



# MARYLAND DEPARTMENT OF THE ENVIRONMENT

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JUN 10 2010

Cynthia Carpenter, Deputy Director  
Division Materials Safety and State Agreements  
Office of Federal and State Materials and  
Environmental Management Programs  
U.S. Nuclear Regulatory Commission  
T8-E24  
Washington, D.C. 20555-0001

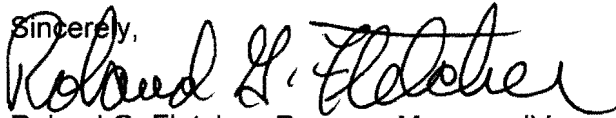
Dear Ms. Carpenter:

Enclosed is a copy of the revisions to the proposed Code of Maryland Regulations 26.12.01.01 titled, "Regulations for the Control of Ionizing Radiation (1994) Supplement 19. The proposed revisions will be made available for public comment on August 13, 2010 with a request for comments by September 13, 2010. We request NRC's comments by July 30, 2010. The proposed regulations are identified in Supplement 19 by line-in/line-out text and correspond to the following equivalent amendment to NRC's regulations.

<u>Rats ID</u>	<u>Title</u>	<u>State Section(s)</u>
2007-2	Exemptions From Licensing, General Licenses and Distribution of Byproduct Material: Licensing and Reporting Requirements Parts 30, 31, 32, 150 72 FR 58473	A and C

Please note that some changes have been incorporated into the above regulations from Rats ID 2007-3. No NRC review on those changes are needed at this time as Maryland will be shortly submitting 2007-3 in its entirety. We believe that adoption of these revisions satisfies the compatibility and health and safety categories established in the Office of Federal and State Materials and Environmental Programs (FSME) Procedure SA200.

If you have any questions, please feel free to contact Ray Manley of my staff at 410-537-3191 or at [rmanley@mde.state.md.us](mailto:rmanley@mde.state.md.us).

Sincerely,  
  
Roland G. Fletcher, Program Manager IV  
Radiological Health Program  
Air and Radiation Management Administration  
Maryland Department of the Environment

Enclosures: Redlined Supplement 19  
CD with redlined copy of Supplement 19.

3/31/10

INSTRUCTION SHEET

COMAR 26.12.01.01

Title: Regulations for the Control of Ionizing  
Radiation (1994)

PROPOSED SUPPLEMENT No. 19

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TO: STATE DEPOSITORIES  
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Instructions: Supplement 19 to the document "Regulations for the Control of Ionizing Radiation (1994)" is being proposed for adoption. Supplement 19 includes the following pages (all pages are inclusive):

Remove Pages

Cover Sheet  
A1 through A4  
C3 through C8  
C13 through C14 (4 pages)  
C29 through C32  
C57 through C58  
C61 through C62

Insert Pages (future)

Cover Sheet  
A1 through A4  
C3 through C8  
C13 through C14 (4 pages)  
C29 through C32  
C57 through C58  
C61 through C62

Verify to make certain that you have the pages listed above.

You will be sent further instructions when later action affects this proposed supplement.

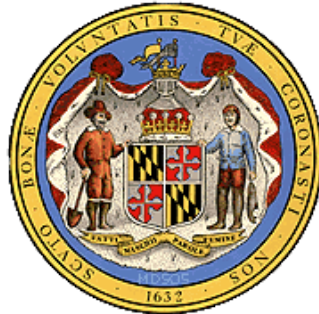
INQUIRIES TO: Michael Kurman  
Radiological Health Program  
Maryland Department of the Environment  
1800 Washington Boulevard  
Baltimore, MD 21230  
(410) 537-3208

**Code of Maryland Regulations 26.12.01.01**

Adopted: September 9, 1995  
Effective: October 9, 1995

- Supplement 1 Effective: December 16, 1996
- Supplement 2 Effective: November 3, 1997
- Supplement 3 Effective: June 29, 1998
- Supplement 4 Effective: December 28, 1998
- Supplement 5 Effective: June 14, 1999
- Supplement 6 Effective: February 7, 2000
- Supplement 7 Effective: April 1, 2002
- Supplement 8 Effective: October 13, 2003
- Supplement 9 Effective: October 27, 2003
- Supplement 10 Effective: March 29, 2004
- Supplement 11 Effective: June 7, 2004
- Supplement 12 Effective: June 20, 2005
- Supplement 13 Effective: December 8, 2005
- Supplement 14 Effective: October 9, 2006
- Supplement 15 Effective: December 17, 2007
- Supplement 16 Effective: June 15, 2009
- Supplement 17 Effective: June 15, 2009
- Supplement 18 Effective:
- Supplement 19 Effective:

**REGULATIONS FOR THE CONTROL OF IONIZING RADIATION (1994)**



RADIOLOGICAL HEALTH PROGRAM  
AIR AND RADIATION MANAGEMENT ADMINISTRATION  
MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 WASHINGTON BOULEVARD  
BALTIMORE, MARYLAND 21230

**PART A**  
**GENERAL PROVISIONS**

Sec. A.1 Scope. Except as otherwise specifically provided, these regulations apply to all persons who receive, possess, use, transfer, own, or acquire any source of radiation; provided, however, that nothing in these regulations shall apply to any person to the extent such person is subject to regulation by the U.S. Nuclear Regulatory Commission.<sup>1/</sup> This part also gives notice to all persons who knowingly provide to any licensee, applicant, certificate of registration holder, contractor, or subcontractor, components, equipment, materials, or other goods or services, that relate to a licensee's, applicant's or certificate of registration holder's activities subject to these regulations, that they may be individually subject to Maryland Department of the Environment enforcement actions for violation of A.16.

Sec. A.2 Definitions. As used in these regulations, these terms have the definitions set forth below. Additional definitions used only in a certain part will be found in that part.

"A1" means the maximum activity of special form radioactive material permitted in a Type A package.  
"A2" means the maximum activity of radioactive material, other than special form radioactive material, permitted in a Type A package. These values are either listed in Appendix A of Part T of these regulations, Table I, or may be derived in accordance with the procedure prescribed in Appendix A of Part T of these regulations.

"Absorbed dose" [See "Dose"]

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

"Act" means the Annotated Code of Maryland, Environment Article, Title 8 "Radiation."

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

"Adult" means an individual 18 or more years of age.

"Agency" means the Maryland Department of Environment, Radiological Health Program.

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

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

"Airborne radioactivity area" means a room, enclosure, or area in which airborne radioactive material exists in concentrations:

(1) In excess of the derived air concentrations (DACs) specified in Appendix B, Table I of Part D of these regulations, or

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

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1/ Attention is directed to the fact that regulation by the State of source material, byproduct material, and special nuclear material in quantities not sufficient to form a critical mass is subject to the provisions of the agreement between the State and the U.S. Nuclear Regulatory Commission and to 10 CFR Part 150 of the Commission's regulations.

"Annually" means either (1) at intervals not to exceed 1 year or (2) once per year, at about the same time per year (plus or minus 1 month).

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

"Authorized nuclear pharmacist" means a pharmacist who:

- (1) Meets the requirements in Sections G.55(a) and G.59; or
- (2) Is identified as an authorized nuclear pharmacist on:
  - (i) A specific license issued by the Agreement State or NRC that authorizes medical use or the practice of nuclear pharmacy;
  - (ii) A permit issued by an NRC master material licensee that authorizes medical use or the practice of nuclear pharmacy;
  - (iii) An authorization issued by an Agreement State or NRC broad scope medical use licensee that authorizes medical use or the practice of nuclear pharmacy; or
  - (iv) A permit issued by an NRC master material license broad scope medical use permittee that authorizes medical use or the practice of nuclear pharmacy; or
- (3) Is identified as an authorized nuclear pharmacist by a commercial nuclear pharmacy that has been authorized to identify authorized nuclear pharmacists; or
- (4) Is designated as an authorized nuclear pharmacist in accordance with Sec. C.28(j)(2)(iv).

"Background radiation" means radiation from cosmic sources; naturally occurring radioactive materials, including radon, except as a decay product of source or special nuclear material, and including global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. "Background radiation" does not include sources of radiation from radioactive materials or radiation producing machines regulated by the Agency.

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

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

"Byproduct material" means:

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

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

~~(1) Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material;~~

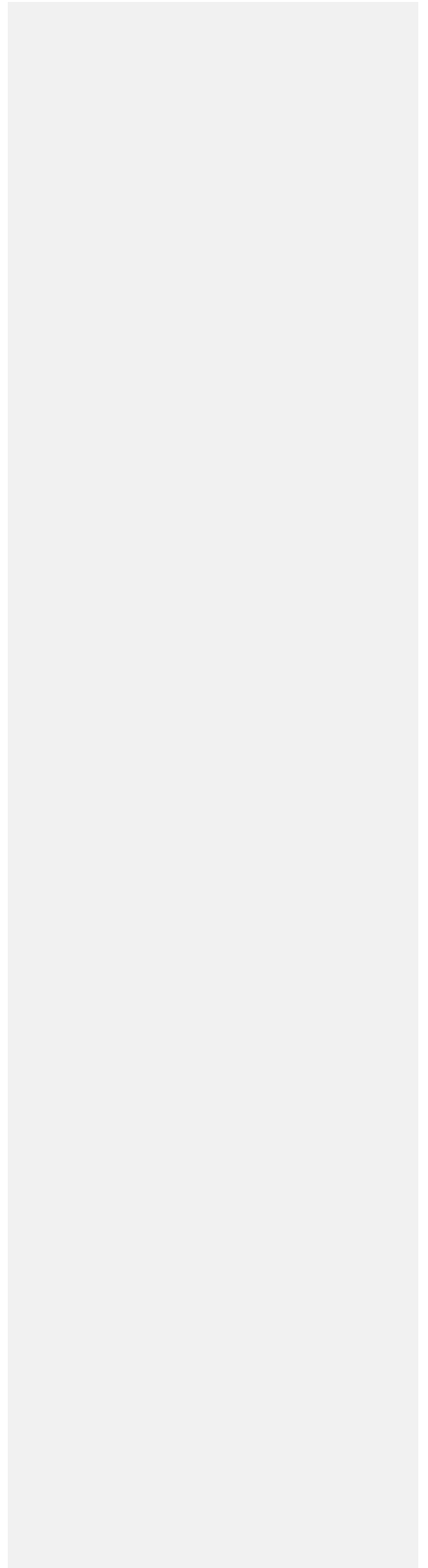
Comment [mdk1]: (From RATS 2007-3)

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

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- (3) (i) Any discrete source of radium-226 that is produced, extracted, or converted after extraction, before, on, or after August 8, 2005, for use for a commercial, medical, or research activity; or
- (ii) Any material that—
- (a) Has been made radioactive by use of a particle accelerator; and
- (b) Is produced, extracted, or converted after extraction, before, on, or after August 8, 2005, for use for a commercial, medical, or research activity; and
- (4) Any discrete source of naturally occurring radioactive material, other than source material, that—
- (i) The NRC, in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, the Secretary of Homeland Security, and the head of any other appropriate Federal agency, determines would pose a threat similar to the threat posed by a discrete source of radium-226 to the public health and safety or the common defense and security; and
- (ii) Before, on, or after August 8, 2005, is extracted or converted after extraction for use in a commercial, medical, or research activity.

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

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

"CFR" means Code of Federal Regulations.

"Chelating agent" means amine polycarboxylic acids, hydroxy-carboxylic acids, gluconic acid, and polycarboxylic acids.

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

"COMAR" means Code of Maryland Regulations

"Committed dose equivalent" [See "Dose"]

"Committed effective dose equivalent" [See "Dose"]

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

"Curie" means a unit of quantity of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of  $3.7 \times 10^{10}$  transformations per second (tps). Commonly used submultiples of the curie are the millicurie and the microcurie. One millicurie (mCi) = 0.001 curie =  $3.7 \times 10^7$  tps. One microcurie ( $\mu$ Ci) = 0.000001 curie =  $3.7 \times 10^4$  tps (See A.12 for SI equivalent becquerel).

"Decommission" means to remove a facility or site safely from service and reduce residual radioactivity to a level that permits:

- (1) Release of the property for unrestricted use and termination of the license; or
- (2) Release of the property under restricted conditions and termination of the license.

"Deep dose equivalent" [see "Dose"]

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

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

"Dose" is a generic term that means absorbed dose, committed dose equivalent, committed effective dose equivalent, deep dose equivalent, dose equivalent, effective dose equivalent, external dose, eye dose equivalent, shallow dose equivalent, total effective dose equivalent, or total organ dose equivalent. For purposes of these regulations, "radiation dose" is an equivalent term.

- (1) "Absorbed dose" means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the gray (Gy) and the rad.
- (2) "Committed dose equivalent" ( $H_{T,50}$ ) means the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.
- (3) "Committed effective dose equivalent" ( $H_{E,50}$ ) is the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to each of these organs or tissues ( $H_{E,50} = \sum w_T H_{T,50}$ ).
- (4) "Deep dose equivalent" ( $H_d$ ), which applies to external whole body exposure, means the dose equivalent at a tissue depth of 1 centimeter ( $1000 \text{ mg/cm}^2$ ).
- (5) "Dose equivalent ( $H_T$ )" means the product of the absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert (Sv) and rem.
- (6) "Effective dose equivalent ( $H_E$ )" means the sum of the products of the dose equivalent to each organ or tissue ( $H_T$ ) and the weighting factor ( $w_T$ ) applicable to each of the body organs or tissues that are irradiated ( $H_E = \sum w_T H_T$ ).
- (7) "External dose" means that portion of the dose equivalent received from any source of radiation outside the body.
- (8) "Lens dose equivalent (LDE)" applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter ( $300 \text{ mg/cm}^2$ ).
- (9) "Shallow dose equivalent" ( $H_s$ ), which applies to the external exposure of the skin of the whole body or the skin of an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter ( $7 \text{ mg/cm}^2$ ).
- (10) "Total effective dose equivalent" (TEDE) means the sum of the deep dose equivalent for external exposures and the committed effective dose equivalent for internal exposures.
- (11) "Total organ dose equivalent" (TODE) means the sum of the deep dose equivalent and the committed dose equivalent to the organ receiving the highest dose as described in D.1107(a)(6) of these regulations.

"Dose equivalent" [see "Dose"]



(ii) each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM," 1/

(iii) each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED," 1/ and

(iv) this exemption shall not be deemed to authorize the chemical, physical, or metallurgical treatment or processing of any such counterweights other than repair or restoration of any plating or other covering;

(6) natural or depleted uranium metal used as shielding constituting part of any shipping container, provided that:

(i) the shipping container is conspicuously and legibly impressed with the legend "CAUTION - RADIOACTIVE SHIELDING - URANIUM", and

(ii) the uranium metal is encased in mild steel or equally fire resistant metal of minimum wall thickness of 1/8 inch (3.2 mm).

(7) thorium contained in finished optical lenses, provided that each lens does not contain more than 30 percent by weight of thorium, and that this exemption shall not be deemed to authorize either

(i) the shaping, grinding, or polishing of such lens or manufacturing processes other than the assembly of such lens into optical systems and devices without any alteration of the lens, or

(ii) the receipt, possession, use, or transfer of thorium contained in contact lenses, or in spectacles, or in eyepieces in binoculars or other optical instruments;

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

(9) thorium contained in any finished aircraft engine part containing nickel-thoria alloy, provided that

(i) the thorium is dispersed in the nickel-thoria alloy in the form of finely divided thoria (thorium dioxide), and

(ii) the thorium content in the nickel-thoria alloy does not exceed 4 percent by weight.

(d) The exemptions in C.3(c) do not authorize the manufacture of any of the products described.

1/ The requirements specified in C.3(c)(5)(ii) and (iii) need not be met by counterweights manufactured prior to December 31, 1969; provided, that such counterweights are impressed with the legend, "CAUTION - RADIOACTIVE MATERIAL - URANIUM", as previously required by the regulations.

Sec. C.4 Radioactive Material Other Than Source Material.

(a) Exempt Concentrations.

(1) Except as provided in C.4(a)(2) ~~and (3)~~, any person is exempt from this part to the extent that such person receives, possesses, uses, transfers, owns or acquires products or materials containing radioactive byproduct material ~~introduced~~ in concentrations not in excess of those listed in Appendix A of this part.

~~(2) A manufacturer, processor, or producer of a product or material is exempt from this part to the extent that this person transfers byproduct material contained in a product or material in concentrations not in excess of those listed in Appendix A of this part 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 byproduct 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.~~

~~(23) No person may introduce radioactive byproduct material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under C.4(a)(1) this section or equivalent regulations of the U.S. Nuclear Regulatory Commission, any Agreement State or Licensing State, except in accordance with a specific license issued pursuant to C.28(a) or the general license provided in C.90.~~

Comment [mdk3]: §32.13

(b) Exempt Quantities.

(1) Except as provided in C.4(b)(3) ~~through (5) and (4)~~, any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive byproduct material in individual quantities each of which does not exceed the applicable quantity set forth in Appendix B of this part.

(2) Any person who possesses radioactive byproduct material received or acquired before September 25, 1971 under the general license formerly provided in C.22(b) is exempt from the requirements for a license set forth in this part to the extent that such person possesses, uses, transfers or owns such radioactive byproduct material. ~~Such exemption does not apply for radium 226.~~

Comment [mdk5]: (This change is from RATS 2007-3)

(3) ~~This paragraph C.4(b) section does not authorize the production, packaging, or repackaging, or transfer of radioactive byproduct material for purposes of commercial distribution, or the incorporation of radioactive byproduct material into products intended for commercial distribution, or the commercial collection or receiving of exempt quantities as waste and the subsequent disposal of these wastes.~~

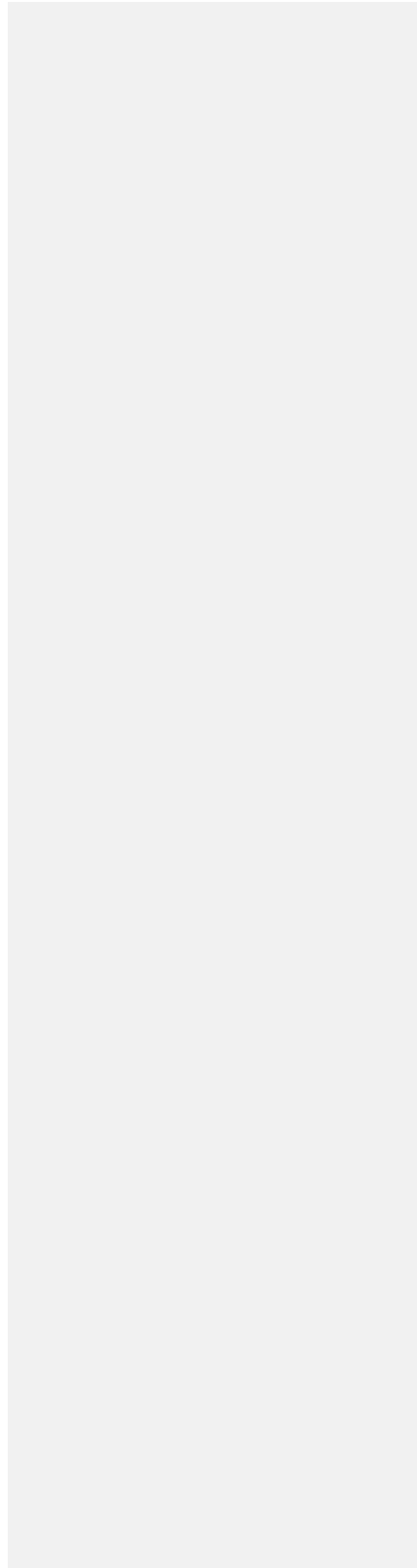
Comment [mdk6]: These changes are in §30.18 as current.

(4) No person may, for purposes of commercial distribution, transfer radioactive byproduct material in the individual quantities set forth in Appendix B of this part, knowing or having reason to believe that such quantities of radioactive byproduct material will be transferred to persons exempt under C.4(b) or equivalent regulations of the U.S. Nuclear Regulatory Commission, any Agreement State or 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 Agency pursuant to C.28(b)~~ which license states that the radioactive byproduct material may be transferred by the licensee to persons exempt under C.4(b) or the equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State, or Licensing State. 2/

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2/ Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing byproduct 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, D.C. 20555.

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(5) No person may, for purposes of producing an increased radiation level, combine quantities of byproduct material covered by this exemption so that the aggregate quantity exceeds the limits set forth in Appendix B of this part, except for byproduct material combined within a device placed in use before May 3, 1999, or as otherwise permitted by the regulations in this part.

(c) Exempt Items.

Comment [mdk7]: §30.15

(1) Certain Items Containing Radioactive Material. Except for persons who apply radioactive material to, or persons who incorporate radioactive material into the following products, any person is exempt from these regulations to the extent that he receives, possesses, uses, transfers, owns, or acquires the following products: 2/

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

(a) 25 millicuries (925 MBq) of tritium per timepiece.

(b) 5 millicuries (185 MBq) of tritium per hand.

(c) 15 millicuries (555 MBq) of tritium per dial (bezels when used shall be considered as part of the dial).

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

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

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

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

(1) For wrist watches, 0.1 millirad (1  $\mu$ Gy) per hour at 10 centimeters from any surface.

(2) For pocket watches, 0.1 millirad (1  $\mu$ Gy) per hour at 1 centimeter from any surface.

(3) For any other timepiece, 0.2 millirad (2  $\mu$ Gy) per hour at 10 centimeters from any surface.

(h) One microcurie (0.037 MBq) of radium-226 per timepiece in intact timepieces manufactured prior to November 30, 2007.

Comment [mdk8]: (This change is from RATS 2007-3)

~~(h) One microcurie (37 kBq) of radium-226 per timepiece in timepieces acquired prior to December 6, 1982.~~

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

(iii) Precision balances containing not more than 1 millicurie (37 MBq) of tritium per balance or not more than 0.5 millicurie (18.5 MBq) of tritium per balance part manufactured before December 17, 2007.

~~(iv) [Reserved] Automobile shift quadrants containing not more than 25 millicuries (925 MBq) of tritium.~~

(v) Marine compasses containing not more than 750 millicuries (27.8 GBq) of tritium gas and other marine navigational instruments containing not more than 250 millicuries (9.25 GBq) of tritium gas manufactured before December 17, 2007.

~~(vi) [Reserved] Thermostat dials and pointers containing not more than 25 millicuries (925 MBq) of tritium per thermostat.~~

(vii) Ionization chamber smoke detectors containing not more than 1 microcurie (0.037 MBq) of americium-241 per detector in the form of a foil and designed to protect life and property from fires.

(viii) Electron tubes; provided, that each tube does not contain more than one of the following specified quantities of radioactive byproduct material:

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

(b) 1 microcurie (37 kBq) of cobalt-60.

(c) 5 microcuries (185 kBq) of nickel-63.

(d) 30 microcuries (1.11 MBq) of krypton-85.

(e) 5 microcuries (185 kBq) of cesium-137.

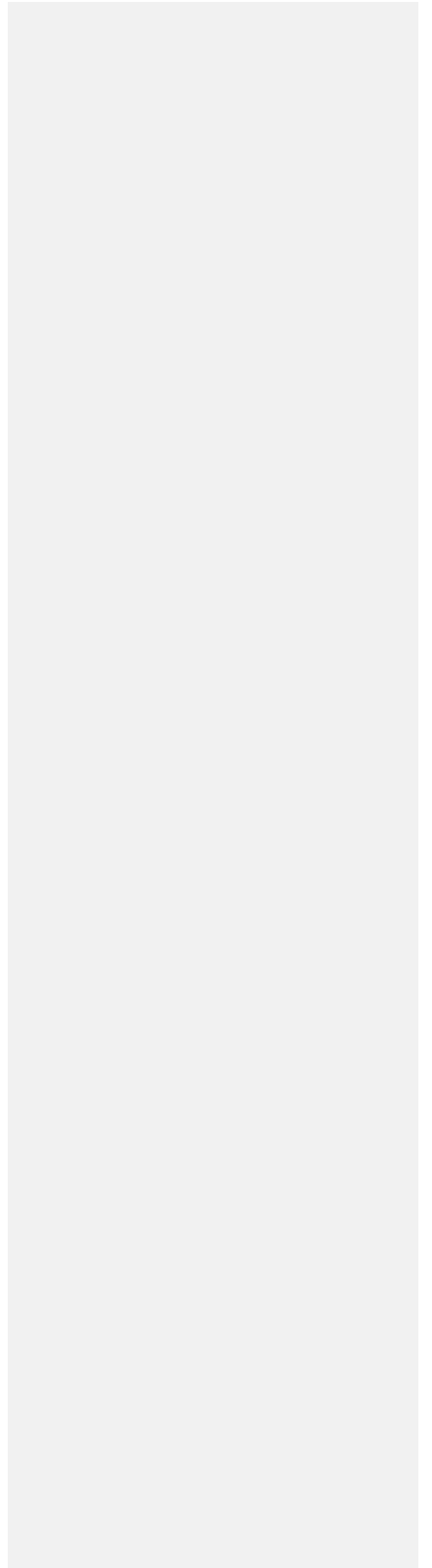
(f) 30 microcuries (1.11 MBq) of promethium-147.

And provided further, that the radiation dose rate from each electron tube containing radioactive byproduct material will not exceed 1 millirad (10 µGy) per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber. 3/

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| 3/ For purposes of C.4(c)(1)(viii), "electron tubes" include spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pick-up tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents.

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~~(viii)~~ Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, one or more sources of ~~radioactive byproduct~~ material, provided that:

- (a) Each source contains no more than one exempt quantity set forth in Appendix B of this part, and
- (b) Each instrument contains no more than 10 exempt quantities. For purposes of this requirement, an instrument's source(s) may contain either one 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 Appendix B of this part, provided that the sum of such fractions shall not exceed unity.
- (c) For americium-241, 0.05 microcurie (1.85 kBq) is considered an exempt quantity under ~~C.4(c)(1)(viii)~~ Appendix B.

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

(2) Self-Luminous Products Containing Radioactive Material.

(i) Tritium, Krypton-85, or Promethium-147. Except for persons who manufacture, process, or produce self-luminous products containing tritium, krypton-85, or promethium-147, any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns, or acquires tritium, krypton-85 or promethium-147 in self-luminous products manufactured, processed, produced, imported, or transferred in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission pursuant to Section 32.22 of 10 CFR Part 32, which license authorizes the transfer of the product to persons who are exempt from regulatory requirements. The exemption in C.4(c)(2) does not apply to tritium, krypton-85, or promethium-147 used in products primarily for frivolous purposes or in toys or adornments.

(ii) Radium-226. Any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, or owns articles containing less than 0.1 microcurie (3.7 kBq) of radium-226 which were acquired prior to December 6, 1982.

(3) Gas and Aerosol Detectors Containing Radioactive Material.

(i) Except for persons who manufacture, process, or produce gas and aerosol detectors containing radioactive material, any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in gas and aerosol detectors designed to protect life or property from fires and airborne hazards provided that detectors containing radioactive material shall have been manufactured, imported, or transferred in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission ~~2/~~ pursuant to Section 32.26 of 10 CFR Part 32; or a Licensing State pursuant to C.28(c), which authorizes the transfer of the detectors to persons who are exempt from regulatory requirements.

(ii) Gas and aerosol detectors previously manufactured and distributed to general licensees in accordance with a specific license issued by an Agreement State shall be considered exempt under C.4(c)(3)(i), provided that the device is labeled in accordance with the specific license authorizing distribution of the generally licensed device, and provided further that they meet the requirements of C.28(c).

(iii) Gas and aerosol detectors containing NARM previously manufactured and distributed in accordance with a specific license issued by a Licensing State shall be considered exempt under C.4(c)(3)(i), provided that the device is labeled in accordance with the specific license authorizing distribution, and provided further that they meet the requirements of C.28(c).

~~(4) Resins Containing Scandium 46 and Designed for Sand Consolidation in Oil Wells. Any person is exempt from these regulations to the extent that such person receives, possesses, uses, transfers, owns or acquires synthetic plastic resins containing scandium 46 which are designed for sand consolidation in oil wells. Such resins shall have been manufactured or imported in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, or shall have been manufactured in accordance with the specifications contained in a specific license issued by the Agency or any Agreement State to the manufacturer of such resins pursuant to licensing requirements equivalent to those in Sections 32.16 and 32.17 of 10 CFR Part 32 of the regulations of the U.S. Nuclear Regulatory Commission. This exemption does not authorize the manufacture of any resins containing scandium 46.~~

~~(45) Radioactive Drug: Capsules Containing Carbon-14 Urea for "In vivo" Diagnostic Use for Humans.~~

Comment [mdk9]: §32.17 and §30.16

(i) Except as provided in paragraphs (b) and (c) of this section, any person is exempt from the requirements for a license and from these regulations provided that such person receives, possesses, uses, transfers, owns, or acquires capsules containing 37 kBq (1  $\mu$ Ci) carbon-14 urea (allowing for nominal variation that may occur during the manufacturing process) each, for "in vivo" diagnostic use for humans.

(ii) Any person who desires to use the capsules for research involving human subjects shall apply for and receive a specific license pursuant to Section C.

(iii) 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.

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



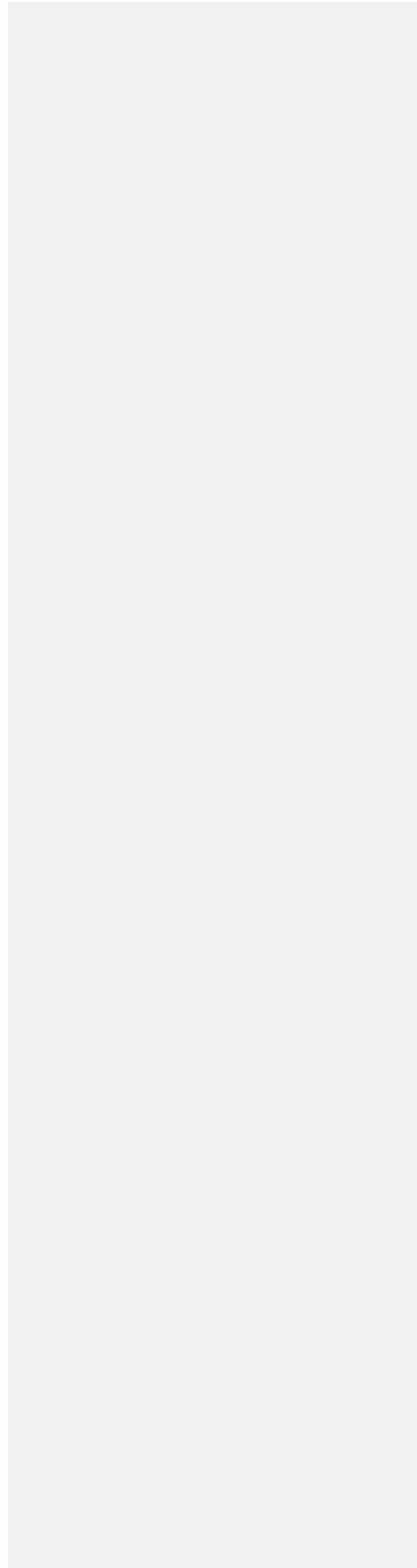
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2/ Authority to transfer possession or control by the manufacturer, processor or producer of any equipment, device, commodity, or other product containing byproduct material whose subsequent possession, use, transfer, and disposal by all other persons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

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(b) devices containing only tritium or not more than 100 microcuries (3.7 MBq) of other beta- and/or gamma-emitting material or 10 microcuries (0.37 MBq) 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;

(iii) shall assure that the tests required by C.22(d)(4)(ii) and other testing, installation, servicing, and removal from installation involving the radioactive material, its shielding or containment, are performed:

(a) in accordance with the instructions provided by the labels, or

(b) by a person holding an applicable specific license from the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State to perform such activities;

(iv) shall maintain records showing compliance with the requirements of C.22(d)(4)(ii) and (iii). The records shall show the results of tests. The records also shall show the dates of performance of, and the names of persons performing, testing, installation, servicing, and removal from installation concerning the radioactive material, its shielding or containment. Records of tests for leakage of radioactive material required by C.22(d)(4)(ii) shall be maintained for 2 years after the next required leak test is performed or until the sealed source is transferred or disposed of. Records of tests of the "on-off" mechanism and indicator required by C.22(d)(4)(ii) shall be maintained for 2 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. Records which are required by C.22(d)(4)(iii) shall be maintained for a period of 2 years from the date of the recorded event or until the device is transferred or disposed of;

(v) 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 185 becquerel (0.005 microcurie) or more removable radioactive material. The device may not be operated until it has been repaired by the manufacturer or other person holding a specific license to repair such devices that was issued under Section C or by the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State. The device and any radioactive material from the device may only be disposed of by transfer to a person authorized by a specific license to receive the byproduct material in the device or as otherwise approved by the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State. A report containing a brief description of the event and the remedial action taken; and, 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, a plan for ensuring that the premises and environs are acceptable for unrestricted use; must be furnished to the Manager, Radiological Health Program, 1800 Washington Boulevard, Baltimore, Maryland 21230 within 30 days. Under these circumstances, the criteria set out in Section D.1402, "Radiological Criteria for Unrestricted Use", may be applicable, as determined by the Agency on a case-by-case basis;

(vi) shall not abandon the device containing radioactive material;

(vii) shall transfer or dispose of the device containing radioactive material by transfer to another general licensee as authorized in C.22(d)(4)(x), or to a person authorized to receive the device by a specific license issued under Section C that authorizes waste collection, or equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State, or as otherwise approved under C.22(d)(4)(ix);

(viii) shall within 30 days after the transfer of a device to a specific licensee or export, furnish a report to: Manager, Radiological Health Program, 1800 Washington Boulevard, Baltimore, Maryland 21230. The report shall contain:

Comment [mdk10]: §31.5

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

(ix) shall obtain written Agency approval before transferring the device to any other specific licensee not specifically identified in C.22(d)(4)(vii); 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:

Comment [mdk11]: §31.5

- (a) 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;
- (b) removes, alters, covers, or clearly and unambiguously augments the existing label (otherwise required by (d)(4)(i) of this section) so that the device is labeled in compliance with D.904(a); however, the label must retain the manufacturer, model number, and serial number;
- (c) obtains manufacturer's or initial transferor's information concerning maintenance that would be applicable under the specific license (such as leak test procedures); and
- (d) reports the transfer under (d)(4)(viii) of this section.

Comment [mdk12]: D.904(a) is §20.1904

(x) shall transfer the device to another general licensee only if:

- (a) the device remains in use at a particular location. In this case, the transferor shall give the transferee a copy of Sections C.20(a), C.22(d), C.38, D.1201, and D.1202 and any safety documents identified in the label of the device. Within 30 days of the transfer, the transferor shall report to the Manager, Radiological Health Program, 1800 Washington Boulevard, Baltimore, Maryland 21230:
  - (1) the manufacturer's (or initial transferor's) name,
  - (2) the model number and the serial number of the device transferred,
  - (3) the transferee's name and mailing address for the location of use, and
  - (4) the name, title, and phone number of the responsible individual identified by the transferee in accordance with C.22(d)(4)(xii) to have knowledge of and authority to take actions to ensure compliance with the appropriate regulations and requirements; or

(b) 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;

(xi) shall comply with the provisions of Sections D.1201 and D.1202 for reporting radiation incidents, theft, or loss of licensed material, but shall be exempt from the other requirements of Parts D and J;

(xii) 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;

(xiii) shall report changes to the mailing address for the location of use (including change in name of general licensee) to the Manager, Radiological Health Program, 1800 Washington Boulevard, Baltimore, Maryland 21230 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;

**Comment [mdk13]:** (RATS ID 2007-3 requires general license registration and a fee. We have this information in C.22(k) and the fee requirement in 26.12.03.)

(xiv) may not hold devices that are not in use for longer than 2 years. If devices with shutters are not being used, the shutter must be locked in the closed position. The testing required by C.22(d)(4)(iii) need not be performed during the period of storage only. However, when devices are put back into service or transferred to another person, and have not been tested within the required test interval, they must be tested for leakage before use or transfer and the shutter tested before use. Devices kept in standby for future use are excluded from the two-year time limit if the general licensee performs quarterly physical inventories of these devices while they are in standby;

(xv) shall not export the device containing byproduct material except in accordance with 10 CFR Part 110; and

(xvi) shall respond to written requests from the Agency 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 Agency a written justification for the request.

(5) The general license in C.22(d)(1) does not authorize the manufacture of devices containing radioactive material.

(6) The general license provided in C.22(d)(1) is subject to the provisions of A.4 through A.9, C.31, C.40, C.50, and Part T of these regulations.

(e) Luminous Safety Devices for Aircraft.

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

(i) each device contains not more than 10 curies (370 GBq) of tritium or 300 millicuries (11.1 GBq) of promethium-147; and

(ii) each device has been manufactured, assembled or imported in accordance with a specific license issued by the U.S. Nuclear Regulatory Commission, or each device has been manufactured or assembled in accordance with the specifications contained in a specific license issued by the Agency or any 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.

(2) Persons who own, receive, acquire, possess, or use luminous safety devices pursuant to the general license in C.22(e)(1) are exempt from the requirements of Parts D and J of these regulations except that they shall comply with the provisions of D.1001, D.1201, D.1202 and D.1207.

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

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

(5) This general license is subject to the provisions of A.4 through A.9, C.31, C.40, C.50, and Part T of these regulations.

under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety committee.

(3) Each Type B specific license of broad scope issued under this part shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety officer.

(4) Each Type C specific license of broad scope issued under this part shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals who satisfy the requirements of C.27(d).

Sec. C.28. Special Requirements for a Specific License to Manufacture, Assemble, Repair, or Distribute Commodities, Products, or Devices which Contain Radioactive Material.

(a) Licensing the Introduction of Radioactive Material into Products in Exempt Concentrations Prohibition of Introduction. No person may introduce byproduct material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under C.4(a)(1) or equivalent regulations of the NRC, an Agreement State, or a Licensing State, except in accordance with a license issued by the NRC under § 32.11. 8/

Comment [p14]: Sec 32.13

(1) In addition to the requirements set forth in C.25, 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 C.4(a)(1) will be issued if:

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

(ii) the applicant provides reasonable assurance that the concentrations of radioactive material at the time of transfer will not exceed the concentrations in Appendix A of this part, that reconcentration of the radioactive material in concentrations exceeding those in Appendix A is not likely, that use of lower concentrations is not feasible, and that the product or material is not likely to be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

(2) Each person licensed under C.28(a) shall file an annual report with the Agency 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 owned or possessed the product or material, into which radioactive material has been introduced, at the time of introduction; the type and quantity of radionuclide introduced into each such product or material; and the initial concentrations of the radionuclide in the product or material at time of transfer of the radioactive material by the licensee. If no transfers of radioactive material have been made pursuant to C.28(a) during the reporting period, the report shall so indicate. The report shall cover the year ending June 30, and shall be filed within 30 days thereafter.

(b) [Reserved]

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| ~~[Licensing the Distribution of Radioactive Material in Exempt Quantities, 8/](#)~~

8/ Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing byproduct 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, D.C. 20555.

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~~(1) An application for a specific license to distribute NARM to persons exempted from these regulations pursuant to C.4(b) will be approved if:~~

~~———— (i) 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;~~

~~———— (ii) 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~~

~~———— (iii) the applicant submits copies of prototype labels and brochures and the Agency approves such labels and brochures.~~

~~———— (2) The license issued under C.28(b)(1) is subject to the following conditions:~~

~~———— (i) 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.~~

~~———— (ii) Each exempt quantity shall be separately and individually packaged. No more than 10 such packaged exempt quantities shall be contained in any outer package for transfer to persons exempt pursuant to C.4(b). The outer package shall be such that the dose rate at the external surface of the package does not exceed 0.5 millirem (5  $\mu$ Sv) per hour.~~

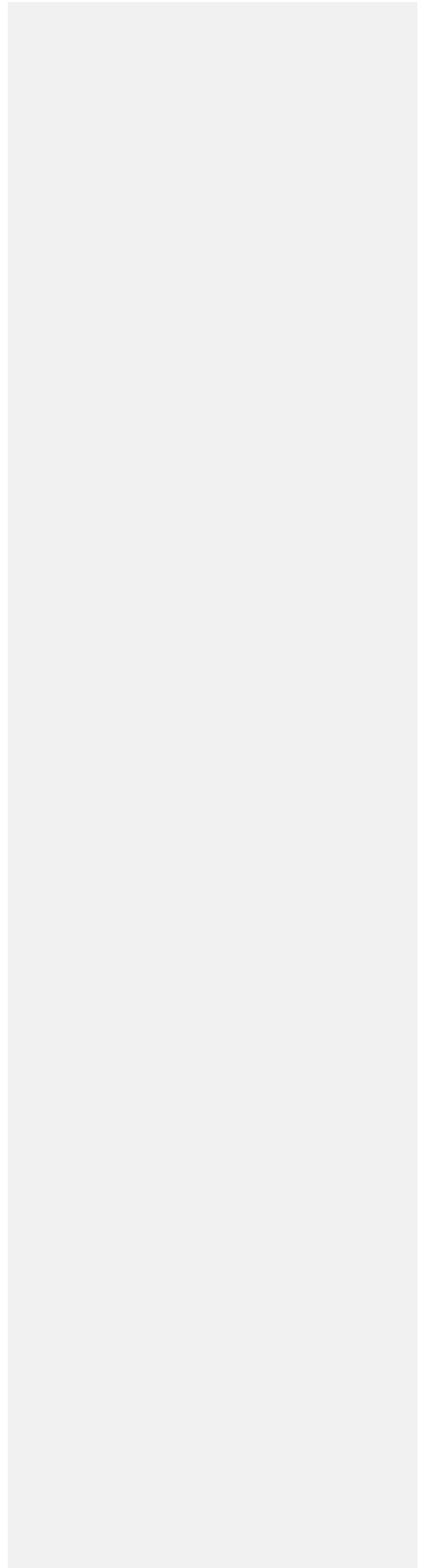
~~———— (iii) The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label which:~~

~~———— (a) identifies the radionuclide and the quantity of radioactivity, and~~

~~(b) bears the words "Radioactive Mater~~This page intentionally left blank.



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~~(iv) In addition to the labeling information required by C.28(b)(2)(iii), the label affixed to the immediate container, or an accompanying brochure, shall:~~

~~(a) state that the contents are exempt from Licensing State requirements,~~

~~(b) bear the words "Radioactive Material - Not for Human Use - Introduction into Foods, Beverages, Cosmetics, Drugs, or Medicinals, or into Products Manufactured for Commercial Distribution is Prohibited - Exempt Quantities Should Not Be Combined", and~~

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

~~(3) Each person licensed under C.28(b) shall maintain records identifying, by name and address, each person to whom radioactive material is transferred for use under C.4(b) 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 Agency. 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 C.28(b) during the reporting period, the report shall so indicate.~~

~~(c) [Reserved] Licensing the Incorporation of Naturally Occurring and Accelerator Produced Radioactive Material into Gas and Aerosol Detectors. An application for a specific license authorizing the incorporation of NARM into gas and aerosol detectors to be distributed to persons exempt under C.4(e)(3) will be approved if the application satisfies requirements equivalent to those contained in Section 32.26 of 10 CFR Part 32. The maximum quantity of radium 226 in each device shall not exceed 0.1 microcurie (3.7 kBq).~~

(d) Licensing the Manufacture and Distribution of Devices to Persons Generally Licensed Under C.22(d).

(1) An application for a specific license to manufacture or distribute devices containing radioactive material, excluding special nuclear material, to persons generally licensed under C.22(d) or equivalent regulations of the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State will be approved if:

(i) the applicant satisfies the general requirements of C.25;

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

(a) the device can be safely operated by persons not having training in radiological protection,

(b) under ordinary conditions of handling, storage, and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in any period of 1 calendar quarter a dose in excess of 10 percent of the limits specified in the table in D.201(a) of these regulations, and

(c) under accident conditions such as fire and explosion associated with handling, storage, and use of the device, it is unlikely that any person would

receive an external radiation dose or dose commitment in excess of the following organ doses:

Whole body; head and trunk; active blood-forming organs; gonads; or lens of eye . . . . . 15 rems (150 mSv)

Hands and forearms; feet and ankles; localized areas of skin averaged over areas no larger than 1 square centimeter . . . . . 200 rems (2 Sv)

Other organs . . . . . 50 rems (500 mSv);  
and

(d) the device has been manufactured so that:

(1) The dose rate in the radiation beam of the device at 18 inches (0.46 meters) from the radiation source with the device shutter in the open position does not exceed 125 millirem (1.25 mSv) per hour; and

(2) There is not an accessible air gap of 18 inches (0.46 meters) or greater between the radiation source and detector which would allow insertion of a 12 inch (0.30 meter) diameter sphere into the radiation beam.

(iii) each device bears a durable, legible, clearly visible label or labels approved by the Agency, which contain in a clearly identified and separate statement:

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

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

(c) the information called for in one of the following statements, as appropriate, in the same or substantially similar form:

(1) The receipt, possession, use, and transfer of this device, Model \_\_\_\_\_, Serial No. \_\_\_\_\_ 9/, are subject to a general license or the equivalent and the regulations of the U.S. Nuclear Regulatory Commission or a State with which the U.S. Nuclear Regulatory Commission has entered into an agreement for the exercise of regulatory authority. This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

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this label is prohibited"; and

(iv) The holder of the specific license shall furnish to each general licensee to whom he transfers such device or on whose premises he installs such device a copy of the general license contained in C.22(d) or in equivalent regulations of the agency having jurisdiction over the manufacture and distribution of the device.

(3) The Agency may withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by a Licensing State, or any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to prevent undue hazard to public health and safety or property.

(c) Reciprocity of Maryland Licensees.

(1) Prior to a State of Maryland company conducting licensed activities in offshore waters or areas of exclusive Federal jurisdiction that company shall meet all pertinent requirements of 10 CFR 150.20.

(2) Any person engaging in activities in non-Agreement States, in areas of exclusive Federal jurisdiction within Agreement States, or in offshore waters under the general licenses provided in 10 CFR 150.20, shall not, in any non-Agreement State, in an area of exclusive Federal jurisdiction within an Agreement State, or in offshore waters, transfer or dispose of radioactive material possessed or used under the general licenses provided in 10 CFR 150.20, except by transfer to a person who is specifically licensed by the NRC to receive this material.

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## Part C

APPENDIX A  
EXEMPT CONCENTRATIONS

Element (atomic number)	Radionuclide	Column I	Column II
		Gas concentration $\mu\text{Ci/ml}$ <u>1/</u>	Liquid and solid concentration $\mu\text{Ci/ml}$ <u>2/</u>
Antimony (51)	Sb-122		$3 \times 10^{-4}$
	Sb-124		$2 \times 10^{-4}$
	Sb-125		$1 \times 10^{-3}$
Argon (18)	Ar-37	$1 \times 10^{-3}$	
	Ar-41	$4 \times 10^{-7}$	
Arsenic (33)	As-73		$5 \times 10^{-3}$
	As-74		$5 \times 10^{-4}$
	As-76		$2 \times 10^{-4}$
	As-77		$8 \times 10^{-4}$
Barium (56)	Ba-131		$2 \times 10^{-3}$
	Ba-140		$3 \times 10^{-4}$
Beryllium (4)	Be-7		$2 \times 10^{-2}$
Bismuth (83)	Bi-206		$4 \times 10^{-4}$
Bromine (35)	Br-82	$4 \times 10^{-7}$	$3 \times 10^{-3}$
Cadmium (48)	Cd-109		$2 \times 10^{-3}$
	Cd-115m		$3 \times 10^{-4}$
	Cd-115		$3 \times 10^{-4}$
Calcium (20)	Ca-45		$9 \times 10^{-5}$
	Ca-47		$5 \times 10^{-4}$
Carbon (6)	C-14	$1 \times 10^{-6}$	$8 \times 10^{-3}$
Cerium (58)	Ce-141		$9 \times 10^{-4}$
	Ce-143		$4 \times 10^{-4}$
	Ce-144		$1 \times 10^{-4}$
Cesium (55)	Cs-131		$2 \times 10^{-2}$
	Cs-134m		$6 \times 10^{-2}$
	Cs-134		$9 \times 10^{-5}$
Chlorine (17)	Cl-38	$9 \times 10^{-7}$	$4 \times 10^{-3}$
Chromium (24)	Cr-51		$2 \times 10^{-2}$
Cobalt (27)	Co-57		$5 \times 10^{-3}$
	Co-58		$1 \times 10^{-3}$
	Co-60		$5 \times 10^{-4}$

1/ Values are given in Column I only for those materials normally used as gases.

2/  $\mu\text{Ci/g}$  for solids.

## Part C

APPENDIX A  
EXEMPT CONCENTRATIONS

Element (atomic number)	Radionuclide	Column I Gas concentration $\mu\text{Ci/ml}$ <u>1/</u>	Column II Liquid and solid concentration $\mu\text{Ci/ml}$ <u>2/</u>
Rubidium (37)	Rb-86		$7 \times 10^{-4}$
Ruthenium (44)	Ru-97		$4 \times 10^{-3}$
	Ru-103		$8 \times 10^{-4}$
	Ru-105		$1 \times 10^{-3}$
	Ru-106		$1 \times 10^{-4}$
Samarium (62)	Sm-153		$8 \times 10^{-4}$
Scandium (21)	Sc-46		$4 \times 10^{-4}$
	Sc-47		$9 \times 10^{-4}$
	Sc-48		$3 \times 10^{-4}$
Selenium (34)	Se-75		$3 \times 10^{-3}$
Silicon (14)	Si-31		$9 \times 10^{-3}$
Silver (47)	Ag-105		$1 \times 10^{-3}$
	Ag-110m		$3 \times 10^{-4}$
	Ag-111		$4 \times 10^{-4}$
	Na-24		$2 \times 10^{-3}$
Sodium (11)	Na-24		$2 \times 10^{-3}$
Strontium (38)	Sr-85		$1 \times 10^{-3-4}$
	Sr-89		$1 \times 10^{-4}$
	Sr-91		$7 \times 10^{-4}$
	Sr-92		$7 \times 10^{-4}$
	S-35	$9 \times 10^{-8}$	
Sulfur (16)	S-35	$9 \times 10^{-8}$	
Tantalum (73)	Ta-182		$4 \times 10^{-4}$
Technetium (43)	Tc-96m		$1 \times 10^{-1}$
	Tc-96		$1 \times 10^{-3}$
Tellurium (52)	Te-125m		$2 \times 10^{-3}$
	Te-127m		$6 \times 10^{-4}$
	Te-127		$3 \times 10^{-3}$
	Te-129m		$3 \times 10^{-4}$
	Te-131m		$6 \times 10^{-4}$
	Te-132		$3 \times 10^{-4}$
Terbium (65)	Tb-160		$4 \times 10^{-4}$
Thallium (81)	Tl-200		$4 \times 10^{-3}$
	Tl-201		$3 \times 10^{-3}$
	Tl-202		$1 \times 10^{-3}$
	Tl-204		$1 \times 10^{-3}$

1/ Values are given in Column I only for those materials normally used as gases.

2/  $\mu\text{Ci/g}$  for solids.

## Part C

APPENDIX A  
EXEMPT CONCENTRATIONS

Element (atomic number)	Radionuclide	Column I Gas concentration $\mu\text{Ci/ml}$ <u>1/</u>	Column II Liquid and solid concentration $\mu\text{Ci/ml}$ <u>2/</u>
Thulium (69)	Tm-170		$5 \times 10^{-4}$
	Tm-171		$5 \times 10^{-3}$
Tin (50)	Sn-113		$9 \times 10^{-4}$
	Sn-125		$2 \times 10^{-4}$
Tungsten (Wolfram) (74)	W-181		$4 \times 10^{-3}$
	W-187		$7 \times 10^{-4}$
Vanadium (23)	V-48		$3 \times 10^{-4}$
Xenon (54)	Xe-131m	$4 \times 10^{-6}$	
	Xe-133	$3 \times 10^{-6}$	
	Xe-135	$1 \times 10^{-6}$	
Ytterbium (70)	Yb-175		$1 \times 10^{-3}$
Yttrium (39)	Y-90		$2 \times 10^{-4}$
	Y-91m		$3 \times 10^{-2}$
	Y-91		$3 \times 10^{-4}$
	Y-92		$6 \times 10^{-4}$
	Y-93		$3 \times 10^{-4}$
Zinc (30)	Zn-65		$1 \times 10^{-3}$
	Zn-69m		$7 \times 10^{-4}$
	Zn-69		$2 \times 10^{-2}$
Zirconium (40)	Zr-95		$6 \times 10^{-4}$
	Zr-97		$2 \times 10^{-4}$
Beta- and/or gamma-emitting radioactive material not listed above with half-life of less than 3 years.		$1 \times 10^{-10}$	$1 \times 10^{-6}$

1/ Values are given in Column I only for those materials normally used as gases.

2/  $\mu\text{Ci/g}$  for solids.

Note 1: Many radionuclides transform into other radionuclides. In expressing the concentrations in Appendix A, the activity stated is that of the parent radionuclide and takes into account the radioactive decay products.