (Nd 149)	100
Nickel–59 (Ni 59)	100
Nickel–63 (Ni 63)	10
Nickel–65 (Ni 65)	100
Niobium–93m (Nb 93m)	10
Niobium–95 (Nb 95)	10
Niobium–97 (Nb 97)	10
Osmium–185 (Os 185)	10
Osmium–191m (Os 191m)	100
Osmium–191 (Os 191)	100
Osmium–193 (Os 193)	100
Palladium–103 (Pd 103)	100
Palladium–109 (Pd 109)	100
Phosphorus–32 (P 32)	10
Platinum–191 (Pt 191)	100
Platinum–193m (Pt 193m)	100
Platinum–193 (Pt 193)	100
Platinum–197m (Pt 197m)	100
Platinum–197 (Pt 197)	100
Polonium–210 (Po 210)	0.1
Potassium–42 (K 42)	10
Potassium–43 (K 43)	10
Praseodymium–142 (Pr 142)	100
Praseodymium–143 (Pr 143)	100
Promethium–147 (Pm 147)	10
Promethium–149 (Pm 149)	10
Rhenium–186 (Re 186)	100
Rhenium–188 (Re 188)	100
Rhodium–103m (Rh 103m)	100
Rhodium–105 (Rh 105)	100
Rubidium–81 (Rb 81)	10
Rubidium–86 (Rb 86)	10
Rubidium–87 (Rb 87)	10
Ruthenium–97 (Ru 97)	100

Radioactive Material	Micro–curies
Ruthenium–103 (Ru 103)	10
Ruthenium–105 (Ru 105)	10
Ruthenium–106 (Ru 106)	1
Samarium–151 (Sm 151)	10
Samarium–153 (Sm 153)	100
Scandium–46 (Sc 46)	10
Scandium–47 (Sc 47)	100
Scandium–48 (Sc 48)	10
Selenium–75 (Se 75)	10
Silicon–31 (Si 31)	100
Silver–105 (Ag 105)	10
Silver–110m (Ag 110m)	1
Silver–111 (Ag 111)	100
Sodium–22 (Na 22)	10
Sodium–24 (Na 24)	10
Strontium–85 (Sr 85)	10
Strontium–89 (Sr 89)	1
Strontium–90 (Sr 90)	0.1
Strontium–91 (Sr 91)	10
Strontium–92 (Sr 92)	10
Sulfur–35 (S 35)	100
Tantalum–182 (Ta 182)	10
Technetium–96 (Tc 96)	10
Technetium–97m (Tc 97m)	100
Technetium–97 (Tc 97)	100
Technetium–99m (Tc 99m)	100
Technetium–99 (Tc 99)	10
Tellurium–125m (Te 125m)	10
Tellurium–127m (Te 127m)	10
Tellurium–127 (Te 127)	100
Tellurium–129m (Te 129m)	10
Tellurium–129 (Te 129)	100
Tellurium–131m (Te 131m)	10
Tellurium–132 (Te 132)	10
Terbium–160 (Tb 160)	10
Thallium–200 (Tl 200)	100
Thallium–201 (Tl 201)	100
Thallium–202 (Tl 202)	100
Thallium–204 (Tl 204)	10
Thulium–170 (Tm 170)	10
Thulium–171 (Tm 171)	10
Tin–113 (Sn 113)	10
Tin–125 (Sn 125)	10
Tungsten–181 (W 181)	10
Tungsten–185 (W 185)	10
Tungsten–187 (W 187)	100
Vanadium–48 (V 48)	10
Xenon–131m (Xe 131m)	1,000
Xenon–133 (Xe 133)	100
Xenon–135 (Xe 135)	100
Ytterbium–175 (Yb 175)	100
Yttrium–87 (Y 87)	10

(Rule 0400-20-10-.38, continued)

Radioactive Material	Micro–curies
Yttrium–88 (Y 88)	10
Yttrium–90 (Y 90)	10
Yttrium–91 (Y 91)	10
Yttrium–92 (Y 92)	100
Yttrium–93 (Y 93)	100
Zinc–65 (Zn 65)	10
Zinc–69m (Zn 69m)	100
Zinc–69 (Zn 69)	1,000
Zirconium–93 (Zr 93)	10
Zirconium–95 (Zr 95)	10
Zirconium–97 (Zr 97)	10
Any radioactive material not listed above other than alpha-emitting radioactive material	0.1
Any alpha emitting radioactive material not listed above other than transuranic radioactive material	0.01

SCHEDULE RHS 8-4: EXEMPT CONCENTRATIONS

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml [a]	Column II and Solid Concentration µCi/ml [b]
Antimony (51)	Sb–122		3×10^{-4}
	Sb–124		2×10^{-4}
	Sb–125		1×10^{-3}
Argon (18)	Ar–37	1×10^{-3}	
	Ar–41	4×10^{-7}	
Arsenic (33)	As–73		5×10^{-3}
	As–74		5×10^{-4}
	As–76		2×10^{-4}
	As–77		8×10^{-4}
Barium (56)	Ba–131		2×10^{-3}
	Ba–140		3×10^{-4}
Beryllium (4)	Be–7		2×10^{-2}
Bismuth (83)	Bi–206		4×10^{-4}
Bromine (35)	Br–82	4×10^{-7}	3×10^{-3}
Cadmium (48)	Cd–109		2×10^{-3}
	Cd–115m		3×10^{-4}
	Cd–115		3×10^{-4}
Calcium (20)	Ca–45		9×10^{-5}
	Ca–47		5×10^{-4}
Carbon (6)	C–14	1×10^{-6}	8×10^{-3}
Cerium (58)	Ce–141		9×10^{-4}
	Ce–143		4×10^{-4}
	Ce–144		1×10^{-4}
Cesium (55)	Cs–131		2×10^{-2}
	Cs–134m		6×10^{-2}
	Cs–134		9×10^{-5}
Chlorine (17)	Cl–38	9×10^{-7}	4×10^{-3}
Chromium (24)	Cr–51		2×10^{-2}
Cobalt (27)	Co–57		5×10^{-3}
	Co–58		1×10^{-3}
	Co–60		5×10^{-4}
Copper (29)	Cu–64		3×10^{-3}
Dysprosium (66)	Dy–165		4×10^{-3}
	Dy–166		4×10^{-4}
Erbium (68)	Er–169		9×10^{-4}
	Er–171		1×10^{-3}

(Rule 0400-20-10-.38, continued)

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml [a]	Column II and Solid Concentration µCi/ml [b]
Europium (63)	Eu–152 (Tr = 9.2h)		6×10^{-4}
	Eu–155		2×10^{-3}
Fluorine(9)	F–18	2×10^{-6}	8×10^{-3}
Gadolinium (64)	Gd–153		2×10^{-3}
	Gd–159		8×10^{-4}
Gallium (31)	Ga–72		4×10^{-4}
Germanium (32)	Ge–71		2×10^{-2}
Gold (79)	Au–196		2×10^{-3}
	Au–198		5×10^{-4}
	Au–199		2×10^{-3}
Hafnium (72)	Hf–181		7×10^{-4}
Hydrogen (1)	H–3	5×10^{-6}	3×10^{-2}
Indium (49)	In–113m		1×10^{-2}
	In–114m		2×10^{-4}
Iodine (53)	I–126	3×10^{-9}	2×10^{-5}
	I–131	3×10^{-9}	2×10^{-5}
	I–132	8×10^{-8}	6×10^{-4}
	I–133	1×10^{-8}	7×10^{-5}
	I–134	2×10^{-7}	1×10^{-3}
Iridium (77)	Ir–190		2×10^{-3}
	Ir–192		4×10^{-4}
	Ir–194		3×10^{-4}
Iron (26)	Fe–55		8×10^{-3}
	Fe–59		6×10^{-4}
Krypton (36)	Kr–85m	1×10^{-6}	
	Kr–85	3×10^{-6}	
Lanthanum (57)	La–140		2×10^{-4}
Lead (82)	Pb–203		4×10^{-3}
Lutetium (71)	Lu–177		1×10^{-3}
Manganese (25)	Mn–52		3×10^{-4}
	Mn–54		1×10^{-3}
	Mn–56		1×10^{-3}
Mercury (80)	Hg–197m		2×10^{-3}
	Hg–197		3×10^{-3}
	Hg–203		2×10^{-4}
Molybdenum (42)	Mo–99		2×10^{-3}
Neodymium (60)	Nd–147		6×10^{-4}
	Nd–149		3×10^{-3}
Nickel (28)	Ni–65		1×10^{-3}
Niobium (41)	Nb–95		1×10^{-3}
	Nb–97		9×10^{-3}
Osmium (76)	Os–185		7×10^{-4}
	Os–191m		3×10^{-2}
	Os–191		2×10^{-3}
	Os–193		6×10^{-4}
Palladium (46)	Pd–103		3×10^{-3}
	Pd–109		9×10^{-4}
Phosphorus (15)	P–32		2×10^{-4}
Platinum (78)	Pt–191		1×10^{-3}
	Pt–193m		1×10^{-2}
	Pt–197m		1×10^{-2}
	Pt–197		1×10^{-3}
Polonium (84)	Po–210		7×10^{-6}

(Rule 0400-20-10-.38, continued)

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml [a]	Column II and Solid Concentration µCi/ml [b]
Potassium (19)	K–42		3×10^{-3}
Praseodymium (59)	Pr–142		3×10^{-4}
	Pr–143		5×10^{-4}
Promethium (61)	Pm–147		2×10^{-3}
	Pm–149		4×10^{-4}
Radium (88)	Ra–226		1×10^{-7}
	Ra–228		3×10^{-7}
Rhenium (75)	Re–183		6×10^{-3}
	Re–186		9×10^{-4}
	Re–188		6×10^{-4}
Rhodium (45)	Rh–103m		1×10^{-1}
	Rh–105		1×10^{-3}
Rubidium (37)	Rb–86		7×10^{-4}
Ruthenium (44)	Ru–97		4×10^{-3}
	Ru–103		8×10^{-4}
	Ru–105		1×10^{-3}
	Ru–106		1×10^{-4}
Samarium (62)	Sm–153		8×10^{-4}
Scandium (21)	Sc–46		4×10^{-4}
	Sc–47		9×10^{-4}
	Sc–48		3×10^{-4}
Selenium (34)	Se–75		3×10^{-3}
Silicon (14)	Si–31		9×10^{-3}
Silver (47)	Ag–105		1×10^{-3}
	Ag–110m		3×10^{-4}
	Ag–111		4×10^{-4}
Sodium (11)	Na–24		2×10^{-3}
Strontium (38)	Sr–85		1×10^{-4}
	Sr–89		1×10^{-4}
	Sr–91		7×10^{-4}
	Sr–92		7×10^{-4}
Sulfur (16)	S–35	9×10^{-8}	6×10^{-4}
Tantalum (73)	Ta–182		4×10^{-4}
Technetium (43)	Tc–96m		1×10^{-1}
	Tc–96		1×10^{-3}
Tellurium (52)	Te–125m		2×10^{-3}
	Te–127m		6×10^{-4}
	Te–127		3×10^{-3}
	Te–129m		3×10^{-4}
	Te–131m		6×10^{-4}
	Te–132		3×10^{-4}
Terbium (65)	Tb–160		4×10^{-4}
Thallium (81)	Tl–200		4×10^{-3}
	Tl–201		3×10^{-3}
	Tl–202		1×10^{-3}
	Tl–204		1×10^{-3}
Thulium (69)	Tm–170		5×10^{-4}
	Tm–171		5×10^{-3}
Tin (50)	Sn–113		9×10^{-4}
	Sn–125		2×10^{-4}
Tungsten (74)	W–181		4×10^{-3}
	W–187		7×10^{-4}
Vanadium (23)	V–48		3×10^{-4}
Xenon (54)	Xe–131m	4×10^{-6}	

(Rule 0400-20-10-.38, continued)

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml [a]	Column II and Solid Concentration µCi/ml [b]
	Xe–133	3×10^{-6}	
	Xe–135	1×10^{-6}	
Ytterbium (70)	Yb–175		1×10^{-3}
Yttrium (39)	Y–90		2×10^{-4}
	Y–91m		3×10^{-2}
	Y–91		3×10^{-4}
	Y–92		6×10^{-4}
	Y–93		3×10^{-4}
Zinc (30)	Zn–65		1×10^{-3}
	Zn–69m		7×10^{-4}
	Zn–69		2×10^{-2}
Zirconium (40)	Zr–95		6×10^{-4}
	Zr–97		2×10^{-4}
Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years.		1×10^{-10}	1×10^{-6}

[a] Values are given in Column I only for those materials normally used as gases.
[b] µCi/gm for solids.

NOTE 1: Many radioisotopes disintegrate into isotopes that are also radioactive. In expressing the concentrations in Schedule RHS 8-4 the activity stated is that of the parent isotope and takes into account the daughters.

NOTE 2: For purposes of Rule 0400-20-10-.04 where there is involved a combination of isotopes, the limit for the combination should be derived as follows: Determine for each isotope in the product the ratio between the concentration present in the product and the exempt concentration established in Schedule RHS 8-4 for the specific isotope when not in combination. The sum of such ratios may not exceed "1" (i.e., unity).

EXAMPLE:

$$\frac{\text{Concentration of Isotope A in Product}}{\text{Exempt concentration of Isotope A}} + \frac{\text{Concentration of Isotope B in Product}}{\text{Exempt concentration of Isotope B}} \leq 1$$

SCHEDULE RHS 8-5: Reserved.

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 rules, are given in Table A-1. The curie (Ci) values specified are obtained by converting from the terabecquerel (TBq) value. The terabecquerel values are the regulatory standard. The curie values are for information only and are not intended to be the regulatory standard. 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) (a) For individual radionuclides whose identities are known but that are not listed in Table A-1, the A_1 and A_2 values contained in Table A-3 may be used. Otherwise, the licensee shall obtain prior Division approval of the A_1 and A_2 values for radionuclides not listed in Table A-1, before shipping the material.

(b) For individual radionuclides whose identities are known, but which are not listed in Table A-2, the exempt material activity concentration and exempt consignment activity values contained in Table A-3 may be used. Otherwise, the licensee shall obtain prior Division approval of the exempt material activity concentration and exempt consignment activity values for radionuclides not listed in Table A-2, before shipping the material.

(c) The licensee shall submit requests for prior approval, described under subparagraphs (a) and (b) of this schedule, to the Division, in accordance with Rule 0400-20-04-.07.

(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 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 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 is as follows:

$$\sum_i \frac{B(i)}{A_1(i)} \leq 1$$

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

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

$$\sum_i \frac{B(i)}{A_2(i)} \leq 1$$

where B(i) is the activity of radionuclide i in normal form**,** and $A_2(i)$ is the A_2 value for radionuclide i.

(c) If the package contains both special and normal radioactive material, the activity that may be transported in a Type A package is as follows:

$$\sum_i \frac{B(i)}{A_1(i)} + \sum_j \frac{C(j)}{A_2(j)} \leq 1$$

where B(i) is the activity of radionuclide i as special form radioactive material, $A_1(i)$ is the A_1 value for radionuclide i, C(j) is the activity of radionuclide j as normal form radioactive material, as $A_2(j)$ is the A_2 value for radionuclide j.

(d) Alternatively, an A_1 value for mixtures of special form material may be determined as follows:

(Rule 0400-20-10-.38, continued)

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

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.

(e) Alternatively, the A_2 value for mixtures of normal form material may be determined as follows:

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

where f(i) is the fraction of activity of nuclide i in the mixture and $A_2(i)$ is the appropriate A_2 value for nuclide i.

(f) The exempt activity concentration for mixtures of nuclides may be determined as follows:

$$\text{Exempt activity concentration for mixture} = \frac{1}{\sum_i \frac{f(i)}{[A](i)}}$$

where f(i) is the fraction of activity concentration of radionuclide i in the mixture, and [A] is the activity concentration for exempt material containing radionuclide i.

(g) The activity limit for an exempt consignment for mixtures of radionuclides may be determined as follows:

$$\text{Exempt consignment activity limit for mixture} = \frac{1}{\sum_i \frac{f(i)}{A(i)}}$$

where f(i) is the fraction of activity of radionuclide i in the mixture, and A(i) is the activity limit for exempt consignments for radionuclide i.

(5) For determining the activities of known radionuclides, the following conditions will apply:

(a) 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) of this schedule. 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.

(b) When the identity of each radionuclide is known but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest [A] (activity concentration for exempt material) or A (activity limit for exempt consignment) value, as appropriate, for the radionuclides in each group may be used in applying the formulas in paragraph (4) of SCHEDULE 10-6: DETERMINATION OF A_1 AND A_2 of this appendix. Groups may be based on the total alpha activity and the total

(Rule 0400-20-10-.38, continued)

beta/gamma activity when these are known, using the lowest [A] or A values for the alpha emitters and beta/gamma emitters, respectively.

Table A-1—A_1 and A_2 VALUES FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]	Specific activity	
						(TBq/g)	(Ci/g)
Ac-225 (a)	Actinium (89)	$8.0X10^{-1}$	$2.2X10^{1}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$2.1X10^{3}$	$5.8X10^{4}$
Ac-227 (a)		$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-5}$	$2.4X10^{-3}$	2.7	$7.2X10^{1}$
Ac-228		$6.0X10^{-1}$	$1.6X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$8.4X10^{4}$	$2.2X10^{6}$
Ag-105	Silver (47)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.1X10^{3}$	$3.0X10^{4}$
Ag-108m (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$9.7X10^{-1}$	$2.6X10^{1}$
Ag-110m (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.8X10^{2}$	$4.7X10^{3}$
Ag-111		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$5.8X10^{3}$	$1.6X10^{5}$
Al-26	Aluminum (13)	$1.0X10^{-1}$	2.7	$1.0X10^{-1}$	2.7	$7.0X10^{-4}$	$1.9X10^{-2}$
Am-241	Americium (95)	$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$1.3X10^{-1}$	3.4
Am-242m (a)		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.6X10^{-1}$	$1.0X10^{1}$
Am-243 (a)		5.0	$1.4X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$7.4X10^{-3}$	$2.0X10^{-1}$
Ar-37	Argon (18)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.7X10^{3}$	$9.9X10^{4}$
Ar-39		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{1}$	$5.4X10^{2}$	1.3	$3.4X10^{1}$
Ar-41		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.5X10^{6}$	$4.2X10^{7}$
As-72	Arsenic (33)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$6.2X10^{4}$	$1.7X10^{6}$
As-73		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$8.2X10^{2}$	$2.2X10^{4}$
As-74		1.0	$2.7X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$3.7X10^{3}$	$9.9X10^{4}$
As-76		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$5.8X10^{4}$	$1.6X10^{6}$
As-77		$2.0X10^{1}$	$5.4X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$3.9X10^{4}$	$1.0X10^{6}$
At-211 (a)	Astatine (85)	$2.0X10^{1}$	$5.4X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$7.6X10^{4}$	$2.1X10^{6}$
Au-193	Gold (79)	7.0	$1.9X10^{2}$	2.0	$5.4X10^{1}$	$3.4X10^{4}$	$9.2X10^{5}$
Au-194		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.5X10^{4}$	$4.1X10^{5}$
Au-195		$1.0X10^{1}$	$2.7X10^{2}$	6.0	$1.6X10^{2}$	$1.4X10^{2}$	$3.7X10^{3}$
Au-198		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$9.0X10^{3}$	$2.4X10^{5}$
Au-199		$1.0X10^{1}$	$2.7X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$7.7X10^{3}$	$2.1X10^{5}$
Ba-131 (a)	Barium (56)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$3.1X10^{3}$	$8.4X10^{4}$
Ba-133		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	9.4	$2.6X10^{2}$
Ba-133m		$2.0X10^{1}$	$5.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.2X10^{4}$	$6.1X10^{5}$
Ba-140 (a)		$5.0X10^{-1}$	$1.4X10^{1}$	$3.0X10^{-1}$	8.1	$2.7X10^{3}$	$7.3X10^{4}$
Be-7	Beryllium (4)	$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$1.3X10^{4}$	$3.5X10^{5}$
Be-10		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-1}$	$1.6X10^{1}$	$8.3X10^{-4}$	$2.2X10^{-2}$
Bi-205	Bismuth (83)	$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$1.5X10^{3}$	$4.2X10^{4}$
Bi-206		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$3.8X10^{3}$	$1.0X10^{5}$

(Rule 0400-20-10-.38, continued)

Bi-207		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	1.9	$5.2X10^{1}$
Bi-210		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.6X10^{3}$	$1.2X10^{5}$
Bi-210m (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$2.1X10^{-5}$	$5.7X10^{-4}$
Bi-212 (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$5.4X10^{5}$	$1.5X10^{7}$
Bk-247	Berkelium (97)	8.0	$2.2X10^{2}$	$8.0X10^{-4}$	$2.2X10^{-2}$	$3.8X10^{-2}$	1.0
Bk-249 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{-1}$	8.1	$6.1X10^{1}$	$1.6X10^{3}$
Br-76	Bromine (35)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$9.4X10^{4}$	$2.5X10^{6}$
Br-77		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$2.6X10^{4}$	$7.1X10^{5}$
Br-82		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{4}$	$1.1X10^{6}$
C-11	Carbon (6)	1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.1X10^{7}$	$8.4X10^{8}$
C-14		$4.0X10^{1}$	$1.1X10^{3}$	3.0	$8.1X10^{1}$	$1.6X10^{-1}$	4.5
Ca-41	Calcium (20)	Unlimited	Unlimited	Unlimited	Unlimited	$3.1X10^{-3}$	$8.5X10^{-2}$
Ca-45		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$6.6X10^{2}$	$1.8X10^{4}$
Ca-47 (a)		3.0	$8.1X10^{1}$	$3.0X10^{-1}$	8.1	$2.3X10^{4}$	$6.1X10^{5}$
Cd-109	Cadmium (48)	$3.0X10^{1}$	$8.1X10^{2}$	2.0	$5.4X10^{1}$	$9.6X10^{1}$	$2.6X10^{3}$
Cd-113m		$4.0X10^{1}$	$1.1X10^{3}$	$5.0X10^{-1}$	$1.4X10^{1}$	8.3	$2.2X10^{2}$
Cd-115 (a)		3.0	$8.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.9X10^{4}$	$5.1X10^{5}$
Cd-115m		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$9.4X10^{2}$	$2.5X10^{4}$
Ce-139	Cerium (58)	7.0	$1.9X10^{2}$	2.0	$5.4X10^{1}$	$2.5X10^{2}$	$6.8X10^{3}$
Ce-141		$2.0X10^{1}$	$5.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.1X10^{3}$	$2.8X10^{4}$
Ce-143		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{4}$	$6.6X10^{5}$
Ce-144 (a)		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.2X10^{2}$	$3.2X10^{3}$
Cf-248	Californium (98)	$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$5.8X10^{1}$	$1.6X10^{3}$
Cf-249		3.0	$8.1X10^{1}$	$8.0X10^{-4}$	$2.2X10^{-2}$	$1.5X10^{-1}$	4.1
Cf-250		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	4.0	$1.1X10^{2}$
Cf-251		7.0	$1.9X10^{2}$	$7.0X10^{-4}$	$1.9X10^{-2}$	$5.9X10^{-2}$	1.6
Cf-252		$1.0x10^{-1}$	2.7	$3.0X10^{-3}$	$8.1X10^{-2}$	$2.0X10^{1}$	$5.4X10^{2}$
Cf-253 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{-2}$	1.1	$1.1X10^{3}$	$2.9X10^{4}$
Cf-254		$1.0X10^{-3}$	$2.7X10^{-2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.1X10^{2}$	$8.5X10^{3}$
Cl-36	Chlorine (17)	$1.0X10^{1}$	$2.7X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.2X10^{-3}$	$3.3X10^{-2}$
Cl-38		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$4.9X10^{6}$	$1.3X10^{8}$
Cm-240	Curium (96)	$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$7.5X10^{2}$	$2.0X10^{4}$
Cm-241		2.0	$5.4X10^{1}$	1.0	$2.7X10^{1}$	$6.1X10^{2}$	$1.7X10^{4}$
Cm-242		$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{-2}$	$2.7X10^{-1}$	$1.2X10^{2}$	$3.3X10^{3}$
Cm-243		9.0	$2.4X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$1.9X10^{-3}$	$5.2X10^{1}$
Cm-244		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	3.0	$8.1X10^{1}$
Cm-245		9.0	$2.4X10^{2}$	$9.0X10^{-4}$	$2.4X10^{-2}$	$6.4X10^{-3}$	$1.7X10^{-1}$
Cm-246		9.0	$2.4X10^{2}$	$9.0X10^{-4}$	$2.4X10^{-2}$	$1.1X10^{-2}$	$3.1X10^{-1}$

(Rule 0400-20-10-.38, continued)

Cm-247 (a)		3.0	$8.1X10^{1}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.4X10^{-6}$	$9.3X10^{-5}$
Cm-248		$2.0X10^{-2}$	$5.4X10^{-1}$	$3.0X10^{-4}$	$8.1X10^{-3}$	$1.6X10^{-4}$	$4.2X10^{-3}$
Co-55	Cobalt (27)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.1X10^{5}$	$3.1X10^{6}$
Co-56		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.1X10^{3}$	$3.0X10^{4}$
Co-57		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$3.1X10^{2}$	$8.4X10^{3}$
Co-58		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.2X10^{3}$	$3.2X10^{4}$
Co-58m		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$2.2X10^{5}$	$5.9X10^{6}$
Co-60		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.2X10^{1}$	$1.1X10^{3}$
Cr-51	Chromium (24)	$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$3.4X10^{3}$	$9.2X10^{4}$
Cs-129	Cesium (55)	4.0	$1.1X10^{2}$	4.0	$1.1X10^{2}$	$2.8X10^{4}$	$7.6X10^{5}$
Cs-131		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$3.8X10^{3}$	$1.0X10^{5}$
Cs-132		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$5.7X10^{3}$	$1.5X10^{5}$
Cs-134		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.8X10^{1}$	$1.3X10^{3}$
Cs-134m		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{5}$	$8.0X10^{6}$
Cs-135		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$4.3X10^{-5}$	$1.2X10^{-3}$
Cs-136		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.7X10^{3}$	$7.3X10^{4}$
Cs-137 (a)		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	3.2	$8.7X10^{1}$
Cu-64	Copper (29)	6.0	$1.6X10^{2}$	1.0	$2.7X10^{1}$	$1.4X10^{5}$	$3.9X10^{6}$
Cu-67		$1.0X10^{1}$	$2.7X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$2.8X10^{4}$	$7.6X10^{5}$
Dy-159	Dysprosium (66)	$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$2.1X10^{2}$	$5.7X10^{3}$
Dy-165		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{5}$	$8.2X10^{6}$
Dy-166 (a)		$9.0X10^{-1}$	$2.4X10^{1}$	$3.0X10^{-1}$	8.1	$8.6X10^{3}$	$2.3X10^{5}$
Er-169	Erbium (68)	$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$3.1X10^{3}$	$8.3X10^{4}$
Er-171		$8.0X10^{-1}$	$2.2X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$9.0X10^{4}$	$2.4X10^{6}$
Eu-147	Europium (63)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.4X10^{3}$	$3.7X10^{4}$
Eu-148		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.0X10^{2}$	$1.6X10^{4}$
Eu-149		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$3.5X10^{2}$	$9.4X10^{3}$
Eu-150 (short lived)		2.0	$5.4X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$6.1X10^{4}$	$1.6X10^{6}$
Eu-150 (long lived)		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$6.1X10^{4}$	$1.6X10^{6}$
Eu-152		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	6.5	$1.8X10^{2}$
Eu-152m		$8.0X10^{-1}$	$2.2X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$8.2X10^{4}$	$2.2X10^{6}$
Eu-154		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	9.8	$2.6X10^{2}$
Eu-155		$2.0X10^{1}$	$5.4X10^{2}$	3.0	$8.1X10^{1}$	$1.8X10^{1}$	$4.9X10^{2}$
Eu-156		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$2.0X10^{3}$	$5.5X10^{4}$
F-18	Fluorine (9)	1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.5X10^{6}$	$9.5X10^{7}$
Fe-52 (a)	Iron (26)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$2.7X10^{5}$	$7.3X10^{6}$
Fe-55		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$8.8X10^{1}$	$2.4X10^{3}$

(Rule 0400-20-10-.38, continued)

Fe-59		$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$1.8X10^{3}$	$5.0X10^{4}$
Fe-60 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-1}$	5.4	$7.4X10^{-4}$	$2.0X10^{-2}$
Ga-67	Gallium (31)	7.0	$1.9X10^{2}$	3.0	$8.1X10^{1}$	$2.2X10^{4}$	$6.0X10^{5}$
Ga-68		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.5X10^{6}$	$4.1X10^{7}$
Ga-72		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.1X10^{5}$	$3.1X10^{6}$
Gd-146 (a)	Gadolinium (64)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.9X10^{2}$	$1.9X10^{4}$
Gd-148		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	1.2	$3.2X10^{1}$
Gd-153		$1.0X10^{1}$	$2.7X10^{2}$	9.0	$2.4X10^{2}$	$1.3X10^{2}$	$3.5X10^{3}$
Gd-159		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.9X10^{4}$	$1.1X10^{6}$
Ge-68 (a)	Germanium (32)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.6X10^{2}$	$7.1X10^{3}$
Ge-71		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$5.8X10^{3}$	$1.6X10^{5}$
Ge-77		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.3X10^{5}$	$3.6X10^{6}$
Hf-172 (a)	Hafnium (72)	$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.1X10^{1}$	$1.1X10^{3}$
Hf-175		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$3.9X10^{2}$	$1.1X10^{4}$
Hf-181		2.0	$5.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.3X10^{2}$	$1.7X10^{4}$
Hf-182		Unlimited	Unlimited	Unlimited	Unlimited	$8.1X10^{-6}$	$2.2X10^{-4}$
Hg-194 (a)	Mercury (80)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.3X10^{-1}$	3.5
Hg-195m (a)		3.0	$8.1X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$1.5X10^{4}$	$4.0X10^{5}$
Hg-197		$2.0X10^{1}$	$5.4X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$9.2X10^{3}$	$2.5X10^{5}$
Hg-197m		$1.0X10^{1}$	$2.7X10^{2}$	$4.0X10^{-1}$	$1.1X10^{1}$	$2.5X10^{4}$	$6.7X10^{5}$
Hg-203		5.0	$1.4X10^{2}$	1.0	$2.7X10^{1}$	$5.1X10^{2}$	$1.4X10^{4}$
Ho-166	Holmium (67)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$2.6X10^{4}$	$7.0X10^{5}$
Ho-166m		$6.0X10^{-1}$	$1.6X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.6X10^{-2}$	1.8
I-123	Iodine (53)	6.0	$1.6X10^{2}$	3.0	$8.1X10^{1}$	$7.1X10^{4}$	$1.9X10^{6}$
I-124		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$9.3X10^{3}$	$2.5X10^{5}$
I-125		$2.0X10^{1}$	$5.4X10^{2}$	3.0	$8.1X10^{1}$	$6.4X10^{2}$	$1.7X10^{4}$
I-126		2.0	$5.4X10^{1}$	1.0	$2.7X10^{1}$	$2.9X10^{3}$	$8.0X10^{4}$
I-129		Unlimited	Unlimited	Unlimited	Unlimited	$6.5X10^{-6}$	$1.8X10^{-4}$
I-131		3.0	$8.1X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.6X10^{3}$	$1.2X10^{5}$
I-132		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.8X10^{5}$	$1.0X10^{7}$
I-133		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.2X10^{4}$	$1.1X10^{6}$
I-134		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$9.9X10^{5}$	$2.7X10^{7}$
I-135 (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.3X10^{5}$	$3.5X10^{6}$
In-111	Indium (49)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$1.5X10^{4}$	$4.2X10^{5}$
In-113m		4.0	$1.1X10^{2}$	2.0	$5.4X10^{1}$	$6.2X10^{5}$	$1.7X10^{7}$
In-114m (a)		$1.0X10^{1}$	$2.7X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$8.6X10^{2}$	$2.3X10^{4}$
In-115m		7.0	$1.9X10^{2}$	1.0	$2.7X10^{1}$	$2.2X10^{5}$	$6.1X10^{6}$
Ir-189 (a)	Iridium (77)	$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$1.9X10^{3}$	$5.2X10^{4}$
Ir-190		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$2.3X10^{3}$	$6.2X10^{4}$

(Rule 0400-20-10-.38, continued)

Ir-192		[c] 1.0	[c] $2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.4X10^{2}$	$9.2X10^{3}$
Ir-194		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$3.1X10^{4}$	$8.4X10^{5}$
K-40	Potassium (19)	$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$2.4X10^{-7}$	$6.4X10^{-6}$
K-42		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$2.2X10^{5}$	$6.0X10^{6}$
K-43		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.2X10^{5}$	$3.3X10^{6}$
Kr-79	Krypton (36)	4.0	$1.1x10^{2}$	2.0	$5.4x10^{1}$	$4.2x10^{4}$	$1.1x10^{6}$
Kr-81		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$7.8X10^{-4}$	$2.1X10^{-2}$
Kr-85		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$1.5X10^{1}$	$3.9X10^{2}$
Kr-85m		8.0	$2.2X10^{2}$	3.0	$8.1X10^{1}$	$3.0X10^{5}$	$8.2X10^{6}$
Kr-87		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.0X10^{6}$	$2.8X10^{7}$
La-137	Lanthanum (57)	$3.0X10^{1}$	$8.1X10^{2}$	6.0	$1.6X10^{2}$	$1.6X10^{-3}$	$4.4X10^{-2}$
La-140		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$2.1X10^{4}$	$5.6X10^{5}$
Lu-172	Lutetium (71)	$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.2X10^{3}$	$1.1X10^{5}$
Lu-173		8.0	$2.2X10^{2}$	8.0	$2.2X10^{2}$	$5.6X10^{1}$	$1.5X10^{3}$
Lu-174		9.0	$2.4X10^{2}$	9.0	$2.4X10^{2}$	$2.3X10^{1}$	$6.2X10^{2}$
Lu-174m		$2.0X10^{1}$	$5.4X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$2.0X10^{2}$	$5.3X10^{3}$
Lu-177		$3.0X10^{1}$	$8.1X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.1X10^{3}$	$1.1X10^{5}$
Mg-28 (a)	Magnesium (12)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$2.0X10^{5}$	$5.4X10^{6}$
Mn-52	Manganese (25)	$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.6X10^{4}$	$4.4X10^{5}$
Mn-53		Unlimited	Unlimited	Unlimited	Unlimited	$6.8X10^{-5}$	$1.8X10^{-3}$
Mn-54		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$2.9X10^{2}$	$7.7X10^{3}$
Mn-56		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$8.0X10^{5}$	$2.2X10^{7}$
Mo-93	Molybdenum (42)	$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{1}$	$5.4X10^{2}$	$4.1X10^{-2}$	1.1
Mo-99 (a)(h)		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.8X10^{4}$	$4.8X10^{5}$
N-13	Nitrogen (7)	$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$5.4X10^{7}$	$1.5X10^{9}$
Na-22	Sodium (11)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.3X10^{2}$	$6.3X10^{3}$
Na-24		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$3.2X10^{5}$	$8.7X10^{6}$
Nb-93m	Niobium (41)	$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	8.8	$2.4X10^{2}$
Nb-94		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$6.9X10^{-3}$	$1.9X10^{-1}$
Nb-95		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.5X10^{3}$	$3.9X10^{4}$
Nb-97		$9.0X10^{-1}$	$2.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$9.9X10^{5}$	$2.7X10^{7}$
Nd-147	Neodymium (60)	6.0	$1.6X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{3}$	$8.1X10^{4}$
Nd-149		$6.0X10^{-1}$	$1.6X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$4.5X10^{5}$	$1.2X10^{7}$
Ni-59	Nickel (28)	Unlimited	Unlimited	Unlimited	Unlimited	$3.0X10^{-3}$	$8.0X10^{-2}$
Ni-63		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	2.1	$5.7X10^{1}$
Ni-65		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$7.1X10^{5}$	$1.9X10^{7}$

(Rule 0400-20-10-.38, continued)

Np-235	Neptunium (93)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$5.2X10^{1}$	$1.4X10^{3}$
Np-236 (short-lived)		$2.0X10^{1}$	$5.4X10^{2}$	2.0	$5.4X10^{1}$	$4.7X10^{-4}$	$1.3X10^{-2}$
Np-236 (long-lived)		$9.0X10^{0}$	$2.4X10^{2}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$4.7X10^{-4}$	$1.3X10^{-2}$
Np-237		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{-3}$	$5.4X10^{-2}$	$2.6X10^{-5}$	$7.1X10^{-4}$
Np-239		7.0	$1.9X10^{2}$	$4.0X10^{-1}$	$1.1X10^{1}$	$8.6X10^{3}$	$2.3X10^{5}$
Os-185	Osmium (76)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$2.8X10^{2}$	$7.5X10^{3}$
Os-191		$1.0X10^{1}$	$2.7X10^{2}$	2.0	$5.4X10^{1}$	$1.6X10^{3}$	$4.4X10^{4}$
Os-191m		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	$4.6X10^{4}$	$1.3X10^{6}$
Os-193		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.0X10^{4}$	$5.3X10^{5}$
Os-194 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.1X10^{1}$	$3.1X10^{2}$
P-32	Phosphorus (15)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.1X10^{4}$	$2.9X10^{5}$
P-33		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$5.8X10^{3}$	$1.6X10^{5}$
Pa-230 (a)	Protactinium (91)	2.0	$5.4X10^{1}$	$7.0X10^{-2}$	1.9	$1.2X10^{3}$	$3.3X10^{4}$
Pa-231		4.0	$1.1X10^{2}$	$4.0X10^{-4}$	$1.1X10^{-2}$	$1.7X10^{-3}$	$4.7X10^{-2}$
Pa-233		5.0	$1.4X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$7.7X10^{2}$	$2.1X10^{4}$
Pb-201	Lead (82)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$6.2X10^{4}$	$1.7X10^{6}$
Pb-202		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{1}$	$5.4X10^{2}$	$1.2X10^{-4}$	$3.4X10^{-3}$
Pb-203		4.0	$1.1X10^{2}$	3.0	$8.1X10^{1}$	$1.1X10^{4}$	$3.0X10^{5}$
Pb-205		Unlimited	Unlimited	Unlimited	Unlimited	$4.5X10^{-6}$	$1.2X10^{-4}$
Pb-210 (a)		1.0	$2.7X10^{1}$	$5.0X10^{-2}$	1.4	2.8	$7.6X10^{1}$
Pb-212 (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$2.0X10^{-1}$	5.4	$5.1X10^{4}$	$1.4X10^{6}$
Pd-103 (a)	Palladium (46)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$2.8X10^{3}$	$7.5X10^{4}$
Pd-107		Unlimited	Unlimited	Unlimited	Unlimited	$1.9X10^{-5}$	$5.1X10^{-4}$
Pd-109		2.0	$5.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$7.9X10^{4}$	$2.1X10^{6}$
Pm-143	Promethium (61)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$1.3X10^{2}$	$3.4X10^{3}$
Pm-144		$7.0X10^{-1}$	$1.9X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$9.2X10^{1}$	$2.5X10^{3}$
Pm-145		$3.0X10^{1}$	$8.1X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	5.2	$1.4X10^{2}$
Pm-147		$4.0X10^{1}$	$1.1X10^{3}$	2.0	$5.4X10^{1}$	$3.4X10^{1}$	$9.3X10^{2}$
Pm-148m (a)		$8.0X10^{-1}$	$2.2X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$7.9X10^{2}$	$2.1X10^{4}$
Pm-149		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.5X10^{4}$	$4.0X10^{5}$
Pm-151		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.7X10^{4}$	$7.3X10^{5}$
Po-210	Polonium (84)	$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$1.7X10^{2}$	$4.5X10^{3}$
Pr-142	Praseodymium (59)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.3X10^{4}$	$1.2X10^{6}$
Pr-143		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{3}$	$6.7X10^{4}$

(Rule 0400-20-10-.38, continued)

Pt-188 (a)	Platinum (78)	1.0	$2.7X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$2.5X10^{3}$	$6.8X10^{4}$
Pt-191		4.0	$1.1X10^{2}$	3.0	$8.1X10^{1}$	$8.7X10^{3}$	$2.4X10^{5}$
Pt-193		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	1.4	$3.7X10^{1}$
Pt-193m		$4.0X10^{1}$	$1.1X10^{3}$	$5.0X10^{-1}$	$1.4X10^{1}$	$5.8X10^{3}$	$1.6X10^{5}$
Pt-195m		$1.0X10^{1}$	$2.7X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.2X10^{3}$	$1.7X10^{5}$
Pt-197		$2.0X10^{1}$	$5.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.2X10^{4}$	$8.7X10^{5}$
Pt-197m		$1.0X10^{1}$	$2.7X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.7X10^{5}$	$1.0X10^{7}$
Pu-236	Plutonium (94)	$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{-3}$	$8.1X10^{-2}$	$2.0X10^{1}$	$5.3X10^{2}$
Pu-237		$2.0X10^{1}$	$5.4X10^{2}$	$2.0X10^{1}$	$5.4X10^{2}$	$4.5X10^{2}$	$1.2X10^{4}$
Pu-238		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$6.3X10^{-1}$	$1.7X10^{1}$
Pu-239		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$2.3X10^{-3}$	$6.2X10^{-2}$
Pu-240		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$8.4X10^{-3}$	$2.3X10^{-1}$
Pu-241 (a)		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-2}$	1.6	3.8	$1.0X10^{2}$
Pu-242		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$1.5X10^{-4}$	$3.9X10^{-3}$
Pu-244 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$6.7X10^{-7}$	$1.8X10^{-5}$
Ra-223 (a)	Radium (88)	$4.0X10^{-1}$	$1.1X10^{1}$	$7.0X10^{-3}$	$1.9X10^{-1}$	$1.9X10^{3}$	$5.1X10^{4}$
Ra-224 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$5.9X10^{3}$	$1.6X10^{5}$
Ra-225 (a)		$2.0X10^{-1}$	5.4	$4.0X10^{-3}$	$1.1X10^{-1}$	$1.5X10^{3}$	$3.9X10^{4}$
Ra-226 (a)		$2.0X10^{-1}$	5.4	$3.0X10^{-3}$	$8.1X10^{-2}$	$3.7X10^{-2}$	1.0
Ra-228 (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$1.0X10^{1}$	$2.7X10^{2}$
Rb-81	Rubidium (37)	2.0	$5.4X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.1X10^{5}$	$8.4X10^{6}$
Rb-83 (a)		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$6.8X10^{2}$	$1.8X10^{4}$
Rb-84		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.8X10^{3}$	$4.7X10^{4}$
Rb-86		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$3.0X10^{3}$	$8.1X10^{4}$
Rb-87		Unlimited	Unlimited	Unlimited	Unlimited	$3.2X10^{-9}$	$8.6X10^{-8}$
Rb(nat)		Unlimited	Unlimited	Unlimited	Unlimited	$6.7X10^{6}$	$1.8X10^{8}$
Re-184	Rhenium (75)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$6.9X10^{2}$	$1.9X10^{4}$
Re-184m		3.0	$8.1X10^{1}$	1.0	$2.7X10^{1}$	$1.6X10^{2}$	$4.3X10^{3}$
Re-186		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$6.9X10^{3}$	$1.9X10^{5}$
Re-187		Unlimited	Unlimited	Unlimited	Unlimited	$1.4X10^{-9}$	$3.8X10^{-8}$
Re-188		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.6X10^{4}$	$9.8X10^{5}$
Re-189 (a)		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{4}$	$6.8X10^{5}$
Re(nat)		Unlimited	Unlimited	Unlimited	Unlimited	0.0	$2.4X10^{-8}$
Rh-99	Rhodium (45)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$3.0X10^{3}$	$8.2X10^{4}$
Rh-101		4.0	$1.1X10^{2}$	3.0	$8.1X10^{1}$	$4.1X10^{1}$	$1.1X10^{3}$
Rh-102		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$4.5X10^{1}$	$1.2X10^{3}$
Rh-102m		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$2.3X10^{2}$	$6.2X10^{3}$
Rh-103m		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$1.2X10^{6}$	$3.3X10^{7}$
Rh-105		$1.0X10^{1}$	$2.7X10^{2}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.1X10^{4}$	$8.4X10^{5}$

(Rule 0400-20-10-.38, continued)

Rn-222 (a)	Radon (86)	$3.0X10^{-1}$	8.1	$4.0X10^{-3}$	$1.1X10^{-1}$	$5.7X10^{3}$	$1.5X10^{5}$
Ru-97	Ruthenium (44)	5.0	$1.4X10^{2}$	5.0	$1.4X10^{2}$	$1.7X10^{4}$	$4.6X10^{5}$
Ru-103 (a)		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.2X10^{3}$	$3.2X10^{4}$
Ru-105		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.5X10^{5}$	$6.7X10^{6}$
Ru-106 (a)		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$1.2X10^{2}$	$3.3X10^{3}$
S-35	Sulphur (16)	$4.0X10^{1}$	$1.1X10^{3}$	3.0	$8.1X10^{1}$	$1.6X10^{3}$	$4.3X10^{4}$
Sb-122	Antimony (51)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.5X10^{4}$	$4.0X10^{5}$
Sb-124		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$6.5X10^{2}$	$1.7X10^{4}$
Sb-125		2.0	$5.4X10^{1}$	1.0	$2.7X10^{1}$	$3.9X10^{1}$	$1.0X10^{3}$
Sb-126		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.1X10^{3}$	$8.4X10^{4}$
Sc-44	Scandium (21)	$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$6.7X10^{5}$	$1.8X10^{7}$
Sc-46		$5.0X10^{-1}$	$1.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$1.3X10^{3}$	$3.4X10^{4}$
Sc-47		$1.0X10^{1}$	$2.7X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$3.1X10^{4}$	$8.3X10^{5}$
Sc-48		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$5.5X10^{4}$	$1.5X10^{6}$
Se-75	Selenium (34)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$5.4X10^{2}$	$1.5X10^{4}$
Se-79		$4.0X10^{1}$	$1.1X10^{3}$	2.0	$5.4X10^{1}$	$2.6X10^{-3}$	$7.0X10^{-2}$
Si-31	Silicon (14)	$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.4X10^{6}$	$3.9X10^{7}$
Si-32		$4.0X10^{1}$	$1.1X10^{3}$	$5.0X10^{-1}$	$1.4X10^{1}$	3.9	$1.1X10^{2}$
Sm-145	Samarium (62)	$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$9.8X10^{1}$	$2.6X10^{3}$
Sm-147		Unlimited	Unlimited	Unlimited	Unlimited	$8.5X10^{-10}$	$2.3X10^{-8}$
Sm-151		$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{1}$	$2.7X10^{2}$	$9.7X10^{-1}$	$2.6X10^{1}$
Sm-153		9.0	$2.4X10^{2}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.6X10^{4}$	$4.4X10^{5}$
Sn-113 (a)	Tin (50)	4.0	$1.1X10^{2}$	2.0	$5.4X10^{1}$	$3.7X10^{2}$	$1.0X10^{4}$
Sn-117m		7.0	$1.9X10^{2}$	$4.0X10^{-1}$	$1.1X10^{1}$	$3.0X10^{3}$	$8.2X10^{4}$
Sn-119m		$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{1}$	$8.1X10^{2}$	$1.4X10^{2}$	$3.7X10^{3}$
Sn-121m (a)		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-1}$	$2.4X10^{1}$	2.0	$5.4X10^{1}$
Sn-123		$8.0X10^{-1}$	$2.2X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$3.0X10^{2}$	$8.2X10^{3}$
Sn-125		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{3}$	$1.1X10^{5}$
Sn-126 (a)		$6.0X10^{-1}$	$1.6X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.0X10^{-3}$	$2.8X10^{-2}$
Sr-82 (a)	Strontium (38)	$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$2.3X10^{3}$	$6.2X10^{4}$
Sr-85		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$8.8X10^{2}$	$2.4X10^{4}$
Sr-85m		5.0	$1.4X10^{2}$	5.0	$1.4X10^{2}$	$1.2X10^{6}$	$3.3X10^{7}$
Sr-87m		3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$4.8X10^{5}$	$1.3X10^{7}$
Sr-89		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.1X10^{3}$	$2.9X10^{4}$
Sr-90 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	5.1	$1.4X10^{2}$
Sr-91 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.3X10^{5}$	$3.6X10^{6}$
Sr-92 (a)		1.0	$2.7X10^{1}$	$3.0X10^{-1}$	8.1	$4.7X10^{5}$	$1.3X10^{7}$
T(H-3)	Tritium (1)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.6X10^{2}$	$9.7X10^{3}$

(Rule 0400-20-10-.38, continued)

Ta-178 (long-lived)	Tantalum (73)	1.0	$2.7X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$4.2X10^{6}$	$1.1X10^{8}$
Ta-179		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$4.1X10^{1}$	$1.1X10^{3}$
Ta-182		$9.0X10^{-1}$	$2.4X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$2.3X10^{2}$	$6.2X10^{3}$
Tb-157	Terbium (65)	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$5.6X10^{-1}$	$1.5X10^{1}$
Tb-158		1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$5.6X10^{-1}$	$1.5X10^{1}$
Tb-160		1.0	$2.7X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$4.2X10^{2}$	$1.1X10^{4}$
Tc-95m (a)	Technetium (43)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$8.3X10^{2}$	$2.2X10^{4}$
Tc-96		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.2X10^{4}$	$3.2X10^{5}$
Tc-96m (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.4X10^{6}$	$3.8X10^{7}$
Tc-97		Unlimited	Unlimited	Unlimited	Unlimited	$5.2X10^{-5}$	$1.4X10^{-3}$
Tc-97m		$4.0X10^{1}$	$1.1X10^{3}$	1.0	$2.7X10^{1}$	$5.6X10^{2}$	$1.5X10^{4}$
Tc-98		$8.0X10^{-1}$	$2.2X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$3.2X10^{-5}$	$8.7X10^{-4}$
Tc-99		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-1}$	$2.4X10^{1}$	$6.3X10^{-4}$	$1.7X10^{-2}$
Tc-99m		$1.0X10^{1}$	$2.7X10^{2}$	4.0	$1.1X10^{2}$	$1.9X10^{5}$	$5.3X10^{6}$
Te-121	Tellurium (52)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$2.4X10^{3}$	$6.4X10^{4}$
Te-121m		5.0	$1.4X10^{2}$	3.0	$8.1X10^{1}$	$2.6X10^{2}$	$7.0X10^{3}$
Te-123m		8.0	$2.2X10^{2}$	1.0	$2.7X10^{1}$	$3.3X10^{2}$	$8.9X10^{3}$
Te-125m		$2.0X10^{1}$	$5.4X10^{2}$	$9.0X10^{-1}$	$2.4X10^{1}$	$6.7X10^{2}$	$1.8X10^{4}$
Te-127		$2.0X10^{1}$	$5.4X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$9.8X10^{4}$	$2.6X10^{6}$
Te-127m (a)		$2.0X10^{1}$	$5.4X10^{2}$	$5.0X10^{-1}$	$1.4X10^{1}$	$3.5X10^{2}$	$9.4X10^{3}$
Te-129		$7.0X10^{-1}$	$1.9X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$7.7X10^{5}$	$2.1X10^{7}$
Te-129m (a)		$8.0X10^{-1}$	$2.2X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.1X10^{3}$	$3.0X10^{4}$
Te-131m (a)		$7.0X10^{-1}$	$1.9X10^{1}$	$5.0X10^{-1}$	$1.4X10^{1}$	$3.0X10^{4}$	$8.0X10^{5}$
Te-132 (a)		$5.0X10^{-1}$	$1.4X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$1.1X10^{4}$	$3.0X10^{5}$
Th-227	Thorium (90)	$1.0X10^{1}$	$2.7X10^{2}$	$5.0X10^{-3}$	$1.4X10^{-1}$	$1.1X10^{3}$	$3.1X10^{4}$
Th-228 (a)		$5.0X10^{-1}$	$1.4X10^{1}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$3.0X10^{1}$	$8.2X10^{2}$
Th-229		5.0	$1.4X10^{2}$	$5.0X10^{-4}$	$1.4X10^{-2}$	$7.9X10^{-3}$	$2.1X10^{-1}$
Th-230		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$7.6X10^{-4}$	$2.1X10^{-2}$
Th-231		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$2.0X10^{4}$	$5.3X10^{5}$
Th-232		Unlimited	Unlimited	Unlimited	Unlimited	$4.0X10^{-9}$	$1.1X10^{-7}$
Th-234 (a)		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$8.6X10^{2}$	$2.3X10^{4}$
Th(nat)		Unlimited	Unlimited	Unlimited	Unlimited	$8.1X10^{-9}$	$2.2X10^{-7}$
Ti-44 (a)	Titanium (22)	$5.0X10^{-1}$	$1.4X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	6.4	$1.7X10^{2}$
Tl-200	Thallium (81)	$9.0X10^{-1}$	$2.4X10^{1}$	$9.0X10^{-1}$	$2.4X10^{1}$	$2.2X10^{4}$	$6.0X10^{5}$
Tl-201		$1.0X10^{1}$	$2.7X10^{2}$	4.0	$1.1X10^{2}$	$7.9X10^{3}$	$2.1X10^{5}$
Tl-202		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$2.0X10^{3}$	$5.3X10^{4}$
Tl-204		$1.0X10^{1}$	$2.7X10^{2}$	$7.0X10^{-1}$	$1.9X10^{1}$	$1.7X10^{1}$	$4.6X10^{2}$
Tm-167	Thulium (69)	7.0	$1.9X10^{2}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.1X10^{3}$	$8.5X10^{4}$
Tm-170		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.2X10^{2}$	$6.0X10^{3}$

(Rule 0400-20-10-.38, continued)

Tm-171		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$
U-230 (fast lung absorption) (a)(d)	Uranium (92)	$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{-1}$	2.7	$1.0X10^{3}$	$2.7X10^{4}$
U-230 (medium lung absorption) (a)(e)		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{-3}$	$1.1X10^{-1}$	$1.0X10^{3}$	$2.7X10^{4}$
U-230 (slow lung absorption) (a)(f)		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{-3}$	$8.1X10^{-2}$	$1.0X10^{3}$	$2.7X10^{4}$
U-232 (fast lung absorption) (d)		$4.0X10^{1}$	$1.1X10^{3}$	$1.0X10^{-2}$	$2.7X10^{-1}$	$8.3X10^{-1}$	$2.2X10^{1}$
U-232 (medium lung absorption) (e)		$4.0X10^{1}$	$1.1X10^{3}$	$7.0X10^{-3}$	$1.9X10^{-1}$	$8.3X10^{-1}$	$2.2X10^{1}$
U-232 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{2}$	$1.0X10^{-3}$	$2.7X10^{-2}$	$8.3X10^{-1}$	$2.2X10^{1}$
U-233 (fast lung absorption) (d)		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-2}$	2.4	$3.6X10^{-4}$	$9.7X10^{-3}$
U-233 (medium lung absorption) (e)		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$3.6X10^{-4}$	$9.7X10^{-3}$
U-233 (slow lung absorption) (f)		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$3.6X10^{-4}$	$9.7X10^{-3}$
U-234 (fast lung absorption) (d)		$4.0X10^{1}$	$1.1X10^{3}$	$9.0X10^{-2}$	2.4	$2.3X10^{-4}$	$6.2X10^{-3}$
U-234 (medium lung absorption) (e)		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$2.3X10^{-4}$	$6.2X10^{-3}$
U-234 (slow lung absorption)		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$2.3X10^{-4}$	$6.2X10^{-3}$

(Rule 0400-20-10-.38, continued)

(f)							
U-235 (all lung absorption types) (a),(d),(e),(f)		Unlimited	Unlimited	Unlimited	Unlimited	$8.0X10^{-8}$	$2.2X10^{-6}$
U-236 (fast lung absorption) (d)		Unlimited	Unlimited	Unlimited	Unlimited	$2.4X10^{-6}$	$6.5X10^{-5}$
U-236 (medium lung absorption) (e)		$4.0X10^{1}$	$1.1X10^{3}$	$2.0X10^{-2}$	$5.4X10^{-1}$	$2.4X10^{-6}$	$6.5X10^{-5}$
U-236 (slow lung absorption) (f)		$4.0X10^{1}$	$1.1X10^{3}$	$6.0X10^{-3}$	$1.6X10^{-1}$	$2.4X10^{-6}$	$6.5X10^{-5}$
U-238 (all lung absorption types) (d),(e),(f)		Unlimited	Unlimited	Unlimited	Unlimited	$1.2X10^{-8}$	$3.4X10^{-7}$
U (nat)		Unlimited	Unlimited	Unlimited	Unlimited	$2.6X10^{-8}$	$7.1X10^{-7}$
U (enriched to 20% or less) (g)		Unlimited	Unlimited	Unlimited	Unlimited	See Table A-4	See Table A-4
U (dep)		Unlimited	Unlimited	Unlimited	Unlimited	See Table A-4	(See Table A-3)
V-48	Vanadium (23)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$6.3X10^{3}$	$1.7X10^{5}$
V-49		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.0X10^{2}$	$8.1X10^{3}$
W-178 (a)	Tungsten (74)	9.0	$2.4X10^{2}$	5.0	$1.4X10^{2}$	$1.3X10^{3}$	$3.4X10^{4}$
W-181		$3.0X10^{1}$	$8.1X10^{2}$	$3.0X10^{1}$	$8.1X10^{2}$	$2.2X10^{2}$	$6.0X10^{3}$
W-185		$4.0X10^{1}$	$1.1X10^{3}$	$8.0X10^{-1}$	$2.2X10^{1}$	$3.5X10^{2}$	$9.4X10^{3}$
W-187		2.0	$5.4X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$2.6X10^{4}$	$7.0X10^{5}$
W-188 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$3.0X10^{-1}$	8.1	$3.7X10^{2}$	$1.0X10^{4}$
Xe-122 (a)	Xenon (54)	$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$4.8X10^{4}$	$1.3X10^{6}$
Xe-123		2.0	$5.4X10^{1}$	$7.0X10^{-1}$	$1.9X10^{1}$	$4.4X10^{5}$	$1.2X10^{7}$
Xe-127		4.0	$1.1X10^{2}$	2.0	$5.4X10^{1}$	$1.0X10^{3}$	$2.8X10^{4}$
Xe-131m		$4.0X10^{1}$	$1.1X10^{3}$	$4.0X10^{1}$	$1.1X10^{3}$	$3.1X10^{3}$	$8.4X10^{4}$
Xe-133		$2.0X10^{1}$	$5.4X10^{2}$	$1.0X10^{1}$	$2.7X10^{2}$	$6.9X10^{3}$	$1.9X10^{5}$
Xe-135		3.0	$8.1X10^{1}$	2.0	$5.4X10^{1}$	$9.5X10^{4}$	$2.6X10^{6}$
Y-87 (a)	Yttrium (39)	1.0	$2.7X10^{1}$	1.0	$2.7X10^{1}$	$1.7X10^{4}$	$4.5X10^{5}$
Y-88		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$5.2X10^{2}$	$1.4X10^{4}$
Y-90		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$2.0X10^{4}$	$5.4X10^{5}$

(Rule 0400-20-10-.38, continued)

Y-91		$6.0X10^{-1}$	$1.6X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$9.1X10^{2}$	$2.5X10^{4}$
Y-91m		2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$1.5X10^{6}$	$4.2X10^{7}$
Y-92		$2.0X10^{-1}$	5.4	$2.0X10^{-1}$	5.4	$3.6X10^{5}$	$9.6X10^{6}$
Y-93		$3.0X10^{-1}$	8.1	$3.0X10^{-1}$	8.1	$1.2X10^{5}$	$3.3X10^{6}$
Yb-169	Ytterbium (70)	4.0	$1.1X10^{2}$	1.0	$2.7X10^{1}$	$8.9X10^{2}$	$2.4X10^{4}$
Yb-175		$3.0X10^{1}$	$8.1X10^{2}$	$9.0X10^{-1}$	$2.4X10^{1}$	$6.6X10^{3}$	$1.8X10^{5}$
Zn-65	Zinc (30)	2.0	$5.4X10^{1}$	2.0	$5.4X10^{1}$	$3.0X10^{2}$	$8.2X10^{3}$
Zn-69		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.8X10^{6}$	$4.9X10^{7}$
Zn-69m (a)		3.0	$8.1X10^{1}$	$6.0X10^{-1}$	$1.6X10^{1}$	$1.2X10^{5}$	$3.3X10^{6}$
Zr-88	Zirconium (40)	3.0	$8.1X10^{1}$	3.0	$8.1X10^{1}$	$6.6X10^{2}$	$1.8X10^{4}$
Zr-93		Unlimited	Unlimited	Unlimited	Unlimited	$9.3X10^{-5}$	$2.5X10^{-3}$
Zr-95 (a)		2.0	$5.4X10^{1}$	$8.0X10^{-1}$	$2.2X10^{1}$	$7.9X10^{2}$	$2.1X10^{4}$
Zr-97 (a)		$4.0X10^{-1}$	$1.1X10^{1}$	$4.0X10^{-1}$	$1.1X10^{1}$	$7.1X10^{4}$	$1.9X10^{6}$

[a] A_1 and/or A_2 values include contributions from daughter nuclides with half-lives less than 10 days as listed in the following:

Mg-28	Al-28
Ca-47	Sc-47
Ti-44	Sc-44
Fe-52	Mn-52m
Fe-60	Co-60m
Zn-69m	Zn-69
Ge-68	Ga-68
Rb-83	Kr-83m
Sr-82	Rb-82
Sr-90	Y-90
Sr-91	Y-91m
Sr-92	Y-92
Y-87	Sr-87m
Zr-95	Nb-95m
Zr-97	Nb-97m, Nb-97
Mo-99	Tc-99m
Tc-95m	Tc-95
Tc-96m	Tc-96
Ru-103	Rh-103m
Ru-106	Rh-106
Pd-103	Rh-103m
Ag-108m	Ag-108
Ag-110m	Ag-110
Cd-115	In-115m
In-114m	In-114
Sn-113	In-113m
Sn-121m	Sn-121
Sn-126	Sb-126m
Te-127m	Te-127
Te-129m	Te-129

(Rule 0400-20-10-.38, continued)

Te-131m	Te-131
Te-132	I-132
I-135	Xe-135m
Xe-122	I-122
Cs-137	Ba-137m
Ba-131	Cs-131
Ba-140	La-140
Ce-144	Pr-144m, Pr-144
Pm-148	Pm-148
Gd-146	Eu-146
Dy-166	Ho-166
Hf-172	Lu-172
W-178	Ta-178
W-188	Re-188
Re-189	Os-189m
Os-194	Ir-194
Ir-189	Os-189m
Pt-188	Ir-188
Hg-194	Au-194
Hg-195m	Hg-195
Pb-210	Bi-210
Pb-212	Bi-212, Tl-208, Po-212
Bi-210m	Tl-206
Bi-212	Tl-208, Po-212
At-211	Po-211
Rn-222	Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Po-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Ra-225	Ac-225, Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ra-226	Rn-222, Po-218, Pb-214, At-218, Bi-214, Po-214
Ra-228	Ac-228
Ac-225	Fr-221, At-217, Bi-213, Tl-209, Po-213, Pb-209
Ac-227	Fr-223
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Th-234	Pa-234m, Pa-234
Pa-230	Ac-226, Th-226, Fr-222, Ra-222, Rn-218, Po-214
U-230	Th-226, Ra-222, Rn-218, Po-214
U-235	Th-231
Pu-241	U-237
Pu-244	U-240, Np-240m
Am-242m	Am-242, Np-238
Am-243	Np-239
Cm-247	Pu-243
Bk-249	Am-245
Cf-253	Cm-249

[b] The values of A_1 and A_2 in Curies (Ci) are approximate and for information only; the regulatory standard units are Terabecquerels (TBq), (see paragraph (1) of Schedule 10-6–Determination of A_1 and A_2 of this rule.).

[c] The activity of Ir-192 in special form may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

(Rule 0400-20-10-.38, continued)

[d] These values apply only to compounds of uranium that take the chemical form of UF_6, UO_2F_2 and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

[e] These values apply only to compounds of uranium that take the chemical form of UO_3, UF_4, UCl_4 and hexavalent compounds in both normal and accident conditions of transport.

[f] These values apply to all compounds of uranium other than those specified in notes (d) and (e) of this table.

[g] These values apply to unirradiated uranium only.

[h] A_2 = 0.74 TBq (20 Ci) for Mo-99 for domestic use.

Table A-2—EXEMPT MATERIAL ACTIVITY CONCENTRATIONS AND EXEMPT CONSIGNMENT ACTIVITY LIMITS FOR RADIONUCLIDES

Symbol of radionuclide	Element and atomic number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Ac-225	Actinium (89)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ac-227		$1.0X10^{-1}$	$2.7X10^{-12}$	$1.0X10^{3}$	$2.7X10^{-8}$
Ac-228		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-105	Silver (47)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-108m (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-110m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ag-111		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Al-26	Aluminum (13)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Am-241	Americium (95)	1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Am-242m (b)		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Am-243 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Ar-37	Argon (18)	$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ar-39		$1.0X10^{7}$	$2.7X10^{-4}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ar-41		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
As-72	Arsenic (33)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
As-73		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
As-74		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
As-76		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
As-77		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
At-211	Astatine (85)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Au-193	Gold (79)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Au-194		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Au-195		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Au-198		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Au-199		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ba-131	Barium (56)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ba-133		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$

(Rule 0400-20-10-.38, continued)

Ba-133m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ba-140 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Be-7	Beryllium (4)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Be-10		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-205	Bismuth (83)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-206		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Bi-207		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-210		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Bi-210m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Bi-212 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Bk-247	Berkelium (97)	1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Bk-249		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Br-76	Bromine (35)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Br-77		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Br-82		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
C-11	Carbon (6)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
C-14		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ca-41	Calcium (20)	$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ca-45		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ca-47		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-109	Cadmium (48)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-113m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-115		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cd-115m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ce-139	Cerium (58)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ce-141		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ce-143		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ce-144 (b)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cf-248	Californium (98)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cf-249		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cf-250		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cf-251		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cf-252		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cf-253		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cf-254		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cl-36	Chlorine (17)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cl-38		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cm-240	Curium (96)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$

(Rule 0400-20-10-.38, continued)

Cm-241		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cm-242		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cm-243		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cm-244		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cm-245		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cm-246		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Cm-247		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cm-248		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Co-55	Cobalt (27)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Co-56		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Co-57		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Co-58		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Co-58m		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Co-60		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cr-51	Chromium (24)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Cs-129	Cesium (55)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-131		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cs-132		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-134		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cs-134m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-135		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Cs-136		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Cs-137 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Cu-64	Copper (29)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Cu-67		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Dy-159	Dysprosium (66)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Dy-165		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Dy-166		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Er-169	Erbium (68)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Er-171		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-147	Europium (63)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-148		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-149		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Eu-150 (short lived)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-150 (long lived)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-152		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-152m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$

(Rule 0400-20-10-.38, continued)

Eu-154		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Eu-155		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Eu-156		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
F-18	Fluorine (9)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-52	Iron (26)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-55		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-59		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Fe-60		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ga-67	Gallium (31)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ga-68		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ga-72		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Gd-146	Gadolinium (64)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Gd-148		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Gd-153		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Gd-159		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ge-68	Germanium (32)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ge-71		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ge-77		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Hf-172	Hafnium (72)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hf-175		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hf-181		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hf-182		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-194	Mercury (80)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-195m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-197		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Hg-197m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Hg-203		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ho-166	Holmium (67)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ho-166m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-123	Iodine (53)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
I-124		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-125		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-126		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-129		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
I-131		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-132		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
I-133		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
I-134		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$

(Rule 0400-20-10-.38, continued)

I-135		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-111	Indium (49)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-113m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-114m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
In-115m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ir-189	Iridium (77)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ir-190		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ir-192		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ir-194		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
K-40	Potassium (19)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
K-42		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
K-43		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Kr-79	Krypton (36)	$1.0x10^{3}$	$2.7x10^{-8}$	$1.0x10^{5}$	$2.7x10^{-6}$
Kr-81		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Kr-85		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{4}$	$2.7X10^{-7}$
Kr-85m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{10}$	$2.7X10^{-1}$
Kr-87		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
La-137	Lanthanum (57)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
La-140		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Lu-172	Lutetium (71)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Lu-173		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Lu-174		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Lu-174m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Lu-177		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Mg-28	Magnesium (12)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Mn-52	Manganese (25)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Mn-53		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{9}$	$2.7X10^{-2}$
Mn-54		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Mn-56		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Mo-93	Molybdenum (42)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{8}$	$2.7X10^{-3}$
Mo-99		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
N-13	Nitrogen (7)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
Na-22	Sodium (11)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Na-24		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Nb-93m	Niobium (41)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Nb-94		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Nb-95		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$

(Rule 0400-20-10-.38, continued)

Nb-97		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Nd-147	Neodymium (60)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Nd-149		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ni-59	Nickel (28)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ni-63		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ni-65		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Np-235	Neptunium (93)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Np-236 (short-lived)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Np-236 (long-lived)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Np-237 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Np-239		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Os-185	Osmium (76)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Os-191		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Os-191m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Os-193		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Os-194		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
P-32	Phosphorus (15)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
P-33		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Pa-230	Protactinium (91)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pa-231		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Pa-233		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pb-201	Lead (82)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pb-202		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pb-203		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pb-205		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pb-210 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pb-212 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Pd-103	Palladium (46)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{8}$	$2.7X10^{-3}$
Pd-107		$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Pd-109		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-143	Promethium (61)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-144		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-145		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pm-147		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$

(Rule 0400-20-10-.38, continued)

Pm-148m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-149		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pm-151		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Po-210	Polonium (84)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pr-142	Praseodymium (59)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Pr-143		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-188	Platinum (78)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-191		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-193		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pt-193m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pt-195m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-197		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pt-197m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Pu-236	Plutonium (94)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-237		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Pu-238		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-239		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-240		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Pu-241		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Pu-242		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Pu-244		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ra-223 (b)	Radium (88)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ra-224 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ra-225		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Ra-226 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Ra-228 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Rb-81	Rubidium (37)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rb-83		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rb-84		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rb-86		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Rb-87		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Rb(nat)		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Re-184	Rhenium (75)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re-184m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re-186		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re-187		$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{9}$	$2.7X10^{-2}$
Re-188		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$

(Rule 0400-20-10-.38, continued)

Re-189		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Re(nat)		$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{9}$	$2.7X10^{-2}$
Rh-99	Rhodium (45)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rh-101		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Rh-102		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rh-102m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Rh-103m		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Rh-105		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Rn-222 (b)	Radon (86)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{8}$	$2.7X10^{-3}$
Ru-97	Ruthenium (44)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ru-103		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ru-105		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ru-106 (b)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
S-35	Sulphur (16)	$1.0X10^{5}$	$2.7X10^{-6}$	$1.0X10^{8}$	$2.7X10^{-3}$
Sb-122	Antimony (51)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{4}$	$2.7X10^{-7}$
Sb-124		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sb-125		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sb-126		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sc-44	Scandium (21)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sc-46		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sc-47		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sc-48		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Se-75	Selenium (34)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Se-79		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Si-31	Silicon (14)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Si-32		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sm-145	Samarium (62)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sm-147		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Sm-151		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
Sm-153		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sn-113	Tin (50)	$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sn-117m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sn-119m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sn-121m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sn-123		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sn-125		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sn-126		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sr-82	Strontium (38)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$

(Rule 0400-20-10-.38, continued)

Sr-85		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sr-85m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Sr-87m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sr-89		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Sr-90 (b)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{4}$	$2.7X10^{-7}$
Sr-91		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Sr-92		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
T(H-3)	Tritium (1)	$1.0X10^{6}$	$2.7X10^{-5}$	$1.0X10^{9}$	$2.7X10^{-2}$
Ta-178 (long-lived)	Tantalum (73)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Ta-179		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Ta-182		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Tb-157	Terbium (65)	$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tb-158		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tb-160		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-95m	Technetium (43)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-96		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-96m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tc-97		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{8}$	$2.7X10^{-3}$
Tc-97m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tc-98		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tc-99		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
Tc-99m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-121	Tellurium (52)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-121m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0x10^{6}$	$2.7x10^{-5}$
Te-123m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-125m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-127		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-127m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Te-129		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-129m		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-131m		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Te-132		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Th-227	Thorium (90)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Th-228 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Th-229 (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Th-230		1.0	$2.7X10^{-11}$	$1.0X10^{4}$	$2.7X10^{-7}$
Th-231		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$

(Rule 0400-20-10-.38, continued)

Th-232		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
Th-234 (b)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Th (nat) (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
Ti-44	Titanium (22)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
Tl-200	Thallium (81)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tl-201		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tl-202		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tl-204		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{4}$	$2.7X10^{-7}$
Tm-167	Thulium (69)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tm-170		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Tm-171		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{8}$	$2.7X10^{-3}$
U-230 (fast lung absorption) (b),(d)	Uranium (92)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-230 (medium lung absorption) (e)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-230 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-232 (fast lung absorption) (b),(d)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
U-232 (medium lung absorption) (e)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-232 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-233 (fast lung absorption) (d)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-233 (medium lung absorption) (e)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-233 (slow lung		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$

(Rule 0400-20-10-.38, continued)

absorption) (f)					
U-234 (fast lung absorption) (d)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-234 (medium lung absorption) (e)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-234 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-235 (all lung absorption types) (b),(d),(e),(f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-236 (fast lung absorption) (d)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-236 (medium lung absorption) (e)		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
U-236 (slow lung absorption) (f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U-238 (all lung absorption types) (b),(d),(e),(f)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{4}$	$2.7X10^{-7}$
U (nat) (b)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
U (enriched to 20% or less) (g)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
U (dep)		1.0	$2.7X10^{-11}$	$1.0X10^{3}$	$2.7X10^{-8}$
V-48	Vanadium (23)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$
V-49		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
W-178	Tungsten (74)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
W-181		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
W-185		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{7}$	$2.7X10^{-4}$
W-187		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$

(Rule 0400-20-10-.38, continued)

W-188		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Xe-122	Xenon (54)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
Xe-123		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{9}$	$2.7X10^{-2}$
Xe-127		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Xe-131m		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{4}$	$2.7X10^{-7}$
Xe-133		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{4}$	$2.7X10^{-7}$
Xe-135		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{10}$	$2.7X10^{-1}$
Y-87	Yttrium (39)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-88		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-90		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{5}$	$2.7X10^{-6}$
Y-91		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-91m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Y-92		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Y-93		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{5}$	$2.7X10^{-6}$
Yb-169	Ytterbium (70)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{7}$	$2.7X10^{-4}$
Yb-175		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Zn-65	Zinc (30)	$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zn-69		$1.0X10^{4}$	$2.7X10^{-7}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zn-69m		$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zr-88	Zirconium (40)	$1.0X10^{2}$	$2.7X10^{-9}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zr-93 (b)		$1.0X10^{3}$	$2.7X10^{-8}$	$1.0X10^{7}$	$2.7X10^{-4}$
Zr-95		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{6}$	$2.7X10^{-5}$
Zr-97 (b)		$1.0X10^{1}$	$2.7X10^{-10}$	$1.0X10^{5}$	$2.7X10^{-6}$

[a] [Reserved]

[b] Parent nuclides and their progeny included in secular equilibrium are listed in the following:

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Ag-108m	Ag-108
Cs-137	Ba-137m
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)

(Rule 0400-20-10-.38, continued)

Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

[c] [Reserved]

[d] These values apply only to compounds of uranium that take the chemical form of UF_6, UO_2F_2 and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

[e] These values apply only to compounds of uranium that take the chemical form of UO_3, UF_4, UCl_4 and hexavalent compounds in both normal and accident conditions of transport.

[f] These values apply to all compounds of uranium other than those specified in notes (d) and (e) of this table.

[g] These values apply to unirradiated uranium only.

TABLE A-3—GENERAL VALUES FOR A_1 AND A_2

Contents	A_1		A_2		Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limits for exempt consignments (Bq)	Activity limits for exempt consignments (Ci)
	(TBq)	(Ci)	(TBq)	(Ci)				
Only beta or gamma emitting radionuclides are known to be present	1×10^{-1}	2.7×10^{0}	2×10^{-2}	5.4×10^{-1}	1×10^{1}	2.7×10^{-10}	1×10^{4}	2.7×10^{-7}
Only alpha emitting radionuclides, but no neutron emitters, are known to be present[a]	2×10^{-1}	5.4×10^{0}	9×10^{-5}	2.4×10^{-3}	1×10^{-1}	2.7×10^{-12}	1×10^{3}	2.7×10^{-8}
Neutron emitting nuclides are known to be present or no relevant data are available	1×10^{-3}	2.7×10^{-2}	9×10^{-5}	2.4×10^{-3}	1×10^{-1}	2.7×10^{-12}	1×10^{3}	2.7×10^{-8}

[a] If beta or gamma emitting nuclides are known to be present, the A1 value of 0.1 TBg (2.7 Ci) should be used.

TABLE A-4—ACTIVITY-MASS RELATIONSHIPS FOR URANIUM

Uranium Enrichment[1] wt % U-235 present	Specific Activity	
	TBq/g	Ci/g
0.45	1.8×10^{-8}	5.0×10^{-7}
0.72	2.6×10^{-8}	7.1×10^{-7}

(Rule 0400-20-10-.38, continued)

1	2.8×10^{-8}	7.6×10^{-7}
1.5	3.7×10^{-8}	1.0×10^{-6}
5	1.0×10^{-7}	2.7×10^{-6}
10	1.8×10^{-7}	4.8×10^{-6}
20	3.7×10^{-7}	1.0×10^{-5}
35	7.4×10^{-7}	2.0×10^{-5}
50	9.3×10^{-7}	2.5×10^{-5}
90	2.2×10^{-6}	5.8×10^{-5}
93	2.6×10^{-6}	7.0×10^{-5}
95	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.; 68-202-101, et seq.; and 68-202-201, et seq.* ***Administrative History:*** *Original rule filed February 22, 2012; effective May 22, 2012. Amendment filed March 3, 2015; effective June 1, 2015. Amendments filed June 14, 2017; effective September 12, 2017. Amendments filed September 1, 2021; effective November 30, 2021. Amendments filed December 4, 2023; effective March 3, 2024.*